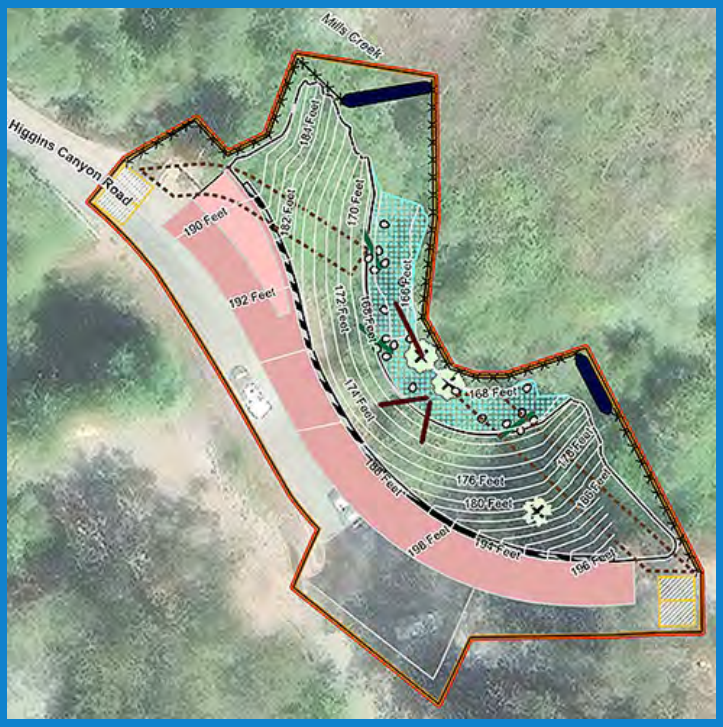
Initial Study and Negative Declaration for the Slip-Out Repair and Bank Stabilization Near 1780 Higgins Canyon Road Project, San Mateo County, California

DECEMBER 2024



PREPARED FOR

County of San Mateo
Department of Public Works

PREPARED BY

SWCA Environmental Consultants

INITIAL STUDY/NEGATIVE DECLARATION FOR THE SLIP-OUT REPAIR AND BANK STABILIZATION NEAR 1780 HIGGINS CANYON ROAD PROJECT, SAN MATEO COUNTY, CALIFORNIA

Prepared for

County of San Mateo
Department of Public Works
555 County Center, 5th Floor
Redwood City, California 94063
Attn: Julie Casagrande, Senior Natural Resource Specialist

Prepared by

SWCA Environmental Consultants
60 Stone Pine Road, Suite 201
Half Moon Bay, CA 94019
(650) 440-4160
www.swca.com

SWCA Project No. 86468

December 2024

CONTENTS

Environmental Factors Potentially Affected 1

Chapter 1. Project Description 1-3
1.1 CEQA Statute and Guidelines 1-3
1.2 Project Location 1-4
1.2.1 Regional Setting 1-4
1.2.2 Local Setting 1-7
1.3 Proposed Project 1-7
1.3.1 Project Construction 1-12
1.4 Project Restoration/Revegetation Plan 1-14
1.5 Project Permitting 1-15

Chapter 2. Environmental Checklist and Responses 2-1
2.1 Aesthetics 2-1
2.2 Agriculture and Forestry Resources 2-5
2.3 Air Quality 2-7
2.4 Biological Resources 2-11
2.5 Cultural Resources 2-22
2.6 Energy 2-24
2.7 Geology and Soils 2-25
2.8 Greenhouse Gas Emissions and Climate Change 2-29
2.9 Hazards and Hazardous Materials 2-32
2.10 Hydrology and Water Quality 2-36
2.11 Land Use and Planning 2-41
2.12 Mineral Resources 2-42
2.13 Noise 2-43
2.14 Population and Housing 2-44
2.15 Public Services 2-45
2.16 Recreation 2-46
2.17 Transportation and Traffic 2-47
2.18 Tribal Cultural Resources 2-48
2.19 Utilities and Service Systems 2-50
2.20 Wildfire 2-52
2.21 Mandatory Findings of Significance 2-54

Chapter 3. List of Preparers 3-1

Appendices

Appendix A. Project Site Plans
- Appendix A1. Design Plans (May 2024)
- Appendix A2. Revised Project Design (October 2024)

Appendix B. *County of San Mateo Routine Maintenance Program Manual* Best Management Practices

Appendix C. Biological Resources Technical Studies
- Appendix C1. Biological Resources Evaluation
- Appendix C2. Preliminary Jurisdictional Delineation Report

Appendix D. Geotechnical Design Report

Figures

Figure 1-1. Project vicinity map. 1-5
Figure 1-2. Project location map. 1-6
Figure 1-3. Existing Conditions: Overview of slip zone and creek, facing east. 1-7
Figure 1-4. Project design 1-8
Figure 1-5. Revegetation plan. 1-11
Figure 2-1. View of current conditions of the road and slip, facing west. Photo taken May 1, 2024. 2-2
Figure 2-2. View from the east border showing western approach, facing west. Photo taken May 1, 2024. 2-2
Figure 2-3. Overview of slip zone and creek showing dense vegetation, facing east. Photo taken May 1, 2024. 2-3
Figure 2-4. Natural Communities and Other Land Cover map. 2-20

Tables

Table 1-1. Linear Feet of Damaged Areas and Required Repair 1-9
Table 1-2. Anticipated Revegetation Species 1-14
Table 2-1. Air Quality BMPs Applicable to the Project 2-10
Table 2-2. Greenhouse Gas Construction Emission BMPs Applicable to the Project 2-30

ENVIRONMENTAL FACTORS POTENTIALLY AFFECTED

The environmental factors checked below would be potentially affected by this project, involving at least one impact that is a "potentially significant impact" as indicated by the checklist on the following pages.

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

DETERMINATION (To be completed by the Lead Agency)

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 (a) has been adequately analyzed in an earlier document pursuant to applicable legal standards, and (b) has been addressed by mitigation measures based on the earlier analysis as described on attached sheets. An ENVIRONMENT 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.

Julie Casagrande 12/17/2024

Signature **Date**

Julie Casagrande, Natural Resource Manager

Printed Name

INITIAL STUDY CHECKLIST

BACKGROUND

PROPONENT NAME	**PHONE NUMBER**
County of San Mateo Department of Public Works	(650) 599-1457
PROPONENT ADDRESS 555 County Center, 5th Floor Redwood City, CA 94063	
AGENCY REQUIRING CHECKLIST County of San Mateo	**DATE SUBMITTED** December 17, 2024
PROPOSAL NAME Slip-Out Repair and Bank Stabilization Project Near 1780 Higgins Canyon	

CHAPTER 1. PROJECT DESCRIPTION

1.1 CEQA STATUTE AND GUIDELINES

According to California Environmental Quality Act (CEQA) Statute Section 21064:

> NEGATIVE DECLARATION
>
> "Negative declaration" means a written statement briefly describing the reasons that a proposed project will not have a significant effect on the environment and does not require the preparation of an environmental impact report.

According to California State (State) CEQA Guidelines Article 6. Negative Declaration Process:

> 15070. DECISION TO PREPARE A NEGATIVE OR MITIGATED NEGATIVE DECLARATION
>
> A public agency shall prepare or have prepared a proposed negative declaration or mitigated negative declaration for a project subject to CEQA when:
>
> (a) The initial study shows that there is no substantial evidence, in light of the whole record before the agency, that the project may have a significant effect on the environment, or
>
> (b) The initial study identifies potentially significant effects, but:
>
> (1) Revisions in the project plans or proposals made by, or agreed to by the applicant before a proposed mitigated negative declaration and initial study are released for public review would avoid the effects or mitigate the effects to a point where clearly no significant effects would occur, and
>
> (2) There is no substantial evidence, in light of the whole record before the agency, that the project as revised may have a significant effect on the environment.
>
> 15071. CONTENTS
>
> A Negative Declaration circulated for public review shall include:
>
> (a) A brief description of the project, including a commonly used name for the project, if any;
>
> (b) The location of the project, preferably shown on a map, and the name of the project proponent;
>
> (c) A proposed finding that the project will not have a significant effect on the environment;
>
> (d) An attached copy of the Initial Study documenting reasons to support the finding; and
>
> (e) Mitigation measures, if any, included in the project to avoid potentially significant effects.

1.2 PROJECT LOCATION

1.2.1 Regional Setting

The County of San Mateo Department of Public Works (County) is proposing a slip-out repair project near 1780 Higgins Canyon Road that would repair the damaged road and restore the bed and failed bank of Mills Creek. Landslides occurred in 2021 and 2022 and then worsened in 2023 near 1780 Higgins Canyon Road in unincorporated San Mateo County near the city of Half Moon Bay, California (Figures 1-1 and 1-2). The landslide area is approximately 115 feet long and extends downslope from the road surface approximately 28 feet. The landslide was likely due to the saturated slope materials in combination with erosion from elevated creek flows. The landslide has resulted in 12 to 24 inches of pavement failure along the outboard shoulder of the roadway (Figure 1-3).

San Mateo County is situated along the central coast of California and encompasses approximately 554 square miles (including tidal waters) of the San Francisco Peninsula. The county's western border is along the Pacific Ocean, and the eastern border is along the San Francisco Bay shoreline. San Mateo County is bounded by the City and County of San Francisco to the north and by Santa Cruz and Santa Clara Counties to the south and southeast, respectively.

The Santa Cruz Mountain Range traverses San Mateo County in a north–south direction, effectively dividing San Mateo County into two distinct regions—the Coastside and the Bayside—and defining the topography in this region. On the Coastside, the steep mountain slopes transition into gradually sloped coastal terraces along the northern portion of the region near Half Moon Bay. The Bayside is characterized by low-lying mudflats, marshes, artificial fill, and broad, flat alluvial plains. Farther west, this low-lying region transitions into the foothills of the Santa Cruz Mountains, increasing in slope to 15% to 30% near its crest.

The Slip-Out Repair and Bank Stabilization Near 1780 Higgins Canyon Road Project (project) is located along Higgins Canyon Road immediately upstream of the Higgins Canyon Road bridge where it crosses Mills Creek. The project area is located in the Central Coastside region of unincorporated San Mateo County, south of the city of Half Moon Bay. The Central Coastside region extends nearly 25 miles from the southern flanks of Montara Mountain south to the Pomponio Creek Watershed, and the Pacific Ocean east to Skyline Boulevard (see Figure 1-1). Development in this region is lower due to the presence of several parks and open space preserves (e.g., Burleigh H. Murray State Park, Purisima Creek Redwoods, El Corte de Madera Creek, La Honda Creek) and the steep topography. However, coastal terraces and alluvial valleys support typical farming and livestock grazing outside of the open space preserves. Many small creeks drain the western hillslopes of the Santa Cruz Mountains; the largest of these creeks include Pilarcitos, Purisima, Lobitos, Tunitas, and San Gregorio Creeks. The project site is on Mills Creek, which is tributary to Arroyo Leon in the Pilarcitos Creek watershed.

The project area consists of an eroded creek bank of Mills Creek immediately upstream of where the creek crosses under Higgins Canyon Road. Higgins Canyon Road begins at the south end of the city of Half Moon Bay, approximately 25 miles south of San Francisco, and extends southeast from California State Route (SR) 1 to the junction of Purisima Creek Road. The slip-out is approximately 1.5 miles east of SR 1. Figures 1-1 and 1-2 show the regional vicinity and project site location, respectively.

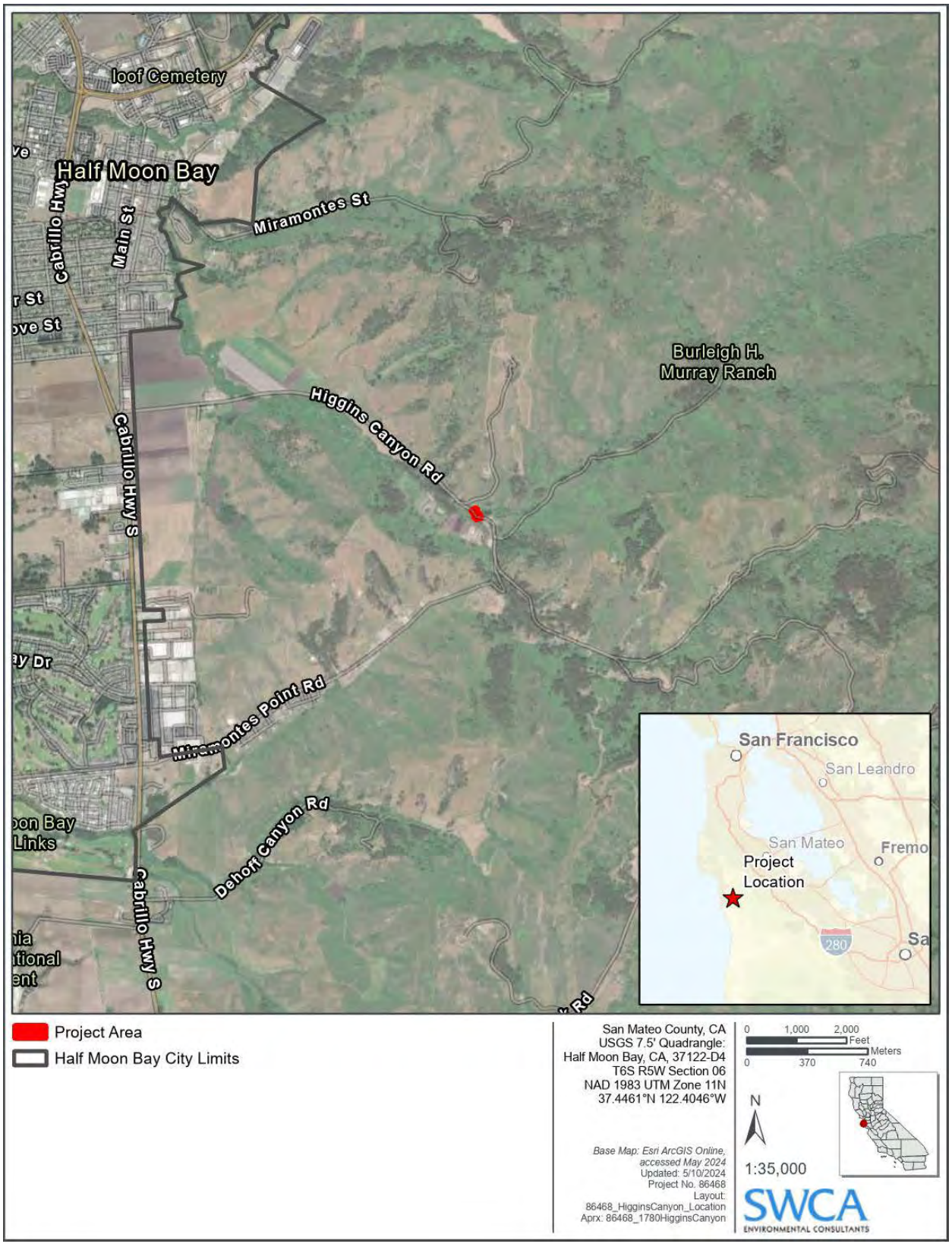


Figure 1-1. Project vicinity map.

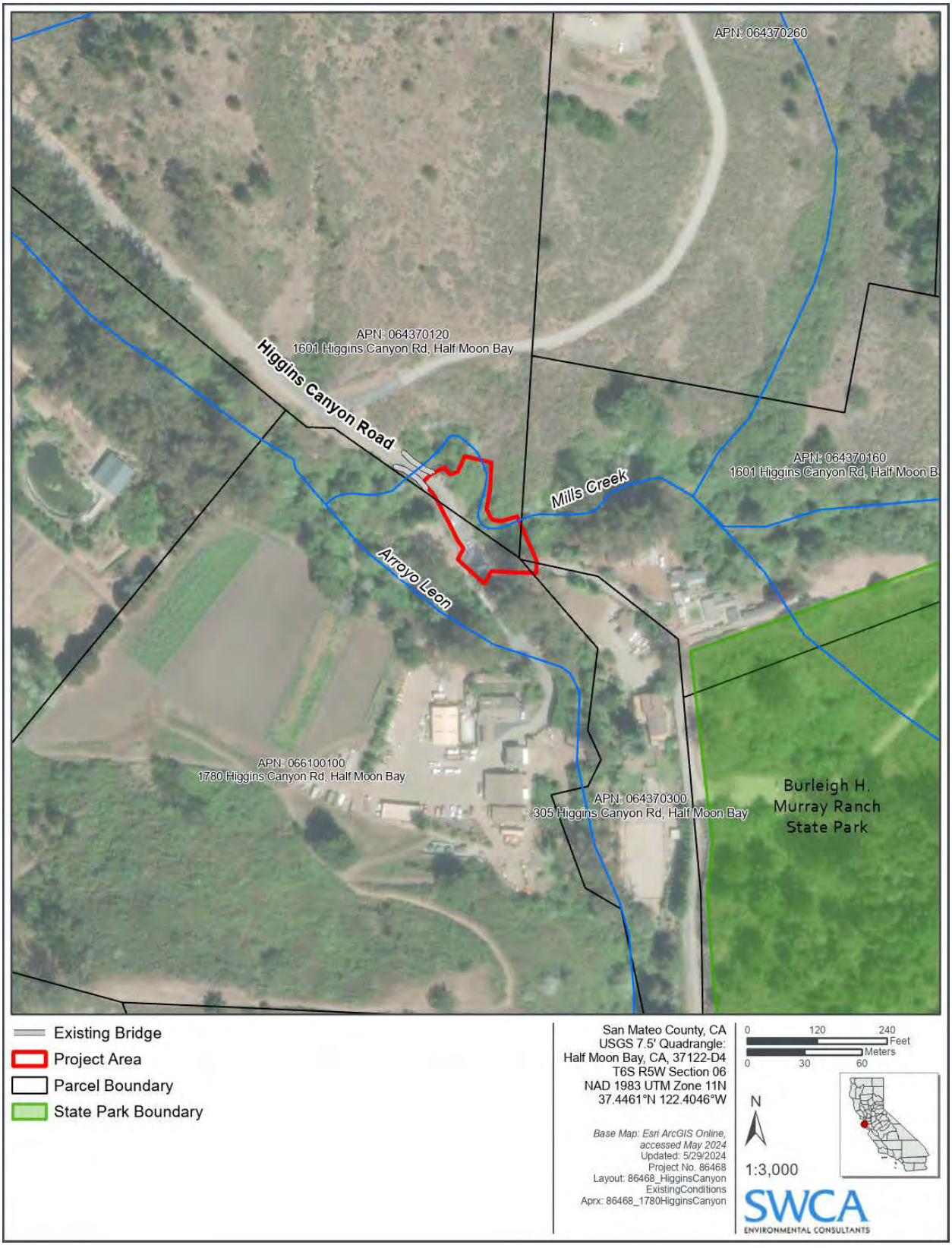


Figure 1-2. Project location map.

1.2.2 Local Setting

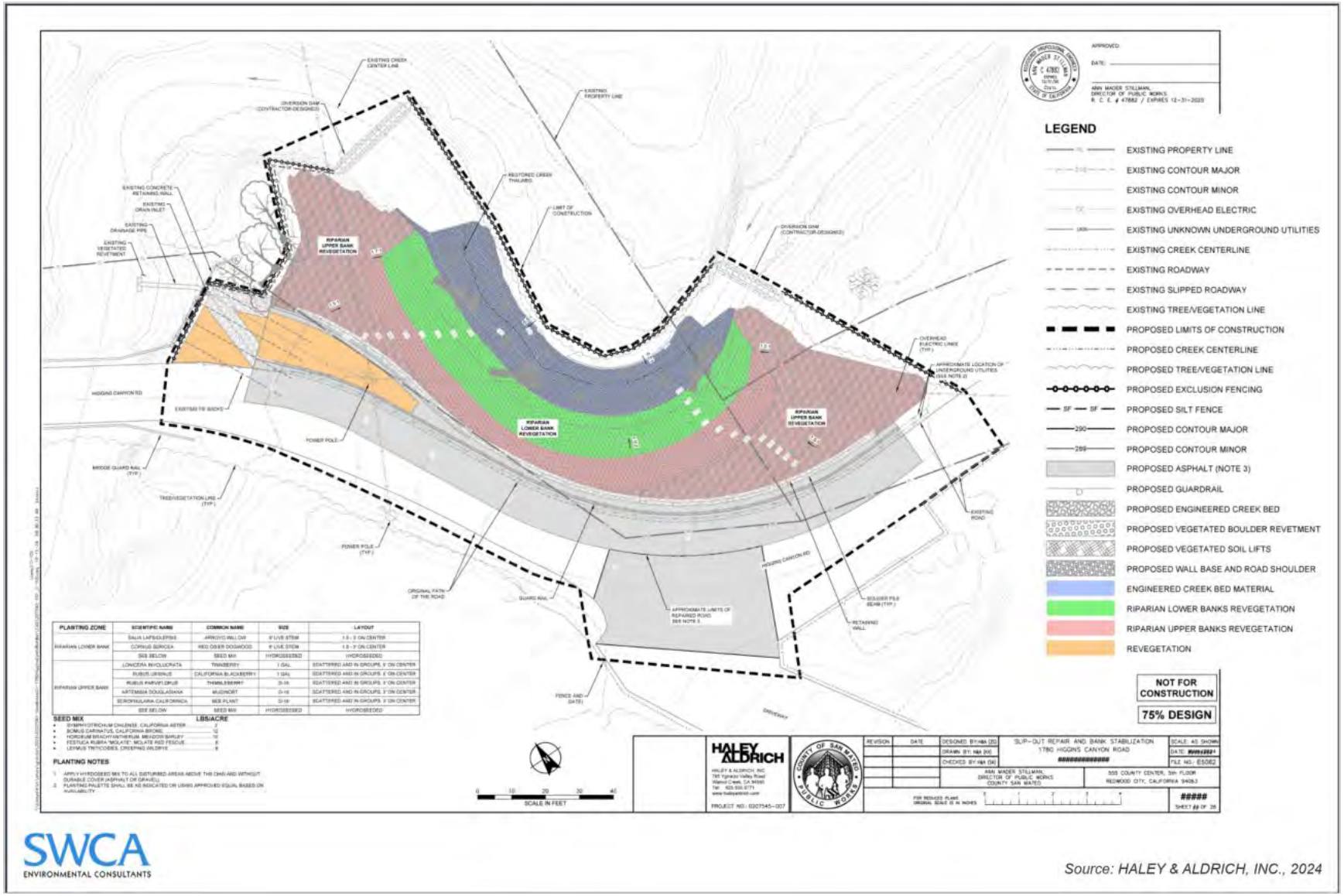
The project site is located just east of a bridge that crosses Mills Creek. Higgins Canyon Road is a narrow two-lane paved roadway that is about 18 to 21 feet wide in the project site vicinity and trends northwest to southeast. The slope requiring repair sits on a southwestern creek bank along Mills Creek and is moderately vegetated with small to large trees and shrubs (Figure 1-3). The portion of Mills Creek at the project location is slightly horseshoe-shaped and flows downstream from the northeast, bending to the northwest within the project footprint; this is assumed to be contributing to the erosion at the top of the slope. The segment of Mills Creek in the project area is between 30 and 45 feet wide. The depth of the creek channel, from road to creek bed, varies but averages approximately 18 feet deep (Figure 1-4). The depth of the active creek varies from approximately 8 inches to 2 feet. The road elevation ranges approximately between 200 and 202 feet above mean sea level (amsl). The creek bottom is approximately 174 feet amsl. Surrounding land uses include rural residential, Burleigh H. Murray State Park, and Lazy H Ranch. The project site includes portions of Assessor's Parcel Numbers (APNs) 066-100-100 (1780 Higgins Canyon Road), 064-370-120 and 064-370-160 (1601 Higgins Canyon Road [Burleigh H. Murray Ranch State Park]), and 064-370-300 (305 Higgins Canyon Road) (see Figure 1-2).



Figure 1-3. Existing Conditions: Overview of slip zone and creek, facing east.

1.3 PROPOSED PROJECT

The proposed project consists of road repairs, bank stabilization, and habitat enhancement along the southwestern bank of Mills Creek adjacent to the northeastern side of Higgins Canyon Road in San Mateo County. Approximately 110 linear feet of creek bed, 185 feet of creek bank, and 180 feet of roadway have been eroded and require repair.



SWCA ENVIRONMENTAL CONSULTANTS

Source: HALEY & ALDRICH, INC., 2024

Figure 1-4. Project design

The project area or envelope is larger than the planned disturbance area. The total project envelope includes approximately 20,040 square feet of area delineated by exclusion fencing to protect surrounding habitat (see Figure 1-4).

Within that envelope, the project footprint includes approximately 15,078 square feet of planned disturbance area (13,578 square feet of permanent disturbance area and 1,500 square feet of temporary disturbance area [coffer dams/water diversion area]). The remaining approximately 4,962 square feet, although not proposed as work areas, are inside the exclusion fencing and therefore may be subject to minor temporary disturbance.

The project components include: 1) an approximately 192-linear-foot-long soldier pile retaining wall, 2) an approximately 185-foot biostabilization-based bank repair (soil lifts and vegetated boulder revetments), 3) approximately 110 linear feet of engineered creek bed to restore the channel to its pre-erosional original flowpath, and 4) reconstruction of approximately 180 linear feet of failed roadway within the existing footprint to restore the travel lane and shoulder area, including the addition of asphalt concrete dike, drainage swales, and Midwest guardrails.[1] The permanent disturbance area includes approximately 7,697 square feet of existing creek, bank, and riparian work and approximately 5,881 square feet of existing roadway and shoulder area (see Figure 1-4). The linear feet of damaged and repair areas are shown in Table 1-1.

Table 1-1. Linear Feet of Damaged Areas and Required Repair

Area	Damaged Area	Repair Area
Road	180 linear feet	216 linear feet of pavement
Creek bank	192 linear feet	192-linear-foot soldier pile retaining wall 185-linear-foot bank stabilization – vegetated revetments
Creek bed	110 linear feet	110 linear feet engineered creek bed

The existing failed area of the creek bed is on a sharp outside curve and water action has eroded the base of the slope contributing to the slip-out. There are 10 trees within the project footprint that must be removed in order to accomplish the repairs. The project would remove the 10 trees and vegetation within the project footprint, existing slumped soil and debris, and existing slumped materials from a previous emergency repair from the channel. Existing underground utilities would be protected in place if feasible. The project would recontour the creek bed to restore the channel to its existing pre-erosional flowpath, moving the current thalweg[2] location away from the base of the eroding slope and closer to the existing center of the channel.

Due to design limitations given the steep slope and limited right-of-way width at the project site, a hardscape engineered feature consisting of an approximately 192-foot-long soldier pile retaining wall with sloped soil nailing is required in order to stabilize the roadbed and restore the failed section of roadway. The retaining wall will be a maximum of 24.8 feet in height and will be fronted by a biostabilization-based bank repair with features to enhance habitat. The biostabilization-based bank repair will include a combination of vegetated boulder revetment and vegetated soil lift features. The voids of the boulder revetment will be filled with a mix of universal gravel filter and topsoil, covered with erosion blankets, and vegetated using a combination of native live pole plantings, container plantings, and seed segments with roots.

[1] Midwest Guardrail System is a product often used adjacent to steep slopes, over long spans culverts, and as bridge rails.

[2] A thalweg is the line or curve of the lowest elevation within a stream.

The vegetated boulder revetment and engineered creek bed will incorporate additional habitat enhancement measures, including rootwads at the base of the revetment and specimen boulders in selected areas along the base of the revetment and throughout the channel. Rootwads are tree trunk attached that are used for streambank stabilization and to provide fish habitat. This method is effective in higher velocity streams at trapping sediment between components, supporting restoration of slope vegetation and distributing flow velocities. The features also enhance habitat by providing cover and flow refuge for salmonids and amphibians and promoting channel diversity (i.e., formation of scour pools). Vegetated soil lifts would be constructed in the upper part of the riparian area. These would be comprised of layers of topsoil wrapped in a double layer of biodegradable fabric and revegetated with live pole plantings, native container plantings, and seed. The area between the retaining wall and roadway would be revegetated with hydroseeding where it is not hardscaped (see Figures 1-4 and 1-5).

Revegetation would include container plants scattered in groups 2 feet apart on the soil lifts of the upper riparian banks. The lower riparian banks would be planted with live pole plantings in the vegetated boulder revetment (see Figure 1-5). These plants would consist of alternating arroyo willow (*Salix lasiolepis*) and creek dogwood (*Cornus sericea* ssp. *sericea*) planted in cardboard tubes with an internal diameter of 0.75 inch to 3 inches. The live pole plants would be harvested in coordination with a qualified biologist, soaked for at least 24 hours, and planted the same day they are removed from the water. The willows that are removed as part of the project would be retained for live pole plantings to the extent feasible. The tubes would be backfilled with topsoil and water. The planting (cardboard) tubes would be long enough to extend through the revetments into the existing soil and would be spaced between 1.5 and 3 feet apart (see Figure 1-5). The plant palette for the project is based on native plant species that are naturally thriving in the project vicinity.

The project would remove approximately 2,116 square feet of the asphalt from the existing compromised roadway on the northeastern edge of the road where it is affected by the slip-out. This would be replaced with approximately 4,556 square feet of new asphalt, including the failed pavement area. The finished roadway would be restored to its original width and be approximately 20 feet wide. The asphalt road would consist of 4 inches of asphalt pavement underlain by 12 inches of Class II aggregate base rock. Guardrail posts would be installed 3 feet below ground surface. Following completion of the project, temporary work areas will be returned to preconstruction conditions. Project plans are provided in Appendix A.

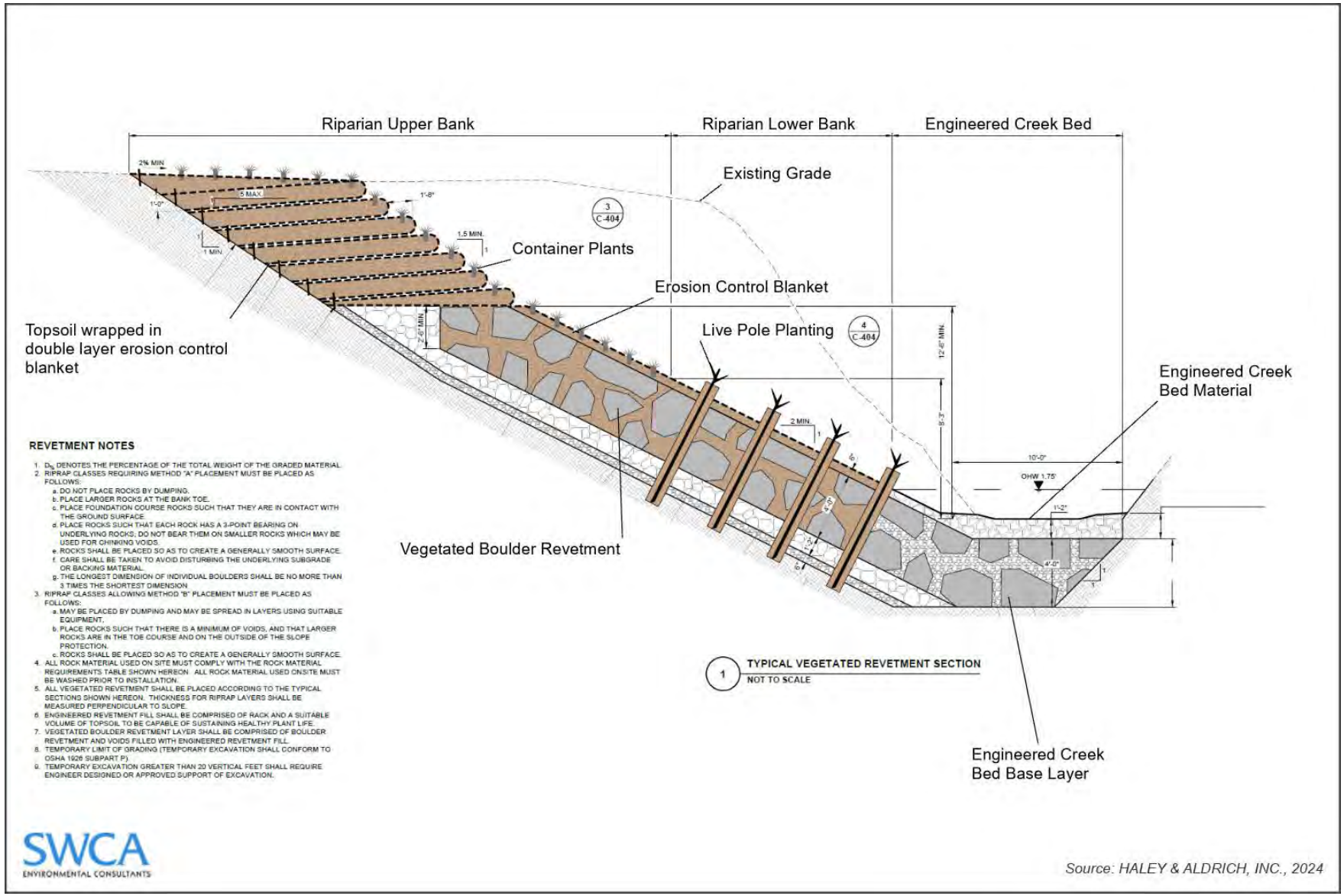


Figure 1-5. Revegetation plan.

1.3.1 Project Construction

Project construction would include the following:

- Install stormwater best management practices (BMPs) (silt fencing, wattles, exclusion fencing, etc.)
- Relocate fish and amphibians from the work area prior to installing creek diversion system;
- Install two temporary cofferdams, fish block nets, and a clean water bypass system in the low-flow channel to isolate the work area from waters of the United States (WOTUS) and waters of the state;
- Dewater the streambed using pumps, piping, filters, and other tools as necessary;
- Clear vegetation, including removal of 10 existing trees and tree complexes from the work area; salvage removed willows for live pole plantings; and protect additional eight trees;
- Create up to two temporary access paths at either end of the slip-out area from Higgins Canyon Road into the creek bed;
- Demolish remaining asphalt concrete on the slipped edge (north side) of the road;
- Prior to grading, protect existing utilities to the extent possible and remove existing debris, including existing pavements and buried pipes within the work area;
- Drill soldier piles in place and construct a concrete lagging retaining wall with tieback anchors;
- Grade and contour the creek bed to restore the center line or flowpath (thalweg) of the creek to its original pre-erosional location;
- Place engineered creek bed materials, vegetated boulder revetments, and soil lifts;
- Install native plantings in the revetments;
- Pave the road, add a gravel drainage swale and asphalt concrete dike, backfill and revegetate the existing shoulder area, and install Midwest guardrails; and
- Install and monitor post-construction stormwater BMPs and erosion control.

Prior to commencement of creek and road repair, the project would include installation of erosion control BMPs, removal of some vegetation to gain access to the work area and creek, and installation of two temporary coffer dams to reroute water around the construction area. Vegetation removal would include removal of six arroyo willow (*Salix lasiolepis*), three red alder (*Alnus rubra*), and one red elderberry (*Sambucus racemosa*), as well as understory vegetation. All six willows would be salvaged and used for live pole planting in the revegetation stage.

Up to two temporary access paths would be constructed at either end of the slip-out area from Higgins Canyon Road into the creek bed. The location of the staging area has not yet been determined. Construction and demolition materials and supplies would be limited to designated off-site staging area(s). A temporary staging area would be established off-site. All temporary work areas would be returned to pre-project conditions at project completion.

The existing ground surface would be grubbed and graded, which would require excavation of approximately 3,265 cubic yards (CY) of debris and existing soil and 120 CY of road excavation for a total of 3,385 CY of cut. Some of the excavated soil may be suitable for reuse on-site. The project would require importation of approximately 1,680 CY of fill, as well as 70 CY of road fill, 70 CY of aggregate road base, asphalt for the roadway, concrete for the retaining wall, and rock and gravel for the revetments

and engineered creek bed. Excavation depths would not exceed 29 feet. The exported materials would be hauled off-site for disposal or recycling. The project would generate approximately 398 one-way haul truck trips, assuming a 14-CY dump truck.

The project would replace and restore approximately 4,556 square feet of existing roadway and create approximately 383 square feet of new impervious surface with the new retaining wall. The project would also create a new graveled shoulder/drainage swale covering approximately 218 square feet and revegetate approximately 724 square feet of road shoulder with hydroseeding.

Access to the project site would be from the west via SR 1 and Higgins Canyon Road. Construction staging and materials staging would occur off-site; however, the location has not been determined to date. Although some of the cut material may be suitable as fill and will be analyzed on-site, using the conservative assumption that none of the material would be suitable for reuse, the project would require an estimated off-haul volume of 3,385 CY (including vegetation, rock, asphalt, soil, etc.) and 1,680 CY of fill material would be hauled to the project site. Assuming a 14-CY dump truck, an estimated 242 truck trips will be required for export, 120 truck trips for fill import, and an additional 36 truck trips to deliver project materials, including concrete, asphalt, guardrail, vegetation, rootwads, specimen boulders, steel piles, rebar, and construction vehicles, for a total of 398 one-way truck trips. Construction and demolition materials and supplies would be limited to designated off-site staging area(s), which would be identified by the contractor. The staging area(s) would function as the assembly point for project personnel, as well as the location for temporary, portable bathroom facilities; equipment storage during off-work hours and weekends; materials storage; employee parking; and a meeting area as needed for project management. All work would comply with the Regional Water Quality Control Board (RWQCB), San Mateo Countywide Pollution Prevention Program (SMCWPPP), and *County of San Mateo Routine Maintenance Program Manual* (County RMP) BMPs.[3]

Construction activities would occur for approximately 70 working days during summer 2025. Construction would be completed by October 15, 2025. Construction hours would be limited to 7:00 a.m. to 6:00 p.m., Monday through Friday, and 9:00 am to 5:00 pm on Saturday. Sunday construction is not anticipated and would require permission from the County. The designated contractor would ensure that driveways accessing Higgins Canyon Road would be accessible at all times. During construction, partial road closures would be necessary, resulting in one-way traffic control. There would also be periods of complete road closures during road grading and paving. During project construction, the contractor would implement a traffic control plan using signs, cones and flaggers to oversee one-way traffic control. Construction equipment would likely include the following:

- drill rig
- asphalt paver
- CAT long-reach excavator
- hauling trucks (14-CY dump truck)
- cement mixer
- bobcat
- drum roller
- water truck
- hand tools for trimming vegetation, such as chainsaws and saws

[3] Flows to Bay. 2024. Construction Best Practices. Available at: https://www.flowstobay.org/preventing-stormwater-pollution/with-new-redevelopment/construction-best-practices/. Accessed May 28, 2024.

Project plans are provided in Appendix A.

1.4 PROJECT RESTORATION/REVEGETATION PLAN

The project would result in a total of approximately 0.03 acre of temporary impacts and 0.18 acre of permanent impacts to creek bed and riparian habitat. Of the permanent impacts, approximately 0.02 acre of impact is associated with WOTUS and approximately 0.16 acre is associated with riparian habitat. The project includes habitat enhancement and would revegetate the banks with native plants using container plants and live pole plantings included in the vegetated boulder revetment and hydroseeding of all unpaved areas above the ordinary high-water mark (OHWM) (see Table 1-2 and Figure 1-4). The bank repair incorporates biostabilization techniques and includes features such as rootwads for refugia and specimen boulders for channel diversity to enhance existing habitat.

Table 1-2. Anticipated Revegetation Species

Planting Zone	Species	Planting Method
Riparian Lower Bank	Arroyo willow (*Salix lasiolepis*)	Live pole
	Red osier dogwood (*Cornus sericea*)	Live pole
	Seed mix*	Hydroseed
Riparian Upper Bank	Twinberry (*Lonicera involucrate*)	Container plant
	California blackberry (*Rubus ursinus*)	Container plant
	Thimbleberry (*Rubus parviflorus*)	Container plant
	Mugwort (*Artemisia douglasiana*)	Container plant
	Bee plant (*Scrophularia californica*)	Container plant
	Seed mix*	Hydroseed

* Seed mix consists of:
California aster (*Symphyotrichum chilense*); 2 pounds (lbs)/acre
California brome (*Bromus carinatus*); 12 lbs/acre
Meadow barley (*Hordeum brachyantherum*); 10 lbs/acre
Molate red fescue (*Festuca rubra 'Molate'*); 8 lbs/acre
Creeping wild rye (*Leymus triticoides*); 8 lbs/acre

Compensatory mitigation would not be required as the project design includes habitat enhancement elements (e.g., live pole plantings, rootwads for refugia, specimen boulders for channel diversity, etc.), which will improve the existing habitat.

The County is working with the U.S. Army Corps of Engineers (USACE), RWQCB, and California Department of Fish and Wildlife (CDFW) for permitting and would implement all required permit conditions.

The Contractor would be required to submit a Water Pollution Control Program in compliance with the San Francisco Bay RWQCB Municipal Regional Stormwater National Pollutant Discharge Elimination System (NPDES) Permit (San Francisco Bay NPDES Permit). [4] The project would include stormwater BMPs from the SMCWPPP and County RMP.[5] Stormwater BMPs will be included in the plan set and

[4] Regional Water Quality Control Board (RWQCB). 2022. *California Regional Water Quality Control Board San Francisco Bay Region Municipal Regional Stormwater NPDES Permit.* Order No. R2-2022-0018. NPDES Permit No. CAS612008. May 11. Available at: https://www.waterboards.ca.gov/sanfranciscobay/board_decisions/adopted_orders/2022/R2-2022-0018.pdf. Accessed May 17, 2024.

[5] Flows to Bay. 2024. Construction Best Practices. Available at: https://flowstobay.org/preventing-stormwater-pollution/with-new-redevelopment/construction-best-practices/. Accessed May 17, 2024.

implemented in compliance with the project Water Pollution Control Program. The loss of soil or sediment to erosion will be minimized with the use of silt fencing, fiber rolls, straw bales, and/or other erosion control measures, where necessary, such as on steep slopes.

After the restoration plantings have been installed, the maintenance phase of the project will begin. The purpose of the maintenance program is to provide guidelines for maintenance of the restored riparian habitat. The goal of the restoration activities is to create habitat that will be self-sufficient and require minimal maintenance. Therefore, maintenance activities will be concentrated over the first couple of years and may include activities such as irrigation and weed management and removal.

1.5 PROJECT PERMITTING

Due to the presence of definable bed, banks, and OHWMs; riparian vegetation; and connectivity to Pilarcitos Creek, which is a tributary to the Pacific Ocean, the watercourse is considered jurisdictional under the USACE, RWQCB, and CDFW. The following permits are required as determined during pre-project regulatory agency coordination:

- **U.S. Army Corps of Engineers:** Section 404 dredge and fill permit under the Clean Water Act (Nationwide Permit 13 – Bank Stabilization)
- **Regional Water Quality Control Board:** Section 401 Water Quality Certification (WQC) under the Clean Water Act (Individual WQC)
- **California Department of Fish and Wildlife:** Section 1602 Lake and Streambed Alteration Agreement
- **County of San Mateo/California Coastal Commission:** Coastal Development Permit

CHAPTER 2. ENVIRONMENTAL CHECKLIST AND RESPONSES

2.1 AESTHETICS

Environmental Issues	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
Except as provided in Public Resources Code Section 21099, would the project:				
(a) Have a substantial adverse effect on a scenic vista, views form existing residential areas, public lands, water bodies, or roads?	☐	☐	☒	☐
(b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?	☐	☐	☒	☐
(c) In non-urbanized areas, substantially degrade the existing visual character or quality of public views of the site and its surroundings, such as significant change in topography or ground surface relief features, and/or development on a ridgeline? (Public views are those that are experienced from publicly accessible vantage points). If the project is in an urbanized area, would the project conflict with applicable zoning and other regulations governing scenic quality?	☐	☐	☒	☐
(d) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?	☐	☐	☐	☒
(e) Be adjacent to a designated Scenic Highway or within State or County Scenic Corridor?	☐	☐	☒	☐
(f) If within a Design Review District, conflict with applicable General Plan or Zoning Ordinance provisions?	☐	☐	☐	☒
(g) Visually intrude into an area having natural scenic qualities?	☐	☐	☒	☐

(a) Would the project have a substantial adverse effect on a scenic vista?

While the *San Mateo County General Plan* and the San Mateo County Local Coastal Program (LCP) do not define or identify scenic vistas, "scenic vistas" are generally defined as high-quality views displaying good aesthetic and compositional value that can be seen from public viewpoints and possess visual qualities of high value to a community. If the project substantially degrades the scenic landscape as viewed from public roads, or along particularly designated scenic routes, or from other public or recreation areas, this would be considered a potentially significant impact on the scenic vista.

Higgins Canyon Road is a designated County Scenic Corridor. In the project area, the road is characterized by riparian vegetation associated with Mills Creek, overhead power lines, fences, residences and barns, agricultural operations, and vegetated hillsides.

The project work would occur in Mills Creek adjacent to the roadway and on the roadway itself. Mills Creek is a heavily vegetated corridor adjacent to Higgins Canyon Road in the project area (Figures 2-1 through 2-3).



Figure 2-1. View of current conditions of the road and slip, facing west. Photo taken May 1, 2024.



Figure 2-2. View from the east border showing western approach, facing west. Photo taken May 1, 2024.



Figure 2-3. Overview of slip zone and creek showing dense vegetation, facing east. Photo taken May 1, 2024.

The project would require the removal of 10 existing trees as well as vegetation in the creek and on the banks of the area to be repaired. As discussed in Section 1.4, *Project Restoration/Revegetation Plan*, the banks of Mills Creek above the OHWM would be revegetated with native species found both upstream and downstream of the project area, including trees planted as live pole plantings, container plants, and hydroseeding in the revetments (see Figure 1-5). The repaired area would be visible at first, but riparian growth would quickly fill in the corridor after construction. The work in the roadway would restore the slip-out area, repave the portion of the road in the project area, and add a gravel shoulder and guard rail. The new roadway, gravel shoulder, and guard rail would be visible but would be consistent and in keeping with the rest of the roadway. The finished roadway would not appear appreciably different than the roadway on either side of the repair. The project would replace the visibly eroded bank and failing pavement with a biostabilization-based bank repair that incorporates native vegetation. Therefore, the project would not have a substantial adverse effect on a scenic vista, and this impact would be less than significant.

(b) Would the project substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings, within a scenic highway?

The project site is located on and adjacent to Higgins Canyon Road approximately 1.5 miles east of California State Route (SR) 1. Higgins Canyon Road is identified as a County Scenic Corridor by the *San Mateo County General Plan.*[6] A Scenic Corridor is defined as:

[6] County of San Mateo. 2010. San Mateo County General Plan Scenic Corridors. Available at: https://www.smcgov.org/media/73106/download?inline=. Accessed May 14, 2024.

> . . . the visual boundaries of the landscape abutting a scenic highway and which contain outstanding views, flora, and geology, and other unique natural or man-made attributes and historical and cultural resources affording pleasure and instruction to the highway traveler.[7]

According to the County Scenic Corridors webpage:

> Public views within and from Scenic Corridors shall be protected and enhanced, and development shall not be allowed to significantly obscure, detract from, or negatively affect the quality of these views. Vegetative screening or setbacks may be used to mitigate such impacts.[8]

The project work would occur in Mills Creek adjacent to the roadway and on the roadway itself. Mills Creek is a heavily vegetated corridor adjacent to Higgins Canyon Road in the project area (Figures 2-1 through 2-3). The project would require the removal of 10 existing trees as well as vegetation in the creek and on the banks of the area to be repaired. As discussed in Section 1.4, *Project Restoration/Revegetation Plan*, the banks of Mills Creek above the OHWM would be revegetated with native species found both upstream and downstream of the project area, including trees planted as live pole plantings in the revetments (see Figure 1-5). The revegetated area would be visible at first, but riparian growth would quickly fill in the corridor after construction. The work in the roadway would restore the slip-out area and repave the portion of road in the project area, add a gravel shoulder and guard rail. The new roadway, gravel shoulder, and guard rail would be visible but visually consistent with the rest of the roadway. The finished roadway would not appear appreciably different than the roadway on either side of the repair. Therefore, the project would not substantially damage scenic resources and this impact would be less than significant.

(c) In non-urbanized areas, would the project substantially degrade the existing visual character or quality of public views of the site and its surroundings? (public views are those that are experienced from publicly accessible vantage point). If the project is in an urbanized area, would the project conflict with applicable zoning and other regulations governing scenic quality?

The project would repair a slip-out from Higgins Canyon Road into Mills Creek and would revegetate the creek banks above the OHWM. The project would not introduce new elements to a scenic riparian corridor. The majority of the improvements in the creek would be obscured from view by riparian vegetation and the improvements to the road would be visually consistent with adjacent portions of the road. Therefore, the project would not substantially degrade the existing visual character of public views, and this impact would be less than significant.

(d) Would the project create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?

The project does not include any lighting or reflective material and would have no impact on light or glare; therefore, no impact would occur.

---

[7] County of San Mateo. 2024. *County of San Mateo Local Coastal Plan Policies, 8.28: Definition of Scenic Corridors.* Available at: https://www.smcgov.org/media/73646/download?inline. Accessed May 14, 2024

[8] County of San Mateo. 2010. *San Mateo County General Plan Scenic Corridors*. Available at: https://www.smcgov.org/media/73106/download?inline=. Accessed May 14, 2024.

(e) Would the project be adjacent to a designated Scenic Highway or within State or County Scenic Corridor?

As discussed in Impact Discussion 2.1(b), the project would repair a portion of the roadway and bank of Mills Creek in a designated County Scenic Corridor. However, the project would not substantially damage scenic resources in a Scenic Corridor; therefore, this impact would be less than significant.

(f) If within a Design Review District, would the project conflict with applicable General Plan or Zoning Ordinance provisions?

The project is not in a Design Review District; therefore, no impact would occur.

(g) Would the project visually intrude into an area having natural scenic qualities?

As discussed in Impact Discussion 2.1(a), the project would repair a slip-out on Higgins Canyon Road and Mills Creek. The new roadway, gravel shoulder, and guard rail would be visible but would be in keeping with the rest of the roadway. The finished roadway would not appear appreciably different than the roadway on either side of the repair. Mills Creek would be revegetated with native species prevalent in the area and vegetation would conceal the majority of the newly engineered creek bed and banks. Therefore, the project would not intrude into an area having natural scenic qualities, and this impact would be less than significant.

2.2 AGRICULTURE AND FORESTRY RESOURCES

Environmental Issues	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997) prepared by the California Dept. of Conservation as an optional model to use in assessing impacts on agriculture and farmland. In determining whether impacts to forest resources, including timberland, are significant environmental effects, lead agencies may refer to information compiled by the California Department of Forestry and Fire Protection regarding the state's inventory of forest land, including the Forest and Range Assessment Project and the Forest Legacy Assessment project; and forest carbon measurement methodology provided in Forest Protocols adopted by the California Air Resources Board. Would the project:				
(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?	☐	☐	☐	☒
(b) Conflict with existing zoning for agricultural use, an existing Open Space Easement, or a Williamson Act contract?	☐	☐	☐	☒
(c) 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))?	☐	☐	☐	☒
(d) Result in the loss of forest land or conversion of forest land to non-forest use?	☐	☐	☐	☒

	Environmental Issues	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
(e)	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?	☐	☐	☐	☒
(f)	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?	☐	☐	☐	☒
(g)	Result in damage to soil capability or loss of agricultural land?	☐	☐	☐	☒

(a) Would the project convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance, as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?

The land is designated as Grazing Land and Other Land and is not included in the Prime Farmland, Unique Farmland, or Farmland of Statewide Importance categories.[9] Therefore, the project would have no impact on the conversion of farmland to non-agricultural uses, and no impact would occur.

(b) Would the project conflict with existing zoning for agricultural use, or a Williamson Act contract?

The land is designated as Grazing Land and Other Land and is not under a Williamson Act contract. Under the County's LCP, the land is designated as Resource Management Coastal Zone District/Coastal Development District and Planned Agriculture District/Coastal Development District.[10] Therefore, the project would not conflict with existing agricultural zoning or a Williamson Act contract, and no impact would occur.

(c) Would the project 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))?

The project site is located in a roadway and creek bed and would not include forestland or timberland. The project site is not zoned for Timberland Production; therefore, no impact to timberland would occur.

[9] California Department of Conservation (CDOC). 2018. California Important Farmland Finder Interactive Viewer, San Mateo County 2018. California Department of Conservation Farmland Mapping Monitoring Program. Available at: https://maps.conservation.ca.gov/DLRP/CIFF/. Accessed May 14, 2024.

[10] County of San Mateo. 2024. Planning and Building Map Viewer. Available at: https://gis.smcgov.org/Html5Viewer/Index.html?configBase=https://gis.smcgov.org/Geocortex/Essentials/REST/sites/PubPlanViewer_13/viewers/HTML52110/virtualdirectory/Resources/Config/Default. Accessed May 14, 2024.

(d) Would the project result in the loss of forest land or conversion of forest land to non-forest use?

The project is not located in forestland; therefore, no impact would occur.

(e) Would the project 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?

The project would repair a slip-out on Higgins Canyon Road and would not result in a conversion of farmland or forestland to other uses; therefore, no impact would occur.

(f) For lands within the Coastal Zone, would the project 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?

The project site is located in the Coastal Zone. The San Mateo County Prime Soils Map shows areas of unincorporated San Mateo County with soils rated and mapped by the National Resources Conservation Service (NRCS) as Class I, Class II, and Class III soils capable of growing artichokes or Brussels sprouts.[11] The Prime Soils Map shows the soils in the project area as Botella loam, gently sloping, and Soquel loam, gently sloping. However, the project footprint would be confined to the existing road and creek channel and would not impact soils rated good or very good for artichokes or Brussels sprouts. Therefore, no impacts related to the conversion or division of lands identified as Class I, Class II, and Class III soils rated good or very food for artichokes or Brussels sprouts would occur, and no impact would occur.

(g) Would the project result in damage to soil capability or loss of agricultural land?

The project footprint would be confined to the existing road and creek channel and would not result in damage to soil capability or loss of agricultural land; therefore, no impact would occur.

2.3 AIR QUALITY

Environmental Issues	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
Where available, the significance criteria established by the applicable air quality management district or air pollution control district may be relied upon to make the following determinations. Would the project:				
(a) Conflict with or obstruct implementation of the applicable air quality plan?	☐	☐	☒	☐
(b) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard?	☐	☐	☒	☐
(c) Expose sensitive receptors to substantial pollutant concentrations, as defined by the Bay Area Air Quality Management District?	☐	☐	☒	☐

[11] County of San Mateo. 2009. Prime Soils Map. Available at: https://www.smcgov.org/media/73091/download?inline=. Accessed May 14, 2024.

Environmental Issues	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
(d) Result in other emissions (such as those leading to odors) adversely affecting a substantial number of people?	☐	☐	☐	☒

The project would be required to follow the County RMP BMPs as well as measures from the Bay Area Air Quality Management District (BAAQMD) *California Environmental Quality Act Air Quality Guidelines* (2022 CEQA Guidelines).[12,13] The text in this section includes the County RMP BMPs listed by number in the discussion, and the County RMP BMPs that are applicable to the project are listed in Appendix B of this document and discussed below.

(a) Would the project conflict with or obstruct implementation of the applicable air quality plan?

The project is located within the San Francisco Bay Area Air Basin under the jurisdiction of the BAAQMD. The BAAQMD regulates air pollutant emissions, enforces regulations, administers permits governing stationary sources, inspects stationary sources, monitors air quality and meteorological conditions, and assists local governments in addressing climate change. This analysis relies on the screening criteria established by the BAAQMD to make the significance determinations below.

The BAAQMD 2022 CEQA Guidelines establishes screening criteria for analyzing projects.[14] If a project meets the screening criteria, then its air quality impacts may be considered less than significant. Table 4-1, Single Land Use and Operational Criteria Air Pollutant and Precursor Screening Levels, of the BAAQMD 2022 CEQA Guidelines, does not include a screening level for road repair projects; however, many of the screening levels for construction of commercial and industrial uses are 452,000 square feet. The smallest screening level, for motel construction, is 230,000 square feet. The project would repair a slip-out on an existing road and reinforce the banks of Mills Creek, impacting at least the 15,078-square-foot project disturbance footprint, and up to a maximum of the approximately 20,040-square-foot (0.46-acre) project area of land during construction. Therefore, impacts related to construction for the repair and reinforcement of the road and creek bed would be less than the BAAQMD screening levels and less than significant. The project would not change existing operational emissions on Higgins Canyon Road.

(b) Would the project 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?

According to the BAAQMD 2022 CEQA Guidelines:

> CEQA does not require that any incremental addition to a significant cumulative impact, no matter how small, must necessarily be treated as cumulatively considerable. The

[12] Montrose Environmental. 2023. *County of San Mateo Routine Maintenance Program Manual.* Prepared for County of San Mateo. Revised May. Available at: https://www.smcgov.org/media/65021/download?inline=. Accessed May 21, 2024.

[13] Bay Area Air Quality Management District (BAAQMD). 2022. *California Environmental Quality Act Air Quality Guidelines.* Available at: https://www.baaqmd.gov/plans-and-climate/california-environmental-quality-act-ceqa/updated-ceqa-guidelines. Accessed May 14, 2024.

[14] BAAQMD. 2022. *California Environmental Quality Act Air Quality Guidelines.* Available at: https://www.baaqmd.gov/plans-and-climate/california-environmental-quality-act-ceqa/updated-ceqa-guidelines. Accessed May 14, 2024.

> statute does not require a so-called "one additional molecule" standard, and some projects' incremental contributions would be so minor that their impact does not have to be treated as significant even though the projects would add an additional amount to the significant cumulative impact.[15]

If implementing the project would make a cumulatively considerable contribution to a significant cumulative impact, the impact is considered significant under CEQA.

A project would have a cumulative significant impact if the aggregate total of all past, present, and foreseeable future sources within a 1,000-foot radius (or beyond where appropriate) from the fence line of a source, or from the location of a receptor, plus the contribution from the project, exceeds the following:

- An excess cancer risk level of more than 100 in one million or a chronic hazard index greater than 10 for toxic air contaminants (TACs); or
- 0.8 micrograms per cubic meter annual average particulate matter with a diameter of 2.5 micrometers or less ($PM_{2.5}$).[16]

Under the BAAQMD 2022 CEQA Guidelines, if a project meets the screening criteria in Table 4-1, then the project would not result in the generation of criteria air pollutants and/or precursors that exceed the thresholds of significance.

The smallest construction-related screening size in Table 4-1 is 230,000 square feet. The project is relatively small (the disturbance area is estimated to be approximately 15,078 square feet, and may include up to the approximately 20,040-square-foot or 0.46-acre exclusion area) and falls under the screening thresholds for generating significant construction emissions. Therefore, the project would not result in a cumulatively considerable net increase of any criteria pollutant, and this impact would be less than significant. The project would not change operational emissions on Higgins Canyon Road.

All projects in the BAAQMD are required to implement BMPs to reduce fugitive dust generated by construction activities. These are found in Table 5-2, Basic Best Management Practices for Construction-Related Dust Emissions, of the BAAQMD 2022 CEQA Guidelines and listed in Table 2-1, below.[17]

(c) Would the project expose sensitive receptors to substantial pollutant concentrations?

The BAAQMD 2022 CEQA Guidelines recommend assessment of risks and hazards on sensitive receptors within 1,000 feet of the project site. Existing sensitive receptors within this radius include residences on Higgins Canyon Road and users of Burleigh H. Murray Ranch State Park. Construction of the project would generate emissions that could expose existing sensitive receptors to pollutant concentrations. However, as discussed under Impact Discussion 2.3(b), the project would not generate criteria air pollutants in excess of threshold levels. The project would repair and reinforce a slip-out in Higgins Canyon Road and Mills Creek. The project would be under the screening thresholds for construction emissions; therefore, the project would not produce construction emissions that would exceed the BAAQMD's recommended localized standards of significance for reactive organic gases

[15] BAAQMD. 2022. *California Environmental Quality Act Air Quality Guidelines.* Available at: https://www.baaqmd.gov/plans-and-climate/california-environmental-quality-act-ceqa/updated-ceqa-guidelines. Accessed May 14, 2024.

[16] BAAQMD. 2022. *California Environmental Quality Act Air Quality Guidelines, Chapter 4: Screening for Criteria Air Pollutants and Precursors.* Available at: https://www.baaqmd.gov/plans-and-climate/california-environmental-quality-act-ceqa/updated-ceqa-guidelines. Accessed May 14, 2024.

[17] BAAQMD. 2022. *California Environmental Quality Act Air Quality Guidelines, Chapter 5: Project Level Air Quality Impacts.* Available at: https://www.baaqmd.gov/plans-and-climate/california-environmental-quality-act-ceqa/updated-ceqa-guidelines. Accessed May 14, 2024.

(ROG), nitrogen oxides (NO_X), particulate matter with a diameter of 10 micrometers or less (PM_{10}), or $PM_{2.5}$ during the construction phase.

Nearby park users and residential receptors could be exposed to localized pollutants from construction of the project. Given the relatively small size of the project and the temporary nature of construction, the project would not generate substantial levels of air emissions. For a project to have a less-than-significant criteria air pollutant impact related to construction-related fugitive dust emissions, the following BAAQMD BMPs listed in Table 5-2 of the 2022 CEQA Guidelines and in County RMP BMP GEN-19 (Dust Management Controls) are required for all projects (Table 2-1; see Appendix B). [18,19]

Table 2-1. Air Quality BMPs Applicable to the Project

Measure	County RMP BMP No.[1]	BAAQMD BMP No.[2]
All exposed surfaces (e.g., parking areas, staging areas, soil piles, graded areas, and unpaved access roads) shall be watered two times per day.	GEN-19(1)	B-1
All haul trucks transporting soil, sand, or other loose material off-site shall be covered.	GEN-19(2)	B-2
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.	GEN-19(3)	B-3
All vehicle speeds on unpaved roads shall be limited to 15 mph.	GEN-19(4)	B-4
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.	GEN-19(5)	B-5
All excavation, grading, and/or demolition activities shall be suspended when average wind speeds exceed 20 mph.	n/a	B-6
All trucks and equipment, including their tires, shall be washed off prior to leaving the site.	n/a	B-7
Publicly visible signs shall be posted with the telephone number and name of the person to contact at the lead agency regarding dust complaints. This person shall respond and take corrective action within 48 hours. The Air District's General Air Pollution Complaints number shall also be visible to ensure compliance with applicable regulations.	n/a	B-9

[1] Source: Montrose Environmental (2023)
[2] Source: BAAQMD (2022)

With incorporation of the BAAQMD and County RMP BMPs related to air quality listed in Table 2-1, sensitive receptors within 1,000 feet of the project would not be adversely affected by project construction. Since the project size is relatively small, potential construction impacts to sensitive receptors would be less than significant.

The project would not change operational emissions on Higgins Canyon Road; therefore, no operational impacts would occur.

(d) Would the project result in other emissions (such as those leading to odors) adversely affecting a substantial number of people?

Odors are usually associated with industrial projects involving the use of chemicals, solvents, petroleum products, and other strong-smelling elements used in manufacturing processes, as well as sewage

[18] BAAQMD. 2022. *California Environmental Quality Act Air Quality Guidelines, Chapter 5: Project Level Air Quality Impacts.* Available at: https://www.baaqmd.gov/plans-and-climate/california-environmental-quality-act-ceqa/updated-ceqa-guidelines. Accessed May 14, 2024.

[19] Montrose Environmental. 2023. *County of San Mateo Routine Maintenance Program Manual.* Prepared for County of San Mateo. Revised May. Available at: https://www.smcgov.org/media/65021/download?inline=. Accessed May 21, 2024.

treatment facilities and landfills. The project would repair and reinforce the roadway and creek channel. The project would not include any land uses typically associated with unpleasant odors and local nuisances (e.g., rendering facilities, dry cleaners); therefore, no impact would occur.

2.4 BIOLOGICAL RESOURCES

Environmental Issues	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the project:				
(a) Have a substantial 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 or National Marine Fisheries Service?	☐	☐	☒	☐
(b) Have a substantial 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 Game, U.S. Fish and Wildlife Service, or National Marine Fisheries Service?	☐	☐	☒	☐
(c) Have a substantial adverse effect on state or federally protected wetlands (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?	☐	☐	☒	☐
(d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or 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)?	☐	☐	☐	☒
(f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?	☐	☐	☐	☒
(g) Be located inside or within 200 feet of a marine or wildlife reserve?	☐	☐	☐	☒
(h) Result in loss of oak woodlands or other non-timber woodlands?	☐	☐	☐	☒

The biological resources analysis is based on the *Biological Resources Evaluation for the Slip-Out Repair and Bank Stabilization Near 1780 Higgins Canyon Road Project, San Mateo County, California* (Appendix C1), and the *Preliminary Jurisdictional Delineation Report for the Slip-Out Repair and Bank Stabilization Near 1780 Higgins Canyon Road Project, San Mateo County, California* (Appendix C2).

[20,21] The biological investigation included a survey of the project site plus a 100-foot wide buffer area, referred to as the Biological Study Area (BSA). The project would be required to follow the County RMP BMPs.[22] The text in this section includes the County RMP BMPs listed by number in the discussion, and the RMP BMPs that are applicable to the project are listed in Appendix B of this document and discussed below.

(a) Would the project have a substantial adverse effect, either directly or through habitat modification, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service?

Based on a CDFW California Natural Diversity Database (CNDDB) query, a California Native Plant Society (CNPS) query, review of existing literature, and a field survey of the project area and a surrounding 100-foot buffer (defined as the BSA), no special-status plant species and five special-status wildlife species were determined to have a moderate-to-high potential to occur. These special-status wildlife species include:

- California red-legged frog (CRLF) (*Rana draytonii*),
- San Francisco garter snake (SFGS) (*Thamnophis sirtalis tetrataenia*),
- Central California Coast steelhead (*Oncorhynchus mykiss irideus*) Distinct Population Segment (DPS),
- California giant salamander (CGS) (*Dicamptodon ensatus*), and
- San Francisco dusky-footed woodrat (*Neotoma fuscipes annectens*).

The implementation of County RMP BMPs GEN-1 (Staging and Access), GEN-2 (Minimize Area of Disturbance and Site Maintenance), GEN-3 (Constructions Entrances and Perimeter), GEN-4 (Salvage/Reuse of Woody Material), GEN-5 (Non-Hazardous Materials), GEN-6 (Hazardous Materials Storage/Disposal), GEN-7 (Spill Prevention and Control), GEN-8, (Waste Management), GEN-9 (Vehicle Maintenance and Parking), GEN-10 (Equipment Maintenance and Fueling), GEN-11 (Paving and Asphalt Work), GEN-12 (Concrete, Grout and Mortar Application), GEN-13 (Exclude Concrete from the Channel), GEN-14 (Concrete Washout Facilities), GEN-15 (Painting and Paint Removal), GEN-16 (Timing of Work), GEN-17 (Maintain Traffic Flow), GEN-18 (Traffic Control and Public Safety), GEN-19 (Dust Management Controls), GEN-20 (Firearms), GEN-21 (Domestic Animals), GEN-22 (Site Stabilization), GEN-23 (Fire Prevention), GEN-24 (Investigation of Utility Lines), GEN-25 (Retention of Tree Stumps/Rootwads), GEN-26 (Decontamination of Project Equipment and Vehicles), GEN-27 (Vegetation and Tree Removal), GEN-28 (Herbicide Application), BIO-1 (Environmental Awareness Training), BIO-2 (Minimize Injury or Mortality of Fish and Amphibian Species during Dewatering), BIO-3 (California Red-legged Frog Protection Measures), BIO-5 (San Francisco Garter Snake Protection Measures), BIO-7 (Check for Wildlife in Pipes/Construction Materials), BIO-8 (Minimize Impacts on Dusky-footed Woodrat Nests), BIO-19 (Restore Channel Features), BIO-21 (General Wildlife Protection Measures), and BIO-24 (Pathogen Control) would prevent harm to wildlife

[20] SWCA Environmental Associates (SWCA). 2024. *Biological Resources Evaluation for the Slip-Out Repair and Bank Stabilization Near 1780 Higgins Canyon Road Project, San Mateo County, California*. Prepared for County of San Mateo Department of Public Works.

[21] SWCA. 2024. *Preliminary Jurisdictional Delineation Report for the Slip-Out Repair and Bank Stabilization Near 1780 Higgins Canyon Road Project, San Mateo County, California*. Prepared for County of San Mateo Department of Public Works.

[22] Montrose Environmental. 2023. *County of San Mateo Routine Maintenance Program Manual.* Prepared for County of San Mateo. Revised May. Available at: https://www.smcgov.org/media/65021/download?inline=. Accessed May 21, 2024.

that may be present during project construction. Additional relevant County RMP BMPs are discussed below. Implementation of relevant County RMP BMPs would reduce impacts to special-status species to less-than-significant levels.

California Red-Legged Frog

CRLF, a federally threatened species and CDFW Species of Special Concern (SSC), occurs in various habitat types depending on its life cycle stage. Breeding areas include aquatic habitats, such as lagoons, streams, and natural and manmade ponds. This species prefers aquatic habitats with little or no flow, the presence of surface water to at least early June, surface water depths to approximately 2 feet, and the presence of emergent vegetation (e.g., cattails and bulrush). During periods of wet weather, some individuals may make overland dispersals through adjacent upland habitats of distances up to 1 mile. Upland habitats, including small mammal burrows and woody debris, can also be used as refuge during the summer if water is scarce or unavailable. CRLF typically travels between sites and is unaffected by topography and vegetation types during migration. Dispersal habitat makes it possible for CRLF to locate new breeding and non-breeding sites and is crucial for conservation of the species (see Appendix C1).

Suitable breeding habitat for CRLF is likely not present within the BSA due to the lack of emergent vegetation, canopy cover, and pools with limited flow. However, suitable upland, foraging, and dispersal habitat for CRLF is present within the BSA. Seven CNDDB occurrences have been recorded within 2 miles of the BSA between 2001 and 2019. The closest CNDDB occurrence (2019) is located approximately 0.3 mile north of the BSA. A second CNDDB occurrence (2001) is located approximately 0.7 mile downstream of the BSA in Arroyo Leon. Therefore, this species could easily enter the project area while traveling through Arroyo Leon and Mills Creek. Critical habitat is not present within the BSA. The closest critical habitat is approximately 1.5 mile north of the BSA.

Coast Ridge Ecology, LLC biologists identified three CRLF (two adults and one subadult) within Mills Creek at Higgins Canyon Road Bridge in August 2022; the frogs were relocated outside of the project area. Therefore, CRLF is assumed to be present within the BSA (see Appendix C1).

Based on recent records of CRLF within the vicinity of the BSA, there are likely to be frogs present in the BSA. CRLF is most likely to occur in stream or riparian areas along Mills Creek and Arroyo Leon. Therefore, construction activities within the stream or riparian zone could result in disturbance, injury, and/or mortality. This species may also occur in upland habitats within the BSA, especially areas with suitable cover. Impacts to adult and juvenile frogs could occur as a result of construction activities. Individuals could be crushed by equipment or entrained into the dewatering pump, causing injury or mortality. Potential direct impacts could occur if CRLF individuals were to enter active project areas or staging areas during project activities and be killed or injured by project equipment or vehicle traffic. County RMP BMP BIO-3 (California Red-legged Frog Protection Measures) includes measures such as preconstruction surveys, biological monitoring, and dry and daylight work restrictions to avoid potential direct impacts to CRLF (see Appendices B and C1).

The potential for harm or mortality of CRLF may still exist during project construction despite efforts by the contractor to avoid CRLF. A portion of Mills Creek will be dewatered to facilitate repair activities. Therefore, frogs may need to be relocated from the project area by a qualified biologist, as described in County RMP BMP BIO-2 (Minimize Injury or Mortality of Fish and Amphibian Species during Dewatering) (see Appendix B), to prevent injury or mortality should they enter the project area.

Potential indirect impacts to CRLF could include temporary alteration of migration behavior because of project activities. Construction noise may also disturb frogs in the vicinity of the project area. Project activities are limited to maintenance and repair of existing infrastructure and would not result in the creation of any new permanent barriers that would prevent dispersal of CRLF between stock ponds and

wetlands or other suitable breeding sites within the vicinity of the BSA. The project is therefore unlikely to substantially interfere with CRLF dispersal.

Indirect effects to CRLF also include potential increased erosion and sedimentation or release of hazardous substances, associated with equipment spills, within aquatic habitat. County RMP BMPs GEN-1 through GEN-28 (General Avoidance and Minimization Measures), EC-1 (Brush Layering), EC-3 (Live Staking), EC-5 (Wattles/Fascines), EC-6 (Hand Seeding), EC-7 (Hydroseeding), EC-8 (Mulching), EC-9 (Vegetative Buffer), EC-10 (Erosion Control Blankets & Mats), EC-13 (Slope or Bank Stabilization), SC-1 (Gravel Bags), SC-2 (Silt Fence), SC-3 (Straw Log, Straw Roll, Coir Log), SC-4 (Inlet Protection), SC-7 (Silt Curtain), SC-8 (Turbidity Monitoring), and DW-1 (Channel Dewatering) will be used as applicable and are designed to avoid and minimize potential impacts to aquatic habitat associated with erosion, sedimentation, and release of hazardous substances (see Appendix B). Indirect project impacts to CRLF are not anticipated with the implementation of these BMPs. In addition, habitat enhancement is part of the project design and will ultimately improve and stabilize the existing habitat for CRLF in the project area.

Project activities will result in a total of approximately 0.03 acre of temporary impacts and approximately 0.20 acre of permanent impacts to suitable CRLF non-breeding, foraging, and dispersal habitat (i.e., Red Alder Forest, open water, and Ruderal/Disturbed). The temporary impact and permanent impact areas would be restored. Restoration of the permanent impact area includes the addition of features such as rootwads, vegetated soil lifts, and vegetated boulder revetment to provide habitat and promote channel diversity. The proposed actions of biostabilization and vegetated revetment will enhance habitat following the completion of the project. Specifically, the suitability of the project site for CRLF with added vegetation on the banks of Mills Creek providing instream cover and habitat complexity could lead to long-term benefits for dispersing CRLF. In addition, the placement of large woody debris would increase the structural richness of Mills Creek. Finally, bank stabilization would improve the stability of the banks, reduce incision and erosion, and improve habitat quality on the portion of Mills Creek in the project area.

San Francisco Garter Snake

The historical range of SFGS, a federally and state endangered/fully protected species, is entirely within San Mateo County. The two main components of SFGS habitat are: (1) wetlands supporting its prey species (e.g., CRLF and Pacific chorus frog [*Pseudacris regilla*]), and (2) surrounding uplands that are adjacent to waterways and that support small mammal burrows used by the snakes for escape cover.[23] SFGS inhabits various aquatic habitats, including reservoirs, freshwater marshes, creeks, drainage ditches, ponds, and lakes. Less ideal habitats can also be used by SFGS, such as ditches and other waterways or floating algal or rush mats. Suitable breeding habitat includes shallow marshlands with an abundance of emergent vegetation. Grasslands and low ground cover are also an important upland habitat for this species, as they provide areas for thermoregulation and cover. Small mammal burrows are used by SFGS during hibernation. During the warm days of summer, most activity occurs during the morning and afternoon. Preferred nocturnal retreats are thought to be holes, especially mammal burrows, crevices, and surface objects.[24]

No CNDDB occurrences of SFGS have been recorded within 2 miles of the Action Area (CDFW 2024a). The occurrence locations are obscured to the USGS quadrangle level, likely to protect limited populations from illegal collection. One occurrence was listed within the Half Moon Bay, California (3712244) USGS 7.5-minute quadrangle and four associated within the Woodside, California (3712243) USGS 7.5-minute quadrangle. Except for one occurrence from the 1980s, all observations of SFGS were made within the

[23] U.S. Fish and Wildlife Service (USFWS). 2006. *San Francisco Garter Snake (*Thamnophis sirtalis tetrataenia*) 5-year Review: Summary and Evaluation*. Sacramento, California: U.S. Fish and Wildlife Service, Sacramento Field Office.

[24] USFWS. 2007. *Endangered Species Accounts: San Francisco Garter Snake (*Thamnophis sirtalis tetrataenia*).*

last 20 years. Historical populations have been documented within the Half Moon Bay area around Denniston Creek and Pilarcitos Creek mouth. The status of these populations is uncertain as there have been no recent observations in the last 30 years, but any extant population is thought to be heavily impacted by habitat alteration and degradation. While aquatic habitats with an abundance of dense vegetation typically associated with SFGS (e.g., cattails [*Typha* spp.], bulrushes [*Scirpus* spp.]) are absent in the BSA, connectivity from the lower reaches of Arroyo Leon and its associated riparian corridor to the BSA may support dispersal and foraging activity. This habitat type may support breeding populations of their primary prey—Pacific chorus frog, but not of CRLF. Newborn and juvenile SFGS depend heavily on Pacific tree frogs as prey.[25] Additionally, the dense shrub cover found along the slopes above Mills Creek could provide suitable foraging, dispersal, and refuge habitat for SFGS.

Potential direct impacts to SFGS could occur if individuals were to enter the active project areas or staging areas during project activities and be killed or injured by project equipment or vehicle traffic. Project activities may also cause SFGS to alter activity patterns to avoid the area and disruptions in activity of prey species such as CRLF may temporarily decrease the suitability of the immediate BSA for SFGS foraging. The implementation of County RMP BMP BIO-5 (San Francisco Garter Snake Protection Measures), which includes surveys and monitoring and requirements for vegetation removal, speed limits, and litter control, should avoid potential direct impacts to SFGS (see Appendices B and C1).
SFGS could be indirectly impacted by potential erosion and sedimentation during construction activities. There is potential for increased erosion and sedimentation due to the temporary loss of herbaceous vegetation. Erosion control measures would be implemented during construction (e.g., BMPs GEN-1 through GEN-28 [General Avoidance and Minimization Measures]; EC-1, EC-3, EC-5, EC-6, EC-7, EC-8, EC-9, EC-10, and EC-13 [Erosion Control Measures]; SC-1, SC-2, SC-3, SC-4, SC-7, and SC-8 [Sediment/Water Quality Control Measures]; and DW-1 [Channel Dewatering] in Appendix B). Following completion of the project, bank stabilization would improve the stability of the banks, reduce incision and erosion, and improve habitat quality on the portion of Mills Creek in the project area.

Project activities will result in a total of approximately 0.03 acre of temporary impacts and approximately 0.18 acre of permanent impacts to suitable SFGS foraging, dispersal, and refuge habitat (i.e., Red Alder Forest and open water). As with CRLF above, the temporary and permanent impact areas would be restored. Restoration of the permanent impact area includes the addition of features such as rootwads, vegetated soil lifts, and vegetated boulder revetment to provide habitat and promote channel diversity. The proposed actions of biostabilization and vegetated revetment will enhance habitat following the completion of the project. Specifically, the suitability of the project site for SFGS with added vegetation on the banks of Mills Creek providing instream cover and habitat complexity could lead to long-term benefits for dispersing or foraging individuals. In addition, the placement of large woody debris would increase the structural richness of Mills Creek.

Steelhead (Central California Coast DPS)

Steelhead (Central California Coast DPS), a federally threatened species and state SSC, is an anadromous fish that occurs along the entire California coast and inland to the Sacramento–San Joaquin River system. Steelhead spends a portion of its life cycle in the Pacific Ocean before returning upstream to spawn. Steelhead requires beds of loose, silt-free, coarse gravel for spawning. Suitable stream habitat contains adequate cover, cool water, and sufficient dissolved oxygen. However, upstream migration is often limited due to upstream barriers such as waterfalls and cataracts as well as human-made dams and diversions. Steelhead feeds on aquatic and terrestrial insects, frogs, and small fish (see Appendix C1).

[25] USFWS. 2017. Species Information: San Francisco Garter Snake. Available at: https://www.fws.gov/species/san-francisco-garter-snake-thamnophis-sirtalis-tetrataenia. Accessed May 5, 2024.

Mills Creek likely contains suitable rearing habitat for juvenile steelhead. However, the portion of Mills Creek within the BSA does not contain ideal spawning habitat for steelhead, and the project will be occurring outside of spawning season. There are records of steelhead occurring within Mills Creek as recently as 2022, and steelhead could enter the BSA traveling upstream from Arroyo Leon.

Construction activities within the Mills Creek could result in disturbance, injury, and/or mortality of steelhead. Potential direct impacts could occur if steelhead individuals were to enter the active project area during project activities and be killed or injured by project equipment. To ensure steelhead are not present within the active work area, a portion of Mills Creek will be dewatered. Prior to dewatering, steelhead may need to be relocated from the dewatered area by a qualified biologist, as described in County RMP BMP BIO-2 (Minimize Injury or Mortality of Fish and Amphibian Species during Dewatering) (see Appendix B), to prevent injury or mortality during the dewatering process.

Potential indirect impacts to steelhead could include temporary alteration of migration behavior because of project activities. Project activities would likely result in the creation of temporary barriers (i.e., cofferdam) that would inhibit the upstream and downstream migration of steelhead. However, all work within Mills Creek will occur outside of the migration season for steelhead, which generally takes place during the rainy season (November–March). Therefore, no temporary impacts to steelhead migration patterns would occur. The restored stream channel would include the addition of features such as rootwads, vegetated soil lifts, and vegetated boulder revetments to provide habitat and promote channel diversity. The proposed actions of biostabilization and vegetated revetment will enhance habitat following the completion of the project. Specifically, the suitability of the enhancement at the project site will provide instream cover and habitat complexity that could lead to long-term benefits for steelhead. Therefore, no long term impacts to steelhead migration patterns would occur.

Indirect effects to steelhead also include potential increased erosion and sedimentation or release of hazardous substances, associated with equipment spills, within aquatic habitat. County RMP BMPs GEN-1 through GEN-28 (General Avoidance and Minimization Measures); EC-1, EC-3, EC-5, EC-6, EC-7, EC-8, EC-9, EC-10, and EC-13 (Erosion Control Measures); SC-1, SC-2, SC-3, SC-4, SC-7, and SC-8 (Sediment/Water Quality Control Measures); and DW-1 (Channel Dewatering) are designed to avoid and minimize potential impacts to aquatic habitat associated with erosion, sedimentation, and release of hazardous substances (see Appendix B). Indirect project impacts to steelhead are not anticipated with the implementation of these BMPs.

Project activities will result in a total of approximately 0.01 acre of temporary and approximately 0.02 acre of permanent impacts to suitable steelhead stream habitat. However, as discussed above under CRLF and SFGS, the temporary and permanent impact areas would be restored. Restoration of the permanent impact area includes the addition of features such as rootwads, vegetated soil lifts, and vegetated boulder revetment to provide habitat and promote channel diversity. The proposed actions of biostabilization and vegetated revetment will enhance habitat following the completion of the project. Specifically, the suitability of the enhancement at the project site will provide instream cover and habitat complexity that could lead to long-term benefits for steelhead. In addition, the placement of large woody debris would increase the structural richness of Mills Creek. Finally, bank stabilization would improve the stability of the banks, reduce incision and erosion, and improve habitat quality on the portion of Mills Creek in the project area.

Mills Creek and the rest of the Pilarcitos Creek watershed are designated critical habitat for steelhead.[26] Project activities are not expected to adversely impact steelhead critical habitat since the impacts will be

[26] National Oceanic and Atmospheric Administration National Marine Fisheries Service (NOAA Fisheries). 2024. National NMFS ESA Critical Habitat Mapper. Available at:

localized and small in scale. In addition, the project will ultimately enhance habitat within this portion of Mills Creek as described above.

California Giant Salamander

CGS, a CDFW SSC, is a year-round resident of north-central California, from southern Santa Cruz County to extreme southern Mendocino and Lake Counties. This species occurs up to 2,160 meters (6,500 feet), primarily in humid coastal forests, especially in Douglas fir, redwood, red fir, and montane and valley-foothill riparian habitats. CGS lives in or near streams in damp forests and tends to be common where it occurs. Aquatic adults and larvae are found in cool, rocky streams and occasionally in lakes and ponds. CGS has the potential to occur in riparian areas within the BSA along Mills Creek. This species could enter the project area while traveling through Arroyo Leon (see Appendix C1).

Project activities have the potential to adversely impact CGS. This species may occur in stream or riparian areas within the BSA along Mills Creek. Potential direct impacts could occur if individuals were to enter the active project area or staging area during project activities and be killed or injured by project equipment or vehicle traffic. The implementation of County RMP BMP BIO-6 (Measures to Protect the Foothill Yellow-legged Frog, California Giant Salamander, Santa Cruz Black Salamander, and Western Pond Turtle) should avoid potential direct impacts to CGS (see Appendix B).

The potential for harm or mortality of CGS may still exist during project construction despite efforts by the contractor to avoid it. A portion of Mills Creek will be dewatered to facilitate repair activities. Therefore, salamanders may need to be relocated from the project area by a qualified biologist, as described in County RMP BMP BIO-6 (Measures to Protect the Foothill Yellow-legged Frog, California Giant Salamander, Santa Cruz Black Salamander, and Western Pond Turtle) (see Appendix B), to prevent injury or mortality should they enter the project area.

Potential indirect impacts to CGS could include temporary alteration of migration behavior because of project activities. Project activities would not result in the creation of any new permanent barriers to migration. Therefore, the project is not likely to result in substantial interference with amphibian migration and dispersal. Indirect effects to CGS also include potential increased erosion and sedimentation or release of hazardous substances, associated with equipment spills, within aquatic habitat. County RMP BMPs EC-1, EC-3, EC-5, EC-6, EC-7, EC-8, EC-9, EC-10, and EC-13 (Erosion Control Measures); SC-1, SC-2, SC-3, SC-4, SC-7, and SC-8 (Sediment/Water Quality Control Measures); and DW-1 (Channel Dewatering) (see Appendix B) are designed to avoid and minimize potential impacts to aquatic habitat associated with erosion, sedimentation, and release of hazardous substances. Project impacts to CGS are not anticipated with the implementation of the aforementioned BMPs; therefore, this impact would be less than significant.

San Francisco Dusky-Footed Woodrat

San Francisco dusky-footed woodrat, a CDFW SSC, is a medium-sized rodent found in grassland, scrub, and wooded areas throughout the San Francisco Bay Area. The species is generally found in habitats with moderate canopy cover and often found in riparian areas. The woodrat uses sticks and leaves to construct nests (i.e., middens), which can be located at ground level or in trees and reach approximately 8 feet in height.

San Francisco dusky-footed woodrat is known to exist in the BSA. San Francisco dusky-footed woodrat or nests (i.e., middens) were not observed during the survey; however, individuals could enter the BSA and construct nests before and/or during project activities. Direct impacts to the species could include

https://noaa.maps.arcgis.com/apps/webappviewer/index.html?id=68d8df16b39c48fe9f60640692d0e318. Accessed March 5, 2024.

being killed or injured by project equipment or vehicle traffic, and construction activities within the project area could result in temporary impacts of disturbance to individuals or nests. County RMP BMP BIO-8 (Minimize Impacts on Dusky-footed Woodrat Nests) (see Appendix B) minimizes impacts on San Francisco dusky-footed woodrat nests through surveys by a qualified biologist 2 weeks prior to construction activities and providing a 10-foot buffer for any nests observed. In addition, County RMP BIO-1 (Environmental Awareness Training) requires environmental awareness training, which includes species field identification and locations of sensitive biological resources (see Appendix B). In addition, County RMP BMPs GEN-1 through GEN-28 (General Avoidance and Minimization Measures) (see Appendix B) will further minimize impacts to San Francisco dusky-footed woodrat habitat. Project impacts to San Francisco dusky-footed woodrat are not anticipated with the implementation of the aforementioned BMPs. The species could benefit from habitat enhancement through bank stabilization, which provides stability of the banks, reduces incision and erosion, and improves structural richness on the portion of Mills Creek in the project area.

(b) Would the project have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in the local or regional plans, policies, regulations by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service?

The project site includes approximately 1.34 acre of Red Alder (*Alnus rubra*) Forest Alliance and 0.44 acre of Coyote Brush Scrub natural plant communities (Figure 2-4). Red Alder Forest Alliance is riparian habitat and is considered a sensitive community by the CDFW. Coyote Brush Scrub occurs upslope of the riparian habitat along Mills Creek and is not considered a sensitive community by CDFW. Other land cover types present in the BSA were classified as Ruderal/Disturbed, Developed, and Streambed (Riverine) (see Appendix C1).

The project includes temporary and permanent impacts to the Mills Creek riparian corridor through removal of trees, vegetation, existing slumped soil and debris, and existing slumped vegetated boulder repair from previous slides in the channel; recontouring the creek bed; and constructing a soldier pile wall with vegetated biostabilization-based revetments. The project is expected to permanently fill up to 0.16 acre (6,782 square feet) and temporarily disturb up to 0.03 acre (1,118 square feet) of CDFW/State Water Resources Control Board (State Water Board)/RWQCB riparian vegetation and LCP/California Coastal Act (CCA) sensitive habitat. The hydroseeded road shoulder and gravel swale areas of the project will impact approximately 50 linear feet of riparian habitat (i.e., willow canopy at the edge of the riparian extent). However, the impacted riparian canopy is provided by willows that are planned to be removed and restored in the project upper riparian vegetation area. Therefore, impacted riparian habitat will be restored and there will be an overall increase in riparian habitat as a result of the project.

The implementation of the following County RMP BMPs would minimize impacts to riparian habitat (see Appendices B and C1): GEN-1 (Staging and Access), GEN-2 (Minimize Area of Disturbance and Site Management), GEN-3 (Construction Entrances and Perimeter), GEN-4 (Salvage/Reuse of Plant and Woody Material), GEN-5 (Non-Hazardous Materials), GEN-6 (Hazardous Materials Storage/Disposal), GEN-7 (Spill Prevention and Control), GEN-8 (Waste Management), GEN-9 (Vehicle Maintenance and Parking), GEN-10 (Equipment Maintenance & Fueling), GEN-11 (Paving and Asphalt Work), GEN-12 (Concrete, Grout and Mortar Application), GEN-13 (Exclude Concrete from Channel), GEN-14 (Concrete Washout Facilities), GEN-22 (Site Stabilization), GEN-23 (Fire Prevention), GEN-25 (Retention of Treestumps/Rootwads), GEN-26 (Decontamination of Project Equipment and Vehicles), GEN-27 (Vegetation and Tree Removal), GEN-28 (Herbicide Application). and BIO-18 (Invasive Plant Control). Project areas that are temporarily disturbed during construction shall be restored as described in the project Site Plans (see Appendix A) and Section 1.4, *Project Restoration/Revegetation Plan*. Direct

and indirect impacts to Red Alder Forest will be avoided and minimized to the extent possible through the implementation of the BMPs listed above. Therefore, this impact would be less than significant.

(c) Would the project have a substantial adverse effect on state or federally protected wetlands (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?

Mills Creek is a perennial drainage within the Arroyo Leon watershed, a sub-watershed in the greater Pilarcitos Creek watershed. The project area is located on Higgins Canyon Road, approximately 1.32 miles east of SR 1, adjacent to Mills Creek. The drainage extends northeast beyond Higgins Canyon Road and is a tributary to Arroyo Leon to the northwest. Due to the presence of definable bed, banks, and OHWMs; riparian vegetation; and connectivity to Arroyo Leon, a tributary to Pilarcitos Creek that flows into the Pacific Ocean, this watercourse would likely be considered WOTUS under the jurisdiction of the USACE and subject to federal Clean Water Act (CWA) regulations, inclusive of Section 401 and state water quality standards as well as the RWQCB. In addition, the channel and adjacent riparian vegetation would likely be subject to California Fish and Game Code Division 2, Chapter 6, Sections 1600 through 1602. Lastly, the project occurs within the California Coastal Commission (CCC) boundary and would be subject to CCA and LCP regulations.

The project includes temporary and permanent impacts to the Mills Creek riparian corridor through removal of trees, vegetation, existing slumped soil and debris, and existing slumped vegetated boulder repair from previous slides in the channel; recontouring the creek bed; and constructing a soldier pile wall with vegetated biostabilization-based revetments. The preliminary wetland delineation surveyed the project area and a 100-foot buffer. The surveyed area contains approximately 1.47 acres (64,053 square feet) of potentially jurisdictional aquatic resources consisting of streambed and riparian non-wetland habitat. This includes approximately 0.13 acre (5,681 square feet) of potentially jurisdictional streambed habitat under the USACE, State Water Board/RWQCB, CDFW, and LCP/CCA and approximately 1.24 acres (54,150 square feet) of potentially jurisdictional riparian non-wetland habitat under the State Water Board/RWQCB, CDFW, and LCP/CCA. Due to the temporary and permanent impacts to the channel and riparian vegetation, it is anticipated that the project will need to obtain federal CWA permits from the USACE and State Water Board/RWQCB, a Lake or Streambed Alteration Agreement (LSAA) from the CDFW, and a Coastal Development Permit (CDP) from the County prior to implementing the project.

Impacts would include removal of existing slide debris, reforming the thalweg of the channel to its original contours, and construction of a soldier pile retaining wall with biostabilization-based bank repair (soil lifts and vegetated boulder revetments). Impacts to all jurisdictional aquatic features will be reduced with implementation of BMPS (see Appendix B) to project water quality and those measures required under regulatory agency wetland/waters authorizations.

A total of approximately 0.01 acre (382 square feet) of temporary impacts and 0.02 acre (915 square feet/114 linear feet) of permanent fill to perennial stream will occur as a result of the project. All temporary and permanent impact areas would be restored. Restoration of the permanent impact area includes the addition of features such as rootwads, vegetated soil lifts, and vegetated boulder revetment to provide habitat and promote channel diversity. The proposed actions of biostabilization and vegetated revetment will enhance habitat following the completion of the project. Specifically, the suitability of the enhancement at the project site will provide instream cover and habitat complexity that could lead to long-term benefits to the watershed. In addition, the placement of large woody debris would increase the structural richness of Mills Creek. Finally, bank stabilization would improve the stability of the banks, reduce incision and erosion, and improve habitat quality on the portion of Mills Creek in the project area.

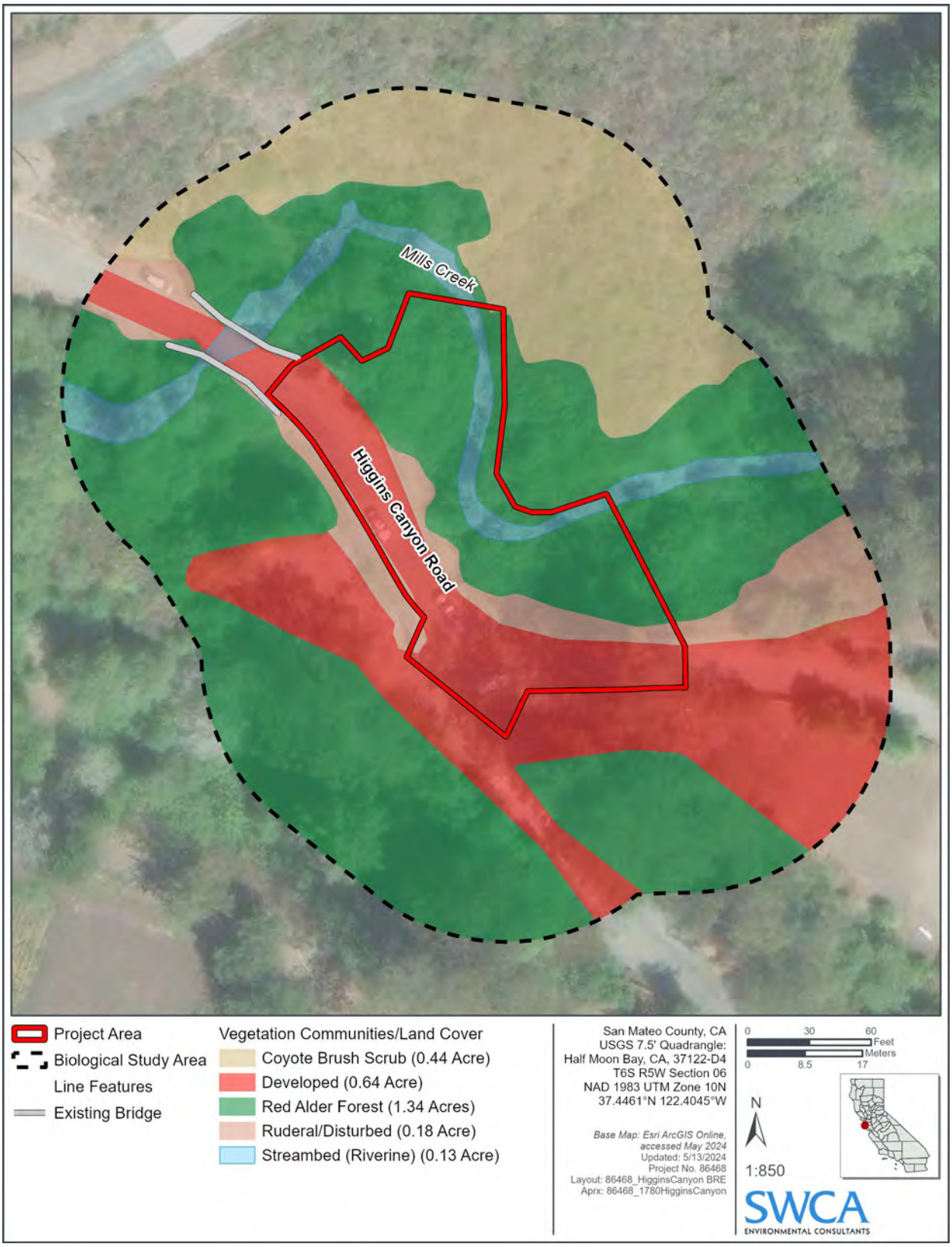


Figure 2-4. Natural Communities and Other Land Cover map.

(d) Would the project interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?

The riparian corridor along Mills Creek provides suitable wildlife and migration habitat for amphibians, reptiles, fish, birds, and mammals. However, the predominantly temporary disturbance and short duration of construction activities are unlikely to substantially disrupt the migration of animals through the above-described areas. Given the above, and with implementation of County RMP BMPs GEN-1 (Staging and Access), GEN-2 (Minimize Area of Disturbance and Site Maintenance), GEN-27 (Vegetation and Tree Removal), BIO-2 (Minimize Injury or Mortality of Fish and Amphibian Species during Dewatering), BIO-19 (Restore Channel Features), and BIO-21 (General Wildlife Protection Measures; see Appendix B), the project is not expected to interfere substantially with the movement of any native resident or migratory wildlife.

The riparian corridor along Mills Creek contains suitable nesting and foraging habitat for avian species protected under the Migratory Bird Treaty Act (MBTA) and California Fish and Game Code Sections 3503 and 3513 during the typical nesting season (February 15–September 15). Suitable nesting and forging habitats would include the Red Alder Forest, Coyote Brush Scrub, and ornamental trees within and adjacent to nearly all project areas. Nesting is unlikely outside of the typical nesting season, although some avian species may forage year-round near the project site. Seventeen avian species protected by the MBTA and California Fish and Game Code were observed in the BSA during the May 2024 field survey (see Appendix C1). No nesting birds were observed during the field survey, which occurred well into the nesting season.

Potential indirect impacts to steelhead could include temporary alteration of migration behavior because of project activities. Project activities would likely result in the creation of temporary barriers (i.e., cofferdam) that would inhibit the upstream and downstream migration of steelhead. However, all work within Mills Creek would occur during the June to October seasonal in-channel work period, outside of the migration season for steelhead, which generally takes place during the rainy season (November–March). Therefore, no temporary impacts to steelhead migration patterns would occur. The restored stream channel would include the addition of features such as rootwads, vegetated soil lifts, and vegetated boulder revetments to provide habitat and promote channel diversity. The proposed actions of biostabilization and vegetated revetment will enhance habitat following the completion of the project. Specifically, the suitability of the enhancement at the project site will provide instream cover and habitat complexity that could lead to long-term benefits for steelhead. Therefore, no long term impacts to steelhead migration patterns would occur.

Project activities will require the removal of vegetation in the riparian zone and could result in impacts to nesting birds in the form of disturbance, injury, and/or mortality. Disturbance due to noise, dust, or vibration from construction equipment may also result in nest abandonment if nesting birds are present within the vicinity of any of the project areas during construction. Nest abandonment would be considered a significant impact under CEQA. Therefore, preconstruction nesting surveys as described in County RMP BMP BIO-9 (Measures to Protect Nesting Migratory Birds) will be implemented to minimize any impacts to nesting birds that may occur in the BSA (see Appendix B). Project impacts to nesting birds are anticipated to be less than significant with implementation of this BMP.

(e) Would the project conflict with any local policies or ordinances protecting biological resources, such as tree preservation policy or ordinance?

Section 12.012 of the San Mateo County Code identifies Significant Trees as “any live woody plant rising above the ground with a single stem or trunk of a circumference of thirty-eight inches (38”) or more

measured at four and one half feet (4½') vertically above the ground or immediately below the lowest branch, whichever is lower, and having the inherent capacity of naturally producing one main axis continuing to grow more vigorously than the lateral axes." The project would remove 10 trees, the largest of which is a willow complex that is 20 inches diameter at ground height and with standing trunks between 2 and 8 inches at breast height. Therefore, the project would not impact any significant trees and would not conflict with the Significant Tree ordinance, and no impact would occur.

(f) Would the project conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?

The project is not within the boundaries of a Habitat Conservation Plan or Natural Community Conservation Plan; therefore, no impact would occur.

(g) Would the project be located inside or within 200 feet of a marine or wildlife reserve?

There are no marine or wildlife reserves within 200 feet of the project site; therefore, no impact would occur.

(h) Would the project result in loss of oak woodlands or other non-timber woodlands?

The project would repair damages to Mills Creek and a portion of Higgins Canyon Road. The project would not remove oak woodlands or non-timber woodlands, and the creek bank would be revegetated to mitigate losses to riparian vegetation during construction; therefore, no impact would occur.

2.5 CULTURAL RESOURCES

Environmental Issues	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the project:				
(a) Cause a substantial adverse change in the significance of a historical resource pursuant to § 15064.5?	☐	☐	☐	☒
(b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to § 15064.5?	☐	☐	☒	☐
(c) Disturb any human remains, including those interred outside of dedicated cemeteries?	☐	☐	☒	☐

The *Cultural Resources Inventory Report for the Higgins Canyon Road Slip-Out Repair Project, San Mateo County, California* was prepared to address potential cultural resources related to the project.[27] While this project exceeds the threshold for being considered a routine maintenance project, the project would follow the County RMP BMPs, as applicable. County RMP BMPs CUL-5 (Conduct Pre-Maintenance Educational Training) and CUL-6 (Address Discovery of Cultural Remains or Historic or

[27] SWCA. 2024. *Cultural Resources Inventory Report for the Higgins Canyon Road Slip-Out Repair Project, San Mateo County, California*. Prepared for County of San Mateo Department of Public Works.

Paleontological Artifacts Appropriately) are applicable to all ground-disturbing activities in natural channels or native soils, regardless of the sensitivity level of the work area. The text in this section includes the County RMP BMPs listed by number in the discussion, and the County RMP BMPs that are applicable to the project are summarized below and listed fully in Appendix B of this document.

(a) Would the project cause a substantial adverse change in significance of a historical resource as defined in State CEQA Guidelines §15064.5?

A Cultural Resources Inventory Report was prepared for the project, which included a records survey and intensive archeological field survey. No historic resources were identified by the records survey or field survey; therefore, the project would have no impact on historic resources.

(b) Would the project cause a substantial adverse change in significance of an archaeological resource pursuant to State CEQA Guidelines §15064.5?

Based on the Cultural Resources Inventory Report, there are no known archaeological resources in the vicinity of the project area. The absence of known archaeological resources does not preclude their existence at the subsurface level. The project would include bank repair and grading, installation of an approximately 192-foot-long vertical retaining wall adjacent to Higgins Canyon Road, approximately 185 feet of bank restoration using bioengineered solutions, and 216 linear feet of road repair. Environmental impacts may result from project implementation due to discovery of previously unrecorded archaeological resources. The likelihood of finding archaeological resources on-site is considered low; however, it is possible that discoveries of previously unrecorded archaeological resources may occur during ground-disturbing activities associated with project construction. With implementation of County RMP BMPs CUL-5 (Conduct Pre-Maintenance Educational Training) and CUL-6 (Address Discovery of Cultural Remains or Historic or Paleontological Artifacts Appropriately), the potential impacts to archaeological resources would be considered less than significant. County RMP BMP CUL-5 includes an educational training session for all employees conducted by a qualified cultural resources specialist. This training would include instructions on identifying historic and prehistoric resources, and the appropriate protocols to follow if resources are encountered during work activities. County RMP BMP CUL-6 includes a stop work order, and details of protocol for a consulting archaeologist that would ensure impacts related to an unanticipated archaeological find would be less than significant.

(c) Would the project disturb any human remains, including those interred outside of formal cemeteries?

A significant adverse effect would occur if grading or excavation activities associated with a project were to disturb previously interred human remains.

The disposition of burials falls first under the general prohibition on disturbing or removing human remains under California Health and Safety Code Section 7050.5. More specifically, remains suspected to be Native American are treated under State CEQA Guidelines Section 15064.5, and California Public Resources Code (PRC) 5097.98 illustrates the process to be followed in the event that remains are discovered. If human remains are discovered during construction, no further disturbance to the project site shall occur, and the County Coroner must be notified (California Code of Regulations [CCR] 15064.5 and PRC 5097.98).

The records search conducted for the project did not reveal any known Native American burial sites; however, the absence of Native American resources does not preclude their existence at the subsurface level. Project activities include grading and limited excavation to repair the channel and road; therefore, subsurface deposits related to previously undiscovered resource may be encountered during ground-disturbing activities. Although not anticipated, it is possible that discoveries of human remains may occur

during ground-disturbing activities associated with project construction. Disturbance of unanticipated human remains would be a potentially significant impact. In the event that previously undiscovered human remains are encountered during the project, the project would implement County RMP BMPs CUL-6 (Address Discovery of Cultural Remains or Historic or Paleontological Artifacts Appropriately, sub-measures 8, 9, and 10) for the discovery of human remains (see Appendix B). With implementation of this BMP, impacts related to undiscovered human remains would be less than significant.

2.6 ENERGY

Environmental Issues	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the project:				
(a) Result in a potentially significant environmental impact due to wasteful, inefficient, or unnecessary consumption of energy resources, during project construction or operation?	☐	☐	☒	☐
(b) Conflict with or obstruct a state or local plan for renewable energy or energy efficiency?	☐	☐	☐	☒

(a) Would the project result in a potentially significant environmental impact due to wasteful, inefficient, or unnecessary consumption of energy resources, during project construction or operation?

Energy use during project construction would be short term and temporary. Construction of the project would require the use of construction equipment and worker vehicles that would use energy. There are no established thresholds of significance for construction-related energy use; therefore, energy use during construction activities was not estimated. The project includes BMPs, as recommended by the BAAQMD, to reduce construction-related GHG emissions, which would also improve energy efficiency. In addition, the project would include a Construction and Demolition Waste Management Plan to recycle at least 65% of all construction waste or demolition material.[28,29] Recycling construction waste would reduce the amount of energy used in the production of new materials.

Due to the relatively small scale and short duration of construction activities and the implementation of measures to reduce GHG emissions and recycle construction debris, the project would not result in the wasteful, inefficient, or unnecessary consumption of energy resources, and construction impacts would be less than significant.

(b) Would the project conflict with or obstruct a state or local plan for renewable energy or energy efficiency?

Operation of the roadway would have no energy use, and energy use during project construction would be short term and temporary. Therefore, the project would not conflict with or obstruct a state or local plan for renewable energy or energy efficiency, and no impact would occur.

[28] County of San Mateo. 2024. Construction & Demolition. County of San Mateo Sustainability Department. Available at: https://www.smcsustainability.org/waste-reduction/construction-demolition/. Accessed May 23, 2024.

[29] California Department of Resources Recycling and Recovery (CalRecycle). 2024. *Construction and Demolition (C&D) Diversion Informational Guide.* Available at: https://calrecycle.ca.gov/LGCentral/Library/CandDModel/. Accessed May 15, 2024.

2.7 GEOLOGY AND SOILS

Environmental Issues	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the project:				
(a) Directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving:				
(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 substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.	☐	☐	☐	☒
(ii) Strong seismic ground shaking?	☐	☐	☒	☐
(iii) Seismic-related ground failure, including liquefaction?	☐	☐	☒	☐
(iv) Landslides?	☐	☐	☒	☐
(v) Coastal cliff/bluff instability or erosion?	☐	☐	☐	☒
(b) Result in substantial soil erosion or the loss of 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?	☐	☐	☒	☐
(d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial direct or indirect risks to life or property?	☐	☐	☒	☐
(e) Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water?	☐	☐	☐	☒
(f) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?	☐	☐	☒	☐

The *Geotechnical Design Report for Slip-Out Repair Near 1780 Higgins Canyon Road*[30] was prepared to address and provide recommended repair alternatives to stabilize the slope and restore Higgins Canyon Road (Appendix D).

[30] Cal Engineering & Geology (CE&G). 2023. *Geotechnical Design Report for Slip-Out Repair Near 1780 Higgins Canyon Road*. Prepared for County of San Mateo Department of Public Works. September 15.

(a) Would the project directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving:

(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 substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.

The project site is in an area of high seismic activity. It sits between the San Gregorio-Fault Zone approximately 2.7 miles southwest and the San Andreas Fault Zone approximately 4.7 miles northeast. Other faults in the area include the Pilarcitos, Monte Vista-Shannon, Hayward and Calaveras. No known active faults cross the project site, and the project site is not located within a currently designated Alquist-Priolo Earthquake Fault Zone.[31] Based on these considerations, the potential for surface rupture at the project site is considered low, and no impact related to surface rupture would occur.

(ii) Strong seismic ground shaking?

Due to the project site's location in the seismically active San Francisco Bay Area, it will likely experience strong ground shaking from a large (Moment Magnitude [Mw] 6.7 or greater) earthquake along with one or more of the nearby active faults during the design lifetime of the project. The intensity of ground shaking that is likely to occur in the area is generally dependent on the magnitude of the earthquake and the distance to the epicenter.

However, the project would reduce the potential for damage in a seismic event by repairing the existing slip-out and stabilizing the southwestern bank of Mills Creek with an engineered retaining wall, an engineered streambed, and biostabilization-based revetement. The project is designed to reduce the potential for damage to Higgins Canyon Road from the effects of strong seismic ground shaking on Mills Creek; therefore, this impact would be less than significant.

(iii) Seismic-related ground failure, including liquefaction?

The project would repair the existing slip-out and stabilize the southwestern bank of Mills Creek with an engineered retaining wall and biostabilization-based revetements. The project has been designed to return the creek thalweg to its original pre-erosional position and stabilize the stream bank to prevent future slip-outs.

The project site is located in an identified liquefaction zone.[32] However, the project would reduce the potential for damage in a seismic event by repairing the existing slip-out and stabilizing the southwestern bank of Mills Creek with an engineered retaining wall and biostabilization-based revetement; therefore, this impact would be less than significant.

(iv) Landslides?

According to the geotechnical report, no evidence of deep-seated landsliding was detected at the project site. The slip-out included a relatively restricted shallow layer of alluvium and the uppermost severely weathered bedrock and was likely caused by saturated slope materials in combination with erosion from elevated creek flows and high groundwater levels that contributed to erosion at the toe of the slopes by

[31] California Geological Survey (CGS). 2017. Earthquake Zones of Required Investigation Map Viewer. California Department of Conservation California Geological Survey. Available at: https://maps.conservation.ca.gov/cgs/eqzapp/app/. Accessed May 16, 2024.

[32] CGS. 2017. Earthquake Zones of Required Investigation Map Viewer. California Department of Conservation California Geological Survey. Available at: https://maps.conservation.ca.gov/cgs/eqzapp/app/. Accessed May 16, 2024.

high creek flows in Mills Creek. The geotechnical report considers the potential for deep-seated landsliding (involving bedrock) to be low under static conditions and low-to-moderate under seismic conditions. Further, the geotechnical investigation contains site-specific recommendations for site preparation and grading, placement and compaction of fill, retaining wall design, and seismic design. Recommendations from the geotechnical investigation related to landslides and instability include retaining a geotechnical engineer to observe and confirm subsurface conditions at the time of excavation and provide revised recommendations as necessary. In addition, all imported fill must be reviewed and approved by a geotechnical engineer before importation to the project site. Compliance with the recommendations contained in the geotechnical investigation would ensure the project does not impact landslide potential or slope stability at the project site or in the surrounding area. The project is designed per specifications of the geotechnical report to reduce the potential for landsliding by repairing the existing slip-out and stabilizing the southwestern bank of Mills Creek with an engineered retaining wall and biostabilization-based revetements; therefore, impacts would be less than significant.

(v) Coastal cliff/bluff instability or erosion?

The project site is not located on a coastal cliff or bluff and is designed to reduce the potential for erosion by repairing the existing slip-out and stabilizing the southwestern bank of Mills Creek with an engineered retaining wall and biostabilization-based revetements; therefore, no impact would occur.

(b) Would the project result in substantial soil erosion or the loss of topsoil?

According to the geotechnical report, the banks of Mills Creek are generally over-steepened in the project area and are particularly susceptible to instability during the rainy season when flow velocity, depth, and volume are significantly greater. The creek conveys stormwater that can produce both high water levels and high-velocity flows during peak storm conditions. The creek geometry makes the creek bank susceptible to erosion and undercutting when slopes are saturated during large storm events. Creek bank erosion (especially at the toe of the slope) is a primary cause of shallow slope failures and slumping, which leads to further erosion and a renewed cycle of slope degradation.

Construction

Project construction would excavate approximately 3,385 CY of soil, and approximately 1,680 CY of fill would need to be imported. A Water Pollution Control Plan will be prepared for the project, which will include erosion and sediment control measures per the requirements of the San Francisco Bay NPDES Permit.[33] Erosion and sediment control measures will be implemented. The Water Pollution Control Program would include construction-related pollution prevention measures and BMPs to control erosion and sedimentation impacts and stabilize disturbed bare-earth areas in accordance with County RMP and SMCWPPP[34] BMPs (see Appendix A). Section 2.7, *Hydrology and Water Quality*, provides additional information about the Water Pollution Control Program, San Francisco Bay NPDES Permit requirements, and related permits.

Areas of the project site disturbed by grading during construction would be protected against erosion during rainfall events. The Mills Creek channel and reconstructed bank above the OHWM would be planted with riparian vegetation before winter and the rainy season. As shown in the design plans, the finished surface would be covered with appropriate erosion matting and replanted to prevent silt from

[33] RWQCB. 2022. *California Regional Water Quality Control Board San Francisco Bay Region Municipal Regional Stormwater NPDES Permit.* Order No. R2-2022-0018. NPDES Permit No. CAS612008. May 11. Available at: https://www.waterboards.ca.gov/sanfranciscobay/board_decisions/adopted_orders/2022/R2-2022-0018.pdf. Accessed May 17, 2024.

[34] Flows to Bay. 2024. Construction Best Practices. Available at: https://www.flowstobay.org/preventing-stormwater-pollution/with-new-redevelopment/construction-best-practices/. Accessed May 28, 2024.

entering the creek after construction. According to the design plans, all work would be supervised by a qualified engineer. With implementation of the BMPs per the design plans (see Appendix A) and geotechnical investigation recommendations, construction of the project would not result in substantial soil erosion or the loss of topsoil, and impacts would be less than significant.

Operation

The project would repair the existing slip-out and stabilize the southwestern bank of Mills Creek with an engineered retaining wall and biostabilization-based revetements. The project would cover a relatively small footprint (approximately 20,052 square feet or 0.46 acre) in the Mills Creek channel and Higgins Canyon Road. All exposed areas except the low water channel would either be paved, stabilized, and/or revegetated prior to the end of construction. Therefore, operation of the project would improve future erosion potential and have minimal impacts related to soil erosion, and this impact would be less than significant.

(c) Would the project 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, liquefaction, or collapse?

The project is located along a stretch of Higgins Canyon Road along the Mills Creek channel, which has experienced multiple slip-outs over the past several years due to heavy rains. Compliance with the recommendations contained in the geotechnical investigation would ensure the project does not impact landslides or slope stability at the project site or in the surrounding area. The project is designed to stabilize the project area by repairing the existing slip-out and stabilizing the southwestern bank of Mills Creek with an engineered retaining wall and biostabilization-based revetements (see Appendix A). The project would also control the subsurface drainage behind the retaining wall, which would contribute to the long-term stability of the repair. Although the project is located in an area with unstable soils, previous damage would be repaired and stability would be increased at the project site; therefore, this impact would be less than significant.

(d) Would the project be located on expansive soil, as defined in Table 18 1 B of the Uniform Building Code (1994), creating substantial direct or indirect risks to life or property?

Portions of the project would be located on expansive soil that has a high clay content. However, the project would repair the existing slip-out and stabilize the southwestern bank of Mills Creek with an engineered retaining wall and biostabilization-based revetements. The project has been designed to restore the centerline of Mills Creek to its original pre-erosional flowpath away from the southwestern bank and includes a soldier pile retaining wall reinforced by a biostabilization-based vegetated revetments on the southwest bank to address erosion and rebuild the failed slope. All excavation would be overseen by a qualified engineer and engineered fill would be imported to support the project, which is designed to reduce the chance of a future slip-out on Higgins Canyon Road. Therefore, the project would not create a direct or indirect risk to life or property, and this impact would be less than significant.

(e) Would the project 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?

The project would repair the existing slip-out and stabilize the southwestern bank of Mills Creek with an engineered retaining wall and biostabilization-based revetements and does not include any wastewater disposal; therefore, no impact would occur.

(f) Would the project directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?

According to the County's General Plan, paleontological resources of known significance are extremely limited throughout the San Mateo County coastal zone. The project has the potential to impact paleontological resources if the work affects sensitive, previously undisturbed surficial sediment or sedimentary rock. The potential for significant paleontological discovery and impact are anticipated to be low within the proposed work area. However, in the unlikely event that a paleontological resource is discovered, the project applicant would implement the resource protection measure included as part of the project, described in Section 1.7.4, *Geology and Soils*, as required by PRC Division 5, Chapter 1.7, Section 5097.5, and Division 20, Chapter 3, Section 30244. As a result, project activities would not directly or indirectly destroy a unique paleontological resource or site or unique geologic feature, and impacts would be less than significant.

2.8 GREENHOUSE GAS EMISSIONS AND CLIMATE CHANGE

Environmental Issues	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the project:				
(a) Generate greenhouse gas emissions (including methane), either directly or indirectly, that may have a significant impact on the environment?	☐	☐	☒	☐
(b) Conflict with an applicable plan (including a local climate action plan), policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases?	☐	☐	☐	☒
(c) Result in the loss of forestland or conversion of forestland to non-forest use, such that it would release significant amounts of GHG emissions, or significantly reduce GHG sequestering?	☐	☐	☐	☒
(d) Expose new or existing structures and/or infrastructure (e.g., leach fields) to accelerated coastal cliff/bluff erosion due to rising sea levels?	☐	☐	☐	☒
(e) Expose people or structures to a significant risk of loss, injury or death involving sea level rise?	☐	☐	☐	☒
(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?	☐	☐	☐	☒
(g) Place within an anticipated 100-year flood hazard area structures that would impede or redirect flood flows?	☐	☐	☐	☒

The project would be required to follow the County RMP BMPs as well as measures from the BAAQMD 2022 CEQA Guidelines.[35,36] The text in this section includes the County RMP BMPs listed by number in

[35] Montrose Environmental. 2023. *County of San Mateo Routine Maintenance Program Manual.* Prepared for County of San Mateo. Revised May. Available at: https://www.smcgov.org/media/65021/download?inline=. Accessed May 21, 2024.

[36] BAAQMD. 2022. *California Environmental Quality Act Air Quality Guidelines.* Available at: https://www.baaqmd.gov/plans-and-climate/california-environmental-quality-act-ceqa/updated-ceqa-guidelines. Accessed May 14, 2024.

the discussion, and the County RMP BMPs that are applicable to the project are summarized below and listed fully in Appendix B of this document.

(a) Would the project generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?

The project would repair and reinforce the roadway and creek bed in Higgins Canyon Road and Mills Creek. Based on the size of the project, there would be minimal construction-related GHG emissions. Construction of the project would require the use of construction equipment and worker vehicles that would generate GHG emissions. The project would implement County RMP BMP GEN-19 (Dust Management Controls, sub-measures 6 and 7) to reduce GHGs (see Appendix B).

As described in Impact Discussion 3.3(a), the BAAQMD has not established screening thresholds for construction-related GHG emissions for general light industry projects. Therefore, GHG emissions during construction activities were not estimated. The project is relatively small compared with other screening criteria and would result in a maximum of approximately 15,078 square feet or 0.31 acre of ground disturbance within the 20,040 square foot project envelope. To reduce emissions, the BAAQMD encourages all project applicants to use off-road vehicles and equipment that comply with Tier 3 or Tier 4 standards.[37,38] In addition to County RMP BMP GEN-19 (Dust Management Controls), the project may choose to implement the following measures recommended in Table 6-1 of the BAAQMD 2022 CEQA Guidelines (Table 2-2) to further reduce GHG emissions.[39]

Table 2-2. Greenhouse Gas Construction Emission BMPs Applicable to the Project

Measure	Presence or Number	
	County RMP BMP No.[1]	BAAQMD[2]
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.	GEN-19(6)	No
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.	GEN-19(7)	No
Use zero-emission and hybrid-powered equipment to the greatest extent possible, particularly if emissions are occurring near sensitive receptors or located within a BAAQMD-designated Community Air Risk Evaluation (CARE) area or Assembly Bill 617 community	No	Yes
Minimize idling time either by shutting equipment off when not in use or reducing the time of idling to no more than 2 minutes (A 5-minute limit is required by the state airborne toxics control measure [Title 13, Sections 2449(d)(3) and 2485 of the California Code of Regulations]). Provide clear signage that posts this requirement for workers at the entrances to the site and develop an enforceable mechanism to monitor idling time to ensure compliance with this measure.	Similar to GEN-19(6)	Yes

[37] The U.S. Environmental Protection Agency and California Air Resources Board established emission standards for new engines found in off-road equipment. There are four tiers of emission standards, which become increasingly more stringent the higher the tier. Tier 3 and 4 emission standards are met through advanced engine design with no or minimal use of exhaust gas after combustion.

[38] BAAQMD. 2017. *2017 Clean Air Plan: Spare the Air, Cool the Climate.* Available at: https://www.baaqmd.gov/plans-and-climate/air-quality-plans/current-plans. Accessed February 7, 2024.

[39] BAAQMD. 2022. *California Environmental Quality Act Air Quality Guidelines, Chapter 6, Project-level Climate Impacts. Table 6-1: Best Management Practices for Construction-Related GHG Emissions.* Available at: https://www.baaqmd.gov/plans-and-climate/california-environmental-quality-act-ceqa/updated-ceqa-guidelines. Accessed May 14, 2024.

Measure	Presence or Number	
	County RMP BMP No.[1]	BAAQMD[2]
Encourage and provide carpools, shuttle vans, transit passes, and/or secure bicycle parking to construction workers and offer meal options onsite or shuttles to nearby meal destinations for construction employees.	No	Yes
Recycle or salvage nonhazardous construction and demolition debris, with a goal of recycling at least 15% more by weight than the diversion requirement in Title 24.	No	Yes

[1] Source: Montrose Environmental (2023).
[2] Source: BAAQMD (2022).

Compliance with County RMP BMP GEN-19 (Dust Management Controls) combined with the size of the project would ensure that impacts are less than significant. The addition of recommended BAAQMD measures would further reduce this less-than-significant impact. In addition, the project would recycle construction debris to further reduce construction-related GHG emissions, as required by the California Green Building Standards Code (CALGreen). With implementation of County RMP BMP GEN-19 (Dust Management Controls) required by the County RMP and CALGreen, construction-related GHG emissions would be less than significant.

(b) Would the project conflict with an applicable plan, policy or regulations adopted for the purpose of reducing the emissions of greenhouse gases?

The project would stabilize and reinforce the southwest bank of Mills Creek and repair a portion of Higgins Canyon Road, which would create minimal construction-related GHG emissions and have no operational GHG emissions. Therefore, the project would not conflict with an applicable plan, policy, or regulation related to GHGs, and no impact would occur.

(c) Would the project result in the loss of forestland or conversion of forestland to non-forest use, such that it would release significant amounts of GHG emissions, or significantly reduce GHG sequestering?

The project would stabilize and reinforce the southwest bank of Mills Creek and repair a portion of Higgins Canyon Road. The project would not convert forest land to non-forest use, and no impact would occur.

(d) Would the project expose new or existing structures and/or infrastructure (e.g., leach fields) to accelerated coastal cliff/bluff erosion due to rising sea levels?

The project would stabilize and reinforce the southwest bank of Mills Creek and repair a portion of Higgins Canyon Road. The project is not located on a coastal cliff or bluff, and no impact would occur.

(e) Would the project expose people or structures to a significant risk of loss, injury or death involving sea level rise?

The project is located approximately 2.7 miles east of the Pacific Ocean and is not in an area vulnerable to sea level rise;[40] therefore, no impact would occur.

[40] County of San Mateo. 2024. Protecting the South Coast from Sea Level Rise. County of San Mateo Office of Sustainability. Available at: https://storymaps.arcgis.com/stories/57c75423d4a143feba1b7c92b2bfe1ea. Accessed May 16, 2024.

(f) Would the project 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?

The project would repair and stabilize the southwest bank of Mills Creek and repair a portion of Higgins Canyon Road that experienced a slip-out. Other than the retaining wall and revetments, the project would not include placement of structures in a flood hazard area; therefore, no impact would occur.

(g) Would the project place within an anticipated 100-year flood hazard area structures that would impede or redirect flood flows?

The project would repair and stabilize the southwest bank of Mills Creek and repave a portion of Higgins Canyon Road that experienced a slip-out. The project would remove debris that has fallen into the creek and restore the centerline of Mills Creek to its original pre-erosional flowpath, moving it away from the southwest bank to reduce erosion. The project would also place rootwads and boulders in the creek bed designed to direct the energy from flood flows away from the creek banks and reduce erosion potential (see Appendix A). Therefore, the project would have a beneficial effect on flood flows, and no impact would occur.

2.9 HAZARDS AND HAZARDOUS MATERIALS

Environmental Issues	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the project:				
(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)?	☐	☐	☒	☐
(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?	☐	☐	☒	☐
(c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?	☐	☐	☐	☒
(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?	☐	☐	☐	☒
(e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard or excessive noise for people residing or working in the project area?	☐	☐	☐	☒
(f) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	☐	☐	☐	☒

	Environmental Issues	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
(g)	Expose people or structures, either directly or indirectly, to a significant risk of loss, injury or death involving wildland fires?	☐	☐	☐	☒
(h)	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?	☐	☐	☐	☒
(i)	Place within an existing 100-year flood hazard area structures that would impede or redirect flood flows?	☐	☐	☐	☒
(j)	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?	☐	☐	☐	☒
(k)	Inundation by seiche, tsunami, or mudflow?	☐	☐	☐	☒

The project would be required to follow the County RMP BMPs.[41] The text in this section includes the County RMP BMPs listed by number in the discussion, and the County RMP BMPs that are applicable to the project are summarized below and listed fully in Appendix B of this document.

(a) Would the project create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?

A significant impact may occur if a project would involve the use or disposal of hazardous materials or would have the potential to generate toxic or otherwise hazardous emissions that could adversely affect sensitive receptors.

Construction of the project would involve the transport, use, and disposal of potentially hazardous materials. These materials include fuels and oils that are typically associated with any construction project. As described in Chapter 1, *Project Description*, construction activities would be temporary, and the majority of construction activities would last for approximately 70 working days. These temporary construction activities involving the use, transport, storage, and disposal of hazardous materials would be conducted in compliance with all health and safety requirements, such as County General Plan policies, CCR Sections 337 through 340, Chapter 6.95 of the California Health and Safety Code Article 1, and CCR Title 19, Public Safety, Division 2 (if required). In addition, the County would implement the following County RMP BMPs as part of the project: GEN-6 (Hazardous Materials Storage/Disposal), GEN-7 (Spill Prevention and Control), GEN-8 (Waste Management), GEN-9 (Vehicle Maintenance), GEN-10 (Equipment Maintenance and Fueling), GEN-11 (Paving and Asphalt Work), GEN-12 (Concrete, Grout and Mortar Application), GEN-13 (Exclude Concrete from the Channel), GEN-14 (Concrete Washout Facilities), and GEN-16 (Timing of Work) (see Appendix B). Because the project applicant would comply with applicable regulations and laws pertaining to the transport, storage, use, and disposal of potentially hazardous materials, the exposure of the public, construction workers, and environment to hazardous materials would be less than significant.

[41] Montrose Environmental. 2023. *County of San Mateo Routine Maintenance Program Manual.* Prepared for County of San Mateo. Revised May. Available at: https://www.smcgov.org/media/65021/download?inline=. Accessed May 21, 2024.

(b) Would the project 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?

A significant impact may occur if a project could create an upset or accident condition involving hazardous materials. Construction of the project would use small amounts of hazardous materials such as diesel fuel. As discussed above, the project would comply with all health and safety requirements and includes BMPs as outlined in the California Stormwater Quality Association (CASQA) *2023 Construction BMP Handbook* and County RMP and identified in Section 2.10, *Hydrology and Water Quality*. Therefore, the project would contain any minor spills during construction (see Appendix B).[42,43] Therefore, the project would not 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, and the impact would be less than significant.

(c) Would the project emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?

The project site is not within 0.25 mile of any school; therefore, no impact would occur.

(d) Would the project be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code §65962.5 and, as a result, would it create a significant hazard to the public or the environment?

California Government Code Section 65962.5 requires various state agencies to compile lists of hazardous waste disposal facilities, unauthorized release from underground storage tanks, contaminated drinking water wells, and solid waste facilities from which there is known migration of hazardous waste, and to submit such information to the Secretary for Environmental Protection on at least an annual basis. In meeting the provisions in California Government Code Section 65962.5, commonly referred to as the "Cortese List," database resources such as EnviroStor and GeoTracker provide information regarding identified facilities. According to EnviroStor and GeoTracker, the project site is not located in the vicinity of a hazardous materials site;therefore, no impact would occur. [44,45]

(e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?

The project site is not located within 2 miles of a public airport. The nearest airport, Half Moon Bay Airport, is approximately 6.2 miles northwest; therefore, no impact would occur.

---

[42] California Stormwater Quality Association (CASQA). 2023. *2023 Construction BMP Handbook.* Available at: https://www.casqa.org/resources/bmp-handbooks. Accessed May 16, 2024.

[43] Montrose Environmental. 2023. *County of San Mateo Routine Maintenance Program Manual.* Prepared for County of San Mateo. Revised May. Available at: https://www.smcgov.org/media/65021/download?inline=. Accessed May 21, 2024.

[44] State Water Resources Control Board (State Water Board). 2024. GeoTracker. Available at: https://geotracker.waterboards.ca.gov/map/?CMD=runreport&myaddress=half+moon+bay. Accessed on May 16, 2024.

[45] California Department of Toxic Substances Control (DTSC). 2024. EnviroStor. Available at: https://www.envirostor.dtsc.ca.gov/public/map. Accessed on May 16, 2024.

(f) Would the project impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?

The *San Mateo County Emergency Operations Plan* manages emergency operations in the San Mateo County Operational Area (SMOA). The SMOA is responsible for emergency response within the unincorporated county in the event of a disaster. The San Mateo County Office of Emergency Services coordinates with county departments, cities/towns, the State Office of Emergency Services Coastal Region, volunteers such as Community Emergency Response Teams (CERT), and special districts in the event of an emergency.[46,47] The County Office of Emergency Management is in the process of developing an *All-Hazard Evacuation Plan*, which will be the first step in understanding and planning for response capacities to a major emergency.[48]

The project would repair a slip-out on Higgins Canyon Road. The project would maintain one-way traffic control during project construction. Construction would cease in the event of a widespread emergency such as a wildfire or earthquake. Access-related impacts would be temporary and alternative access is available via Purisima Creek Road. The project would return the road to its original dimensions, improving emergency access in the long term. Therefore, the work would not interfere with an emergency evacuation plan or emergency response plan, and no impact would occur.

(g) Would the project expose people or structures, either directly or indirectly, to a significant risk of loss, injury or death involving wildland fires?

The project would repair a slip-out on Higgins Canyon Road, which would improve the road for emergency evacuations in case of wildfire. The project would not introduce new people or structures into an area vulnerable to wildfire; therefore, no impact would occur.

(h) Would the project 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?

The project would not introduce new housing; therefore, no impact would occur.

(i) Would the project place within an existing 100-year flood hazard area structures that would impede or redirect flood flows?

The project would repair and stabilize the southwest bank of Mills Creek and repair a portion of Higgins Canyon Road that experienced a slip-out. The project would restore the centerline of Mills Creek to its original pre-erosional flowpath, moving it away from the southwest bank to reduce erosion. The project would also remove material that has slipped into the creek, which would restore flood capacity, and as discussed in Section 1.3, *Proposed Project*, would place rootwads and boulders in the creek bed designed to direct the energy from flood flows away from the creek bank and reduce erosion potential (see Appendix A). Therefore, the project would have a beneficial effect on flood flows, and no impact would occur.

---

[46] County of San Mateo. 2015. *County of San Mateo Emergency Operations Plan – Basic Plan.* Available at: https://hsd.smcsheriff.com/sites/default/files/downloadables/1%20-%20Emergency%20Operations%20Plan.pdf. Accessed October 22, 2024.

[47] California Governor's Office of Emergency Services. 2024. *Response Operations webpage.* Available at: https://www.caloes.ca.gov/office-of-the-director/operations/response-operations/#adminmap> Accessed October 22, 2024.

[48] County of San Mateo. 2024. *Year in Review 2022-2023.* County of San Mateo Department of Emergency Management. Available at: https://www.smcgov.org/media/145447/download?inline=. Accessed October 22, 2024.

(j) Would the project 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?

The project would repair and stabilize the southwest bank of Mills Creek and restore a portion of Higgins Canyon Road that experienced a slip-out. The project is not in an area subject to inundation in the event of a dam or levee failure[49] and would not introduce people into an area susceptible to flooding; therefore, no impact would occur.

(k) Would the project expose people or structures to inundation by seiche, tsunami, or mudflow?

The project would repair and stabilize the southwest bank of Mills Creek and restore a portion of Higgins Canyon Road that experienced a slip-out. The project is approximately 2.6 miles from the Pacific Ocean and is not in an area subject to seiche or tsunami.[50] The project would stabilize and reinforce the bank of Mills Creek and reduce the potential for mudflows. The project would not introduce people into an area susceptible to flooding; therefore, no impact would occur.

2.10 HYDROLOGY AND WATER QUALITY

Environmental Issues	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the project:				
(a) Violate any water quality standards or waste discharge requirements or otherwise substantially degrade surface or ground water quality (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])?	☐	☐	☒	☐
(b) Substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin?	☐	☐	☐	☒
(c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner which would:				
(i) Result in substantial erosion or siltation on- or off-site;	☐	☐	☒	☐
(ii) Substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site;	☐	☐	☐	☒

[49] State Water Resources Control Board (State Water Board). 2024. Dam Breach Inundation Map Web Publisher. State Water Resources Control Board, Division of Safety of Dams. Available at: https://fmds.water.ca.gov/webgis/?appid=dam_prototype_v2. Accessed May 16, 2024.

[50] Metropolitan Transportation Commission (MTC)/Association of Bay Area Governments (ABAG). 2024. MTC/ABAG Hazard Viewer Map. Available at: https://mtc.maps.arcgis.com/apps/webappviewer/index.html?id=4a6f3f1259df42eab29b35dfcd086fc8. Accessed May 16, 2024.

	Environmental Issues	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
	(iii) Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff; or	☐	☐	☒	☐
	(iv) Impede or redirect flood flows?	☐	☐	☐	☒
(d)	In flood hazard, tsunami, or seiche zones, risk release of pollutants due to project inundation?	☐	☐	☐	☒
(e)	Conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan?	☐	☐	☐	☒
(f)	Significantly degrade surface or ground-water water quality?	☐	☐	☒	☐
(g)	Result in increased impervious surfaces and associated increased runoff?	☐	☐	☒	☐

The project would be required to follow the County RMP BMPs.[51] The text in this section includes the County RMP BMPs listed by number in the discussion, and the County RMP BMPs that are applicable to the project are summarized below and listed fully in Appendix B of this document.

(a) Would the project violate any water quality standards or waste discharge requirements or otherwise substantially degrade surface or ground water quality?

Activities associated with construction of the project could have a significant impact if they resulted in violation of waste discharge requirements under the San Francisco Bay NPDES Permit from contaminated runoff entering the stormwater system.

The SMCWPPP is a partnership of the County, the City/County Association of Governments (C/CAG) of San Mateo County, and each incorporated city and town in the county, which share a common NPDES permit. The San Francisco Bay NPDES Permit was issued by the San Francisco Bay RWQCB in compliance with the *San Francisco Bay Basin (Region 2) Water Quality Control Plan* (Basin Plan) and the NPDES Program. [52,53] Participating agencies must comply with the provisions of the San Francisco Bay NPDES Permit by ensuring that new development and redevelopment mitigate, to the maximum extent practicable, water quality impacts from stormwater runoff during both construction and operational periods of projects. Section C.6 of the NPDES Permit requires a construction site inspection and control

[51] Montrose Environmental. 2023. *County of San Mateo Routine Maintenance Program Manual.* Prepared for County of San Mateo. Revised May. Available at: https://www.smcgov.org/media/65021/download?inline=. Accessed May 21, 2024.

[52] RWQCB. 2022. *California Regional Water Quality Control Board San Francisco Bay Region Municipal Regional Stormwater NPDES Permit.* Order No. R2-2022-0018. NPDES Permit No. CAS612008. May 11. Available at: https://www.waterboards.ca.gov/sanfranciscobay/board_decisions/adopted_orders/2022/R2-2022-0018.pdf. Accessed May 17, 2024.

[53] San Francisco Regional Water Quality Control Board (RWQCB). 2017. *San Francisco Bay Basin (Region 2) Water Quality Control Plan.* California Regional Water Quality Control Board, San Francisco Bay Region. May 4. Available at: https://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/planningtmdls/basinplan/web/docs/BP_all_chapters.pdf. Accessed May 17, 2024.

program at all construction sites to prevent construction site discharges of pollutants.[54] In addition, the project would be implemented in accordance with SMCWPPP BMPs and the following County RMP BMPs as appropriate: GEN-1 through GEN-28 (General Avoidance and Minimization Measures); EC-1, EC-3, EC-5, EC-6, EC-7, EC-8, EC-9, EC-10, and EC-13 (Erosion Control Measures); SC-1, SC-2, SC-3, SC-4, SC-7, SC-8 (Sediment/Water Quality Control Measures); and DW-1 (Channel Dewatering) (see Appendix B).

The project would repair and stabilize the southwest bank of Mills Creek and restore a portion of Higgins Canyon Road. Operation of the project would not result in a change in the quality of stormwater runoff.

The project would require a CWA Section 401 permit from the RWQCB and a Section 404 permit from the USACE and would be required to follow all conditions specified in the permits. In addition, during construction, the project would include County RMP BMPs that are in compliance with the Basin Plan, San Francisco Bay NPDES Permit, and the CASQA *2023 Construction BMP Handbook*. [55,56,57] The County RMP BMPs related to each CASQA BMP are shown in parentheses. These BMPs from the CASQA *2023 Construction BMP Handbook* and County RMP would include, but not be limited to:

- Creek flow shall be diverted around or through excavation activities per Section NS-5, Clear Water Diversion (County RMP BMP DW-1 [Channel Dewatering]).
- Stockpiled materials shall be protected per Section WM-3, Stockpile Management (County RMP BMP GEN-19 [Dust Management Controls], GEN-22 [Site Stabilization], and SC-2 Silt Fence).
- Handling of all shrubs, trees, and materials to be disposed of shall follow Section WM-5, Solid Waste Management (County RMP BMP GEN-27 [Vegetation and Tree Removal]).
- Streambank stabilization and sediment control shall follow Section EC-12, Streambank Stabilization (County RMP BMP EC-13 [Slope or Bank Stabilization]).
- Exclusion fence shall follow Section SE-1, Silt Fence (County RMP BMP SC-2 [Silt Fence]).
- Contractor shall limit soil disturbance in conformance with CASQA BMP EC-2 (County RMP BMP GEN-2 [Minimize Area of Disturbance and Site Maintenance]).
- Contractor shall limit vegetation disturbance to the maximum extent possible, and in conformance with CASQA BMP EC-2 (County RMP BMP GEN-2 [Minimize Area of Disturbance and Site Maintenance]).
- Contractor shall perform no vehicle maintenance, fueling or washing on-site (County RMP BMP GEN-10 [Equipment Maintenance & Fueling]).
- Spills shall be prevented and cleaned according to CASQA BMP WM-4 (County RMP BMP GEN-7 [Spill Prevention and Control]).
- No hazardous waste shall be permitted on-site.

[54] Flows to Bay. 2024. Construction Best Practices. Available at: https://www.flowstobay.org/preventing-stormwater-pollution/with-new-redevelopment/construction-best-practices/. Accessed May 28, 2024.

[55] San Francisco RWQCB. 2017. *San Francisco Bay Basin (Region 2) Water Quality Control Plan.* California Regional Water Quality Control Board, San Francisco Bay Region. May 4. Available at: https://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/planningtmdls/basinplan/web/docs/BP_all_chapters.pdf. Accessed May 17, 2024.

[56] RWQCB. 2022. *California Regional Water Quality Control Board San Francisco Bay Region Municipal Regional Stormwater NPDES Permit.* Order No. R2-2022-0018. NPDES Permit No. CAS612008. May 11. Available at: https://www.waterboards.ca.gov/sanfranciscobay/board_decisions/adopted_orders/2022/R2-2022-0018.pdf. Accessed May 17, 2024.

[57] CASQA. 2023. *2023 Construction BMP Handbook.* Available at: https://www.casqa.org/resources/bmp-handbooks. Accessed May 16, 2024.

These permit conditions and BMPs would be adequate to ensure that the project would not violate any water quality standards or waste discharge requirements during construction; therefore, this impact would be less than significant.

(b) Would the project substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin?

The project would repair and stabilize the southwest bank of Mills Creek and restore a 4,556-square-foot portion of Higgins Canyon Road. The project would create approximately 383 square feet of new impervious surface adjacent to the creek and would not use groundwater during operation. The new impervious surface would drain directly to the creek. Therefore, the project would not decrease groundwater supplies or interfere with groundwater recharge, and no impact would occur.

(c) Would the project substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner which would:

(i) Result in substantial erosion or siltation on- or off-site?

The project would repair and stabilize a slip-out into Mills Creek and restore a portion of Higgins Canyon Road. The project would include installing a soldier pile retaining wall with vegetated boulder revetments, recontouring the creek bed to its original pre-erosional flowpath, and adding rootwads and specimen boulders for habitat enhancement and to direct creekflow away from the eroding slope. The upgrades are intended to repair existing erosion and reduce future damage to the road and waterway.

As discussed under Impact Discussion 2.10(a), construction would comply with required permit conditions and BMPs, which would be adequate to keep any erosion or siltation during construction to a less-than-significant level. Therefore, the project would not result in substantial erosion or siltation, and this impact would be less than significant.

(ii) Substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site?

The project would repair and stabilize a portion of the Mills Creek channel, which would restore flood capacity and prevent further damage to Higgins Canyon Road. Therefore, no impact would occur.

(iii) Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?

Stormwater in the project area runs by overland flow or roadside ditch relief culverts directly into Mills Creek. The project would repair and stabilize a portion of the Mills Creek channel but would not change flow from upstream or stormwater inputs into Mills Creek. The project would repave a portion of Higgins Canyon Road, removing approximately 2,116 square feet of existing asphalt on the northern edge of the road affected by the slip-out and replacing it with approximately 4,556 square feet of new asphalt, including the failed pavement area. Overall, the project would add approximately 383 square feet of new impervious surface. The project would restore the capacity of the existing creek by removing debris and engineering the channel to reduce future erosion; however, the project would not increase the original impervious surface area of the road and would not contribute additional runoff water to Mills Creek, and no impact would occur.

As discussed under Impact Discussion 3.10(a), during construction, the project would implement BMPs as outlined in the CASQA *2023 Construction BMP Handbook,* SMCWPPP BMPs, and the following County RMP BMPs as appropriate: GEN-1 (Staging and Access), GEN-2 (Minimize Area of Disturbance and Site Management), GEN-3 (Construction Entrances and Perimeter), GEN-4 (Salvage/Reuse of Plant and Woody Material), GEN-5 (Non-Hazardous Materials), GEN-6 (Hazardous Materials Storage/Disposal), GEN-7 (Spill Prevention and Control), GEN-8 (Waste Management), GEN-9 (Vehicle Maintenance and Parking), GEN-10 (Equipment Maintenance & Fueling), GEN-11 (Paving and Asphalt Work), GEN-12 (Concrete, Grout and Mortar Application), GEN-13 (Exclude Concrete from Channel), GEN-14 (Concrete Washout Facilities), and GEN-22 (Site Stabilization); EC-1, EC-3, EC-5, EC-6, EC-7, EC-8, EC-9, EC-10, and EC-13 (Erosion Control Measures); and SC-1, SC-2, SC-3, SC-4, SC-7, and SC-8 (Sediment/Water Quality Control Measures). In addition, the project would be required to obtain permits from the RWQCB under CWA Section 401 and the USACE under CWA Section 404. The CWA Sections 401 and 404 permit conditions and BMPs, which are included as part of the project, would be adequate to ensure that the project would not provide additional sources of polluted runoff. Therefore, this impact would be less than significant.

(iv) Impede or redirect flood flows?

The project would remove accumulated slide debris from the channel, repair and stabilize a portion of the Mills Creek creek bank, and restore the thalweg of the channel to its original path. This would restore its flood capacity and prevent further damage to Higgins Canyon Road. The project would not impede flood flows and would direct them away from the southwest bank of Mills Creek to reduce the amount of erosion; therefore, no impact would occur.

(d) Would the project in flood hazard, tsunami, or seiche zones, risk release of pollutants due to project inundation?

The project is located in and adjacent to Mills Creek and would improve the creek channels resistance to flood damage. The project is located approximately 2.6 miles east of the Pacific Ocean and is not in an identified tsunami hazard zone.[58] The project is not in an area subject to seiche. Therefore, the project would not risk release of pollutants due to project inundation, and no impact would occur.

(e) Would the project conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan?

The project does not include discharge to either ground or surface water and does not require water for operation. The project would result in a minor increase in impervious surface areas, primarily from the retaining wall. Gravel drainage swales will be installed within the existing shoulder area and are designed to handle roadway runoff and direct it away from the wall to an existing outfall location. Therefore, the project would not conflict with or obstruct a water quality control plan or groundwater management plan, and no impact would occur.

(f) Would the project significantly degrade surface or ground-water water quality?

As discussed in Impact Discussion 2.10(a), the project would repair and stabilize a portion of the southwest bank of Mills Creek and return the thalweg to its original alignment which would reduce future erosion and improve surface water quality. During construction, the project would implement BMPs, as outlined in the CASQA *2023 Construction BMP Handbook* and County RMP, as required by the County

[58] MTC/ABAG. 2024. MTC/ABAG Hazard Viewer Map. Available at: https://mtc.maps.arcgis.com/apps/webappviewer/index.html?id=4a6f3f1259df42eab29b35dfcd086fc8. Accessed May 16, 2024.

and would comply with all conditions of the Section 404 and 401 permits. Therefore, project construction would have a less than significant impact on surface water quality. The project would have no impact on groundwater water quality; therefore, no impact would occur.

(g) Would the project result in increased impervious surfaces and associated increased runoff?

The project would restore the original extent of Higgins Canyon Road in the project area and would add a soldier pile retaining wall and biostabilization-based bank repair to Mills Creek. Although the project would increase the amount of impervious surface by approximately 383 square feet, due to construction of the retaining wall, the increase in runoff would be minimal and similar to previous conditions. The project would also replace soil in the creek banks with soil lifts (vegetated boulder revetement), which would be semi-permeable and result in a negligible increase in runoff. Therefore, this impact would be less than significant.

2.11 LAND USE AND PLANNING

Environmental Issues	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the project:				
(a) Physically divide an established community?	☐	☐	☐	☒
(b) Cause a significant environmental impact due to a conflict with any land use plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect?	☐	☐	☒	☐
(c) Serve to encourage off-site 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)?	☐	☐	☐	☒

(a) Would the project physically divide an established community?

The project would repair a section of Higgins Canyon Road and stabilize the southwest bank of Mills Creek. The project would not physically divide an established community; therefore, no impact would occur.

(b) Would the project cause a significant environmental impact due to a conflict with any land use plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect?

A project would normally have a significant impact related to land use consistency if it would be inconsistent with the General Plan or its elements, a local coastal plan, or adopted environmental goals or policies, or if it would require a General Plan amendment or zone change.

The project would repair and stabilize an existing portion of Higgins Canyon Road and Mills Creek. As discussed in Section 2.4, *Biological Resources*, the project would be required to obtain permits from the RWQCB under CWA Section 401 and the USACE under CWA Section 404. The CWA Sections 401 and 404 permit conditions and BMPs would be included as part of the project. In addition, the project would

be required to obtain and comply with all conditions of a CDP; therefore, the project would not conflict with a land use plan or policy, and this impact would be less than significant.

(c) Would the project serve to encourage off-site development of presently undeveloped areas of increase development intensity of already developed areas (examples include the introduction of new or expanded public utilities, new industry, commercial facilities or recreation activities)?

The project would repair and stabilize an existing portion of Higgins Canyon Road and Mills Creek. The project would not change operations on Higgins Canyon Road or encourage development in the area surrounding the project; therefore, no impact would occur.

2.12 MINERAL RESOURCES

Environmental Issues	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the project:				
(a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?	☐	☐	☐	☒
(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?	☐	☐	☐	☒

(a) Would the project result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?

The project is located in an area zoned Mineral Resource Zone (MRZ)-3 for aggregate mineral resources.[59] MRZ-3 is defined as an area containing mineral deposits, the significance of which cannot be evaluated from available data. Neither the project site nor the surrounding area is identified as an area containing mineral deposits of statewide or regional significance.[60] The closest identified aggregate resource area is at Pilarcitos Quarry, approximately 4.8 miles northeast. Therefore, no impacts to mineral resources of statewide or regional significance would occur.

[59] California Department of Mines and Geology (CDMG). 1982. *Mineral Resource Sectors: South San Francisco Bay Production-Consumption Region, Half Moon Bay Quadrangle, Special Report 143, Plate 2.3 and Plate 2.73.* Available at: https://maps.conservation.ca.gov/mineralresources/. Accessed May 17, 2024.

[60] Stinson, M.C., M.W. Manson, and J.J. Plappert. 1983. *Mineral Resource Zones and Resource Sectors: San Francisco and San Mateo Counties, South San Francisco Bay Production-Consumption Region, Special Report 146, Plate 2.3.* Available at: https://maps.conservation.ca.gov/mineralresources/. Accessed May 17, 2024.

(b) Would the project 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?

Neither the project site nor the surrounding area is identified as an area containing mineral deposits of local significance.[61] Therefore, no impacts to mineral resources of local significance would occur.

2.13 NOISE

Environmental Issues	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the project result in:				
(a) Generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?	☐	☐	☒	☐
(b) Generation of excessive groundborne vibration or groundborne noise levels?	☐	☐	☒	☐
(c) For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☒

(a) Would the project result in generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?

Sensitive receptors in the vicinity of the project include users of Burleigh H. Murray Ranch State Park and the residential uses Higgins Canyon Road in the vicinity of the project area. The nearest residences are approximately 360 feet from the project site.

The County has established restrictions limiting construction and similar noise-generating activities from 7:00 a.m. to 6:00 p.m., Monday through Friday; 9:00 a.m. to 5:00 p.m., Saturdays; and never on Sundays, Thanksgiving Day, or Christmas Day.[62] The project contractor would be required to comply with construction hour restrictions.

Construction activities would generate noise that would vary over the 70-working-day construction period and would include equipment such as a bobcat, a skid-steer loader, a CAT long reach excavator, a drill rig, an asphalt paving machine, a drum roller, and hand tools for removing vegetation. Equipment noise would be up to approximately 100 A-weighted decibels (dBA) during work activities, and up to approximately 120 dBA during percussive work into rock. There would be secondary noise from

[61] County of San Mateo. 1986. *General Plan. Overview Background & Issues.* Available at: https://www.smcgov.org/planning/general-plan. Accessed May 17, 2024.

[62] County of San Mateo. 2024. Building: Frequently Asked Questions, What is the County's Construction Noise Ordinance. Available at: https://www.smcgov.org/planning/building-frequently-asked-questions. Accessed May 17, 2024.

construction worker vehicles and vendor deliveries. During construction, noise-generating activities would be limited to the allowable hours in the County's noise ordinance. No nighttime construction would occur. Because construction noise would comply with local noise regulations, impacts related to construction noise would be less than significant.

There would be no change in operational noise associated with the road.

(b) Would the project result in generation of excessive groundborne vibration or groundborne noise levels?

The project would include groundborne noise and vibration from the operation of equipment to install bore holes and from equipment used for asphalt removal and installation. Construction activities, such as drilling and other high-power or vibratory tools, excavation, and grading and rolling stock equipment (e.g., tracked vehicles, compactors, etc.) may generate groundborne vibration in the immediate vicinity of construction activities. Construction vehicles and equipment used during the project would include standard equipment such as dump trucks, excavators, a drill rig, a drum roller, an asphalt paving machine, and water trucks. Equipment such as drill rigs and excavators can create vibration velocities of up to 0.09 inches/second peak particle velocity (PPV) at 25 feet from the work area, and vibrations attenuate quickly with distance. In order to determine structural damage to buildings caused by groundborne vibration, the California Department of Transportation (Caltrans) uses a vibration limit of 0.5 inches/sec PPV for buildings that are structurally sound and designed to modern engineering standards, 0.2 inches/sec PPV for buildings that are found to be structurally sound but where structural damage is a major concern, and a conservative limit of 0.08 inches/sec PPV for historic buildings or buildings that are documented to be structurally weakened. The nearest residences are approximately 360 feet from the project site. Therefore, the project would not create vibrations that would be damaging to existing buildings, and this impact would be less than significant.

(c) For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?

The project is not located in the vicinity of an airport or airstrip; therefore, no impact would occur.

2.14 POPULATION AND HOUSING

Environmental Issues	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the project:				
(a) Induce substantial unplanned population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?	☐	☐	☐	☒
(b) Displace substantial numbers of existing people or housing, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒

(a) Would the project induce substantial unplanned population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?

The project would repair a slip-out on an existing road and would not induce substantial unplanned population growth; therefore, no impact would occur.

(b) Would the project displace substantial numbers of existing people or housing, necessitating the construction of replacement housing elsewhere?

The project would repair a slip-out on an existing road and would not displace existing people or housing; therefore, no impact would occur.

2.15 PUBLIC SERVICES

Environmental Issues	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
(a) Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental 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:				
Fire protection?	☐	☐	☐	☒
Police protection?	☐	☐	☐	☒
Schools?	☐	☐	☐	☒
Parks?	☐	☐	☐	☒
Other public facilities?	☐	☐	☐	☒

(a) Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental 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:

Fire protection?

The project would repair a slip-out on an existing road and would not increase the population in the area, introduce a hazard, or increase the need for fire protection services; therefore, no impacts to fire protection services would occur.

Police protection?

The project would repair a slip-out on an existing road and would not increase the population in the area, introduce a hazard, or increase the demand for public services, including police protection; therefore, no impacts to police protection would occur.

Schools?

The project would repair a slip-out on an existing road and would not increase the population in the area or increase the demand for public services, including schools; therefore, no impacts to schools would occur.

Parks?

The project would repair a slip-out on an existing road and would not increase the population in the area or increase the demand for public services, including parks; therefore, no impacts to parks would occur.

Other public facilities?

The project would repair a slip-out on an existing road and would not increase the population in the area or increase the demand for other public facilities; therefore, no impacts to other public facilities would occur.

2.16 RECREATION

Environmental Issues	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
(a) Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?	☐	☐	☐	☒
(b) Would the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?	☐	☐	☐	☒

(a) Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?

The project would repair a slip-out on an existing road and would not increase the population in the area or cause an increased demand for recreational facilities; therefore, no impact would occur.

(b) Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?

The project would repair a slip-out on an existing road and would not include recreational facilities or require the expansion of recreational facilities; therefore, no impact would occur.

2.17 TRANSPORTATION AND TRAFFIC

Environmental Issues	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the project:				
(a) Conflict with a program plan, ordinance or policy addressing the circulation system, including transit, roadway, bicycle and pedestrian facilities and parking?	☐	☐	☒	☐
(b) Would the project conflict or be inconsistent with CEQA Guidelines section 15064.3, subdivision (b)?	☐	☐	☐	☒
(c) Substantially increase hazards due to a geometric design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?	☐	☐	☐	☒
(d) Result in inadequate emergency access?	☐	☐	☒	☐

The project would be required to follow the County RMP BMPs.[63] The text in this section includes the County RMP BMPs listed by number in the discussion, and the County RMP BMPs that are applicable to the project are summarized below and listed fully in Appendix B of this document.

(a) Would the project conflict with a program plan, ordinance or policy addressing the circulation system, including transit, roadway, bicycle and pedestrian facilities?

Access to the project site would be provided via SR 1 and Higgins Canyon Road. The project site is on Higgins Canyon Road, which is a narrow (19–21 feet) two-lane road.

Project construction would result in vehicle worker trips, haul trips, and vendor trips. The vegetation removal, cut and fill, and importation of rock, gravel, asphalt, etc. could generate approximately 398 one-way haul trips over the 70-day construction period. The increase in traffic as a result of worker and haul trips would increase traffic at nearby traffic intersections and roadway segments; however, the increase would be short term and temporary, lasting approximately 70 days. The project would include implementation of the County RMP BMPs GEN-17 (Maintain Traffic Flow) and GEN-18 (Traffic Control and Public Safety) (see Appendix B). Construction would not conflict with an applicable plan, ordinance, or policy establishing measures of effectiveness. In addition, hauling and vendor trips would primarily occur during off-peak hours (9:00 a.m.–3:00 p.m.). Therefore, construction impacts would be less than significant.

(b) Would the project conflict or be inconsistent with CEQA Guidelines section 15064.3, subdivision (b)?

State CEQA Guidelines Section 15064.3 includes criteria for analyzing transportation impacts, including changes in vehicle miles traveled (VMT). The project would repair a slip-out on an existing road, which would have no operational impact on VMT. Therefore, the project would not conflict with State CEQA Guidelines Section 15064.3, and no impact would occur.

[63] Montrose Environmental. 2023. *County of San Mateo Routine Maintenance Program Manual.* Prepared for County of San Mateo. Revised May. Available at: https://www.smcgov.org/media/65021/download?inline=. Accessed May 21, 2024.

(c) Would the project substantially increase hazards due to a geometric design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?

The project would repair a slip-out on an existing road, repave and rebuild the road, and add a guardrail to that section of Higgins Canyon Road, which would increase the safety of that portion of the road. Therefore, the project does not include any design features that would increase hazards, and no impact would occur.

(d) Would the project result in inadequate emergency access?

The project would include a temporary staging area, which will be determined by the contractor, and access to the project site would be from SR 1 and Higgins Canyon Road. The project would require one-way traffic control on Higgins Canyon Road during construction hours, as well as road closures during road grading and paving operations. The contractor would be required to follow County RMP BMPs GEN-17 (Maintain Traffic Flow) and GEN-18 (Traffic Control and Public Safety) (see Appendix B), which include notification of local emergency service providers regarding any planned lane and road closures. In addition, the contractor would be required to keep driveways and private property free of construction materials and equipment. In addition, alternative access to the project area is available from Purisima Creek Road. Therefore, emergency access would not be compromised, and this impact would be less than significant.

2.18 TRIBAL CULTURAL RESOURCES

Environmental Issues	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
(a) Would the project cause a substantial adverse change in the significance of a tribal cultural resource, defined in Public Resources Code section 21074 as either a site, feature, place, cultural landscape that is geographically defined in terms of the size and scope of the landscape, sacred place, or object with cultural value to a California Native American tribe, and that is:				
(i) Listed or eligible for listing in the California Register of Historical Resources, or in a local register of historical resources as defined in Public Resources Code section 5020.1(k), or	☐	☐	☒	☐
(ii) A resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in subdivision (c) of Public Resources Code Section 5024.1. In applying the criteria set forth in subdivision (c) of Public Resource Code Section 5024.1, the lead agency shall consider the significance of the resource to a California Native American tribe.	☐	☐	☒	☐

(a) Would the project cause a substantial adverse change in the significance of a tribal cultural resource, defined in Public Resources Code section 21074 as either a site, feature, place, cultural landscape that is geographically defined in terms of the size and scope of the landscape, sacred place, or object with cultural value to a California Native American tribe, and that is:

(i) Listed or eligible for listing in the California Register of Historical Resources, or in a local register of historical resources as defined in Public Resources Code section 5020.1(k)?

Under Assembly Bill (AB) 52, Native American correspondence and tribal consultation was performed by the County. The County sent out letters to six tribes—Muwekma Ohlone Indian Tribe, Costanoan Rumsen Carmel Tribe, Tamien Nation, Ohlone Indian Tribe, Indian Canyon Mutsun Band of Costanoan, and Amah Mutsun Tribal Band of Mission San Juan Bautista—on May 17, 2024. Letters to two tribes, Tamien Nation and Costanoan Rumsen Carmel Tribe, were returned due to insufficient address. On June 21, 2024, these two tribes were sent letters via email. During the scoping process, Ann Marie Sayers of the Indian Canyon Mutsun Band of Costanoan requested tribal monitoring of the project. In a follow-up meeting with the tribe's chairperson, Kanyon Sayers-Roods, County staff summarized the cultural review process conducted to date and planned BMPs, and it was concluded that a tribal monitor would not be necessary. The County agreed to notify the tribe in the event of a discovery of any potential pre-contact artifacts or tribal cultural resources. With implementation of County RMP BMPs CUL-5 (Conduct Pre-Maintenance Educational Training) and CUL-6 (Address Discovery of Cultural Remains or Historic or Paleontological Artifacts Appropriately), the potential impacts to tribal cultural resources would be considered less than significant (see Appendix B). County RMP BMP CUL-5 includes an educational training session for all employees conducted by a qualified cultural resources specialist. This training would include instructions on identifying historic, pre-contact resources, and the appropriate protocols to follow if resources are encountered during work activities. County RMP BMP CUL-6 includes a stop work order, and details of protocol for a consulting archaeologist that would ensure impacts related to an unanticipated archaeological find would be less than significant. Therefore, the project will have no impact to known tribal cultural resources.

(ii) A resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in subdivision (c) of Public Resources Code Section 5024.1. In applying the criteria set forth in subdivision (c) of Public Resource Code Section 5024.1, the lead agency shall consider the significance of the resource to a California Native American tribe?

As discussed above, the Indian Canyon Mutsun Band of Costanoan has requested notification if potential tribal cultural resources are uncovered during the project, and the County agreed to notification in the event a previously undiscovered pre-contact resource is encountered. Therefore, the project would not cause substantial adverse change in the significance of a tribal cultural resource, and this impact would be less than significant.

2.19 UTILITIES AND SERVICE SYSTEMS

Environmental Issues	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the project:				
(a) Require or result in the relocation or construction of new or expanded water, wastewater treatment or storm water drainage, electric power, natural gas, or telecommunications facilities, the construction or relocation of which could cause significant environmental effects?	☐	☐	☐	☒
(b) Have sufficient water supplies available to serve the project and reasonably foreseeable future development during normal, dry and multiple dry years?	☐	☐	☐	☒
(c) Result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?	☐	☐	☐	☒
(d) Generate solid waste in excess of State or local standards, or in excess of the capacity of local infrastructure, or otherwise impair the attainment of solid waste reduction goals?	☐	☐	☒	☐
(e) Comply with federal, state, and local management and reduction statutes and regulations related to solid waste?	☐	☐	☐	☒

The project would be required to follow the County RMP BMPs.[64] The text in this section includes the County RMP BMPs listed by number in the discussion, and the County RMP BMPs that are applicable to the project are summarized below and listed fully in Appendix B of this document.

(a) Would the project require or result in the relocation or construction of new or expanded water, wastewater treatment or storm water drainage, electric power, natural gas, or telecommunications facilities, the construction or relocation of which could cause significant environmental effects?

The project would repair an existing slip-out into Mills Creek. Prior to the start of construction, the contractor would implement County RMP BMP GEN-24 (Investigation of Utility Lines), which includes excavation, exposure, and protection of any utility crossings or connections that could be affected by the work. The project would not result in a need for any new or expanded utilities; therefore, no impact would occur.

[64] Montrose Environmental. 2023. *County of San Mateo Routine Maintenance Program Manual.* Prepared for County of San Mateo. Revised May. Available at: https://www.smcgov.org/media/65021/download?inline=. Accessed May 21, 2024.

(b) Would the project have sufficient water supplies available to serve the project and reasonably foreseeable future development during normal, dry and multiple dry years?

The project would require a minimal amount of water during construction, primarily for dust control. Water would be delivered to the project site by water truck. The project would not require any operational water supply; therefore, no impact would occur.

(c) Would the project 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?

The project would repair an existing slip-out into Mills Creek. The project would not generate wastewater or require wastewater treatment; therefore, no impact would occur.

(d) Would the project generate solid waste in excess of State or local standards, or in excess of the capacity of local infrastructure, or otherwise impair the attainment of solid waste reduction goals?

Construction of the project would require clearing and grubbing, soils excavation, and removal of the existing asphalt, slumped soil, and debris, resulting in up to approximately 3,385 CY of soil and debris to be hauled off-site for disposal over the 70-day construction period. The project contractor would implement County RMP BMP GEN-4 (Salvage/Reuse of Plant and Woody Material) and GEN-25 (Retention of Tree Stumps/Rootwads) and be required to prepare and submit a Construction and Demolition Waste Management Plan to the County for review and approval (see Appendix B). Under the Construction and Demolition Waste Management Plan, the project contactor would be required to identify types and amounts of materials that could feasibly be reused, salvaged, or recycled and note the procedures intended to be used. The Construction and Demolition Waste Management Plan must be approved by the County prior to project construction.[65] Therefore, impacts related to construction would be less than significant.

The landfill has a remaining capacity of approximately 45 million CY and is expected to operate until 2034.[66] The landfill would accept clean fill for daily cover and would have adequate capacity to serve the construction phase of the project because the construction phase of the project would be temporary and would generate a limited amount of solid waste. Development of the required Construction and Demolition Waste Management Plan would further reduce this less-than-significant impact.

(e) Would the project comply with federal, state, and local management and reduction statutes and regulations related to solid waste?

The County would be required to comply with all federal, state, and local ordinances for water, energy, and waste reduction and management, including, but not limited to, the County's requirement for a Construction and Demolition Waste Management Plan for construction debris.[67] Therefore, the project

[65] County of San Mateo. 2024. Construction & Demolition. County of San Mateo Sustainability Department. Available at: https://www.smcsustainability.org/waste-reduction/construction-demolition/. Accessed May 23, 2024.

[66] California Department of Resources Recycling and Recovery (CalRecycle). 2024. SWIS Facility Detail, Corinda Los Trancos (Ox Mtn) (41-AA-0002). Available at: https://www2.calrecycle.ca.gov/SolidWaste/SiteActivity/Details/1561?siteID=3223. Accessed May 23, 2024.

[67] Flows to Bay. 2024. Construction Best Practices. Available at: https://www.flowstobay.org/preventing-stormwater-pollution/with-new-redevelopment/construction-best-practices/. Accessed May 28, 2024.

would comply with all federal, state, and local management and reduction statutes and regulations, and no impact would occur.

2.20 WILDFIRE

Environmental Issues	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
If located in or near state responsibility areas or lands classified as very high fire hazard severity zones, would the project:				
(a) Substantially impair an adopted emergency response plan or emergency evacuation plan?	☐	☐	☒	☐
(b) Due to slope, prevailing winds, and other factors, exacerbate wildfire risks, and thereby expose project occupants to, pollutant concentrations from a wildfire or the uncontrolled spread of a wildfire?	☐	☐	☐	☒
(c) Require the installation or maintenance of associated infrastructure (such as roads, fuel breaks, emergency water sources, power lines or other utilities) that may exacerbate fire risk or that may result in temporary or ongoing impacts to the environment?	☐	☐	☐	☒
(d) Expose people or structures to significant risks, including downslope or downstream flooding or landslides, as a result of runoff, post-fire slope instability, or drainage changes?	☐	☐	☐	☒

The project would be required to follow the County RMP BMPs.[68] The text in this section includes the County RMP BMPs listed by number in the discussion, and the County RMP BMPs that are applicable to the project are summarized below and listed fully in Appendix B of this document.

(a) If located in or near state responsibility areas or lands classified as very high fire hazard severity zones, would the project substantially impair an adopted emergency response plan or emergency evacuation plan?

The project would repair and stabilize the southwest bank of Mills Creek and a portion of Higgins Canyon Road. The project site is located in a State Responsibility Area in a High Fire Hazard Severity Zone.[69] The project would require one-way traffic control and would have short-term, temporary impacts to traffic flow during construction. The contractor would be required to follow County RMP BMPs GEN-17 (Maintain Traffic Flow) and GEN-18 (Traffic Control and Public Safety), which include notification of local emergency service providers regarding any planned lane closures (see Appendix B). In addition, alternative access would be available via Purisima Creek Road. However, the project would restore the original width of Higgins Canyon Road at the project site and would strengthen the southwest bank of Mills Creek to make future slip-outs less likely. The project would have a long-term benefit related to any potential future emergency evacuations. Therefore, the project would have a less-than-significant impact in the short term and no impact would occur in the long term.

[68] Montrose Environmental. 2023. *County of San Mateo Routine Maintenance Program Manual.* Prepared for County of San Mateo. Revised May. Available at: https://www.smcgov.org/media/65021/download?inline=. Accessed May 21, 2024.

[69] MTC/ABAG. 2024. MTC/ABAG Hazard Viewer Map. Available at: https://mtc.maps.arcgis.com/apps/webappviewer/index.html?id=4a6f3f1259df42eab29b35dfcd086fc8. Accessed May 16, 2024.

(b) If located in or near state responsibility areas or lands classified as very high fire hazard severity zones, would the project, due to slope, prevailing winds, and other factors, exacerbate wildfire risks, and thereby expose project occupants to, pollutant concentrations from a wildfire or the uncontrolled spread of a wildfire?

The project site is located in a State Responsibility Area in a High Fire Hazard Severity Zone. The project would repair and stabilize the southwest bank of Mills Creek and a portion of Higgins Canyon Road, which would improve emergency access; therefore, no impact would occur.

(c) If located in or near state responsibility areas or lands classified as very high fire hazard severity zones, would the project require the installation or maintenance of associated infrastructure (such as roads, fuel breaks, emergency water sources, power lines or other utilities) that may exacerbate fire risk or that may result in temporary or ongoing impacts to the environment?

The project site is located in a State Responsibility Area in a High Fire Hazard Severity Zone. The project would repair and stabilize the southwest bank of Mills Creek and a portion of Higgins Canyon Road; therefore, no impact would occur.

(d) If located in or near state responsibility areas or lands classified as very high fire hazard severity zones, would the project expose people or structures to significant risks, including downslope or downstream flooding or landslides, as a result of runoff, post-fire slope instability, or drainage changes?

The project site is located in a State Responsibility Area in a High Fire Hazard Severity Zone. The project would repair and stabilize the southwest bank of Mills Creek and a portion of Higgins Canyon Road and improve slope stability in Mills Creek. By stabilizing the bank and restoring stream channel capacity, the project would reduce risks associated with downstream flooding and landslides, and no impact would occur.

2.21 MANDATORY FINDINGS OF SIGNIFICANCE

	Environmental Issues	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
(a)	Does the project have the potential to substantially degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, substantially reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?	☐	☐	☒	☐
(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)?	☐	☐	☒	☐
(c)	Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?	☐	☐	☒	☐

The project would be required to follow the County RMP BMPs.[70] The text in this section includes the County RMP BMPs listed by number in the discussion, and the County RMP BMPs that are applicable to the project are summarized below and listed fully in Appendix B of this document.

(a) Does the project have the potential to degrade the quality of the environment, substantially 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?

The project site is located on Higgins Canyon Road and Mills Creek, south of the city of Half Moon Bay. The habitat surrounding the work area consists of paved roadways, residences, agriculture, and undeveloped land. Mills Creek is a perennial stream channel and includes waters and riparian vegetation in the project area. There are five potential special-status species—CRLF, SFGS, Central California Coast DPS steelhead, CGS, and San Francisco dusky-footed woodrat—in the project footprint. The project would be required to follow the County RMP BMPs as appropriate, including GEN-1 through GEN-28 (General Avoidance and Minimization Measures); BIO-1 (Environmental Awareness Training), BIO-2 (Minimize Injury or Mortality of Fish and Amphibian Species during Dewatering), BIO-3 (California Red-legged Frog Protection Measures), BIO-5 (San Francisco Garter Snake Protection Measures), BIO-6 (Measures to Protect the Foothill Yellow-legged Frog, California Giant Salamander, Santa Cruz Black Salamander, and Western Pond Turtle), BIO-7 (Check for Wildlife in Pipes/Construction Materials),

[70] Montrose Environmental. 2023. *County of San Mateo Routine Maintenance Program Manual.* Prepared for County of San Mateo. Revised May. Available at: https://www.smcgov.org/media/65021/download?inline=. Accessed May 21, 2024.

BIO-8 (Minimize Impacts to Dusky-footed Woodrat Nests), BIO-9 (Measures to Protect Nesting Migratory Birds), BIO-14 (Measures to Protect Bat Colonies), BIO-18 (Invasive Plant Control), BIO-19 (Restore Channel Features), BIO-21 (General Wildlife Protection Measures), and BIO-24 (Pathogen Control); EC-1, EC-3, EC-5, EC-6, EC-7, EC-8, EC-9, EC-10, and EC-13 (Erosion Control Measures); SC-1, SC-2, SC-3, SC-4, SC-7, and SC-8 (Sediment/Water Quality Control Measures); and DW-1 (Channel Dewatering) (see Appendix B).[71] Compliance with the County RMP BMPs would be adequate to protect special-status species, nesting birds, and sensitive habitat; therefore, the project would have a less-than-significant impact on biological resources. There are no known cultural, historic, or paleontological resources in the project area, and County RMP BMPs CUL-5 (Conduct Pre-Maintenance Educational Training) and CUL-6 (Address Discovery of Cultural Remains or Historic or Paleontological Artifacts Appropriately) would protect previously undiscovered cultural, historical, and paleontological resources; therefore, the project would have no impact on cultural, historic, or paleontological resources. The project would have a less-than-significant impact on archaeological resources and human remains with implementation of BMP CUL-6. As described in this document, the project would not degrade the quality of the environment, reduce or threaten any fish or wildlife species (endangered or otherwise), or eliminate important examples of the major periods of California history or pre-history. Therefore, impacts from the project would be less than significant.

(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?

The project would have less-than-significant construction impacts to aesthetics, air quality, biological resources, cultural resources, energy, geology and soils, GHG emissions, hazards and hazardous materials, hydrology and water quality, land use and planning, noise, recreation, transportation and traffic, tribal cultural resources, and utilities and service systems. Cumulative impacts are assessed as follows:

- **Aesthetics.** As described in Section 2.1, *Aesthetics*, temporary construction impacts to scenic resources and the visual character of a public view would be limited to the view from Higgins Canyon Road. Construction impacts would be short term and temporary, lasting approximately 70 days, and would be limited to the imposition of construction vehicles and equipment on the area. Because of the small size and limited duration of project construction, and planting of replacement riparian vegetation, the improvements to the road and creek would not add to cumulatively considerable visual impacts.
- **Air Quality and Greenhouse Gas Emissions.** As described in Section 2.3, *Air Quality*, and Section 2.8, *Greenhouse Gas Emissions and Climate Change*, according to the BAAQMD 2022 CEQA Guidelines,[72] if a project's emissions levels exceed the identified significance thresholds for air quality and GHGs, the emissions would be cumulatively considerable. Construction emissions for the project would not exceed BAAQMD thresholds of significance. Operationally, the project would not result in an increase in intensity of use. Therefore, construction and operational impacts would not be cumulatively considerable.
- **Biological Resources.** As described in Section 2.4, *Biological Resources*, the project could have temporary impacts to special-status species, riparian habitat, waters, and nesting birds. However, the project would comply with all applicable County RMP BMPs, which would reduce all

[71] Montrose Environmental. 2023. *County of San Mateo Routine Maintenance Program Manual.* Prepared for County of San Mateo. Revised May. Available at: https://www.smcgov.org/media/65021/download?inline=. Accessed May 21, 2024.

[72] BAAQMD. 2022. *California Environmental Quality Act Air Quality Guidelines.* Available at: https://www.baaqmd.gov/plans-and-climate/california-environmental-quality-act-ceqa/updated-ceqa-guidelines. Accessed May 14, 2024.

potential impacts to a less-than-significant level. Therefore, construction and operational impacts to biological resources would not contribute to cumulatively considerable impacts.

- **Cultural and Tribal Cultural Resources.** As described in Section 2.5, *Cultural Resources*, and 2.18, *Tribal Cultural Resources*, there are no known significant tribal or cultural resources located in the project area. The proposed project would adhere to County RMP BMPs CUL-1 through CUL-6 as required by the County. Therefore, the project would not cause impacts that could be cumulatively considerable.
- **Energy.** As described in Section 2.6, *Energy*, there are no established thresholds of significance for construction-related energy use. Cumulative impacts to energy resources would occur if the proposed project would add to a substantial aggregation of impacts related to wasteful, inefficient, or unnecessary energy consumption or conflict with a state or local plan for renewable energy or efficiency. Projects in the County are required to comply with the BAAQMD and County RMP BMPs to reduce construction-related GHG emissions, which also reduces energy use. In addition, all projects in San Mateo County are required to comply with the County Waste Management Plan by recycling at least 65% of all construction waste or demolition material. Therefore, the project would not contribute to a cumulatively considerable impact on energy use.
- **Geology and Soils.** As described in Section 2.7, *Geology and Soils*, there is no indication of any paleontological resources located in the project area. The proposed project would adhere to County RMP BMP CUL-6 (Address Discovery of Cultural Remains or Historic or Paleontological Artifacts Appropriately), which would require the cessation of construction activities following the discovery of any previously unidentified paleontological resource. The potential impacts remaining after cessation of proposed project activities would be negligible and would not contribute to an incremental impact. Therefore, the project would not cause impacts that could be cumulatively considerable.
- **Hydrology and Water Quality.** As described in Section 2.10, *Hydrology and Water Quality*, project construction could cause runoff to Mills Creek that could violate water quality standards and result in erosion or siltation. The project would require a CWA Section 401 permit from the RWQCB and CWA Section 404 permit from the USACE and would be required to follow all conditions specified in the permits. In addition, during construction, the project would include BMPs in compliance with the Basin Plan and San Francisco Bay NPDES Permit,[73,74] and outlined in the SMCWPPP, County RMP BMPs, and CASQA *2023 Construction BMP Handbook*.[75] Therefore, project construction would not contribute to cumulative water quality impacts in Mills Creek or Arroyo Leon.
- **Land Use and Planning.** As described in Section 2.11, *Land Use and Planning*, the project would repair a slip-out on the existing Higgins Canyon Road. The project would not add new traffic to Higgins Canyon Road. Therefore, the project would not have impacts that are cumulatively considerable.

[73] San Francisco RWQCB. *San Francisco Bay Basin (Region 2) Water Quality Control Plan.* California Regional Water Quality Control Board, San Francisco Bay Region. May 4. Available at: https://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/planningtmdls/basinplan/web/docs/BP_all_chapters.pdf. Accessed May 17, 2024.

[74] RWQCB. 2022. *California Regional Water Quality Control Board San Francisco Bay Region Municipal Regional Stormwater NPDES Permit.* Order No. R2-2022-0018. NPDES Permit No. CAS612008. May 11. Available at: https://www.waterboards.ca.gov/sanfranciscobay/board_decisions/adopted_orders/2022/R2-2022-0018.pdf. Accessed May 17, 2024.

[75] CASQA. 2023. *2023 Construction BMP Handbook.* Available at: https://www.casqa.org/resources/bmp-handbooks. Accessed May 16, 2024.

- **Noise.** As described in Section 2.13, *Noise*, temporary noise impacts from project construction would be limited to the area of Higgins Canyon Road, and construction hours would meet County requirements. Construction impacts would be short term and temporary, lasting approximately 70 days. Because of the temporary nature and short duration of project construction, project construction would not contribute to cumulatively considerable impacts.
- **Transportation and Traffic.** As described in Section 2.17, *Transportation and Traffic*, construction trips would increase traffic at nearby traffic intersections and roadway segments; however, the increase would be short term and temporary, lasting approximately 70 days. The project would include implementation of the County RMP BMPs GEN-17 (Maintain Traffic Flow) and GEN-18 (Traffic Control and Public Safety). Because of the temporary nature and short duration of project construction, project construction would not contribute to cumulatively considerable impacts. Project operation would improve and restore access for users of Higgins Canyon Road.
- **Utilities and Service Systems.** As described in Section 2.19, *Utilities and Service Systems*, project construction would produce approximately 3,385 CY of debris to be hauled off-site for disposal. The project contractor would be required to identify types and amounts of materials that could feasibly be reused, salvaged, or recycled, and to note the procedures intended to be used. The Construction and Demolition Waste Management Plan must be approved by the County prior to project construction. Solid waste goes to the Corinda Los Trancos Ox Mountain Sanitary Landfill for recycling, composting, and disposal, which is permitted to receive 3,598 tons of waste per day.[76] The total amount of construction waste from the project would be small, less than 0.75% of the 608,086 tons received at the Ox Mountain Landfill in 2019. In addition, the project would comply with the County Waste Management Plan by recycling at least 65% of all construction waste or demolition material. Therefore, solid waste from project construction would not contribute to a cumulatively considerable impact.

  The landfill has a remaining capacity of approximately 45 million CY and is expected to operate until 2034.[77] The landfill would accept clean fill for daily cover and would have adequate capacity to serve the construction phase of the project because the construction phase of the project would be temporary and would generate a limited amount of solid waste. Development of the required Construction and Demolition Waste Management Plan would further reduce this less-than-significant impact.

Given the small size of the project, its limited duration, and implementation of the County RMP BMPs to reduce all potential impacts, the incremental construction effects of repairing the slip-out would not contribute to a cumulatively considerable impact.

Because the project is limited to road repair, wall and biostabilization-based bank repair, and engineered creek channel, the project would have few permanent impacts, including stormwater runoff from approximately 383 square feet of new impervious pavement from the installation of the retaining wall and 4,556 square feet of replaced impervious surface from restoring the original road footprint. The new paved road would have essentially the same footprint as the original. The project would improve the stability of the Mills Creek streambed and embankment and reduce future erosion and sedimentation of the stream, which would decrease the chance of impacts to sensitive species. Therefore, the project would not contribute to a cumulatively considerable impact.

[76] CalRecycle. 2024. SWIS Facility Detail, Corinda Los Trancos (Ox Mtn) (41-AA-0002). Available at: https://www2.calrecycle.ca.gov/SolidWaste/SiteActivity/Details/1561?siteID=3223. Accessed May 23, 2024.

[77] CalRecycle. 2024. SWIS Facility Detail, Corinda Los Trancos (Ox Mtn) (41-AA-0002). Available at: https://www2.calrecycle.ca.gov/SolidWaste/SiteActivity/Details/1561?siteID=3223. Accessed May 23, 2024.

(c) Does the project have environmental effects, which will cause substantial adverse effects on human beings, either directly or indirectly?

A significant impact may occur if a project has the potential to result in substantial adverse effects on human beings, as discussed in the previous sections. Repairing the slip-out and restoring the original road contours would improve access for the local residents who live east of the slip-out. As described throughout this environmental impact analysis, with implementation of County RMP BMPs (where applicable), the project would not result in any significant impacts. Therefore, the project would not have the potential to result in substantial adverse effects on human beings, and impacts would be less than significant.

CHAPTER 3. LIST OF PREPARERS

Lauren Huff, M.S., Northern California Ecological Restoration Director

Leticia Morris, B.S., Project Manager

Seth Dallmann, B.S., Natural Resources Director

Juliet Bolding, B.A., Associate Project Environmental Planner

Erich Schickenberg, B.S., Associate Project Botanist/Wetland Specialist

Alec Villanueva, B.S., Staff Biologist

Cleopatra Tuday, B.S., Associate Project Biologist

Christina Alonso, M.A., Senior Cultural Resources Team Lead

Julie Barlow, B.S., AICP, Principal Planning Team Lead

Erin Butts, B.S., Assistant Project Geospatial Scientist

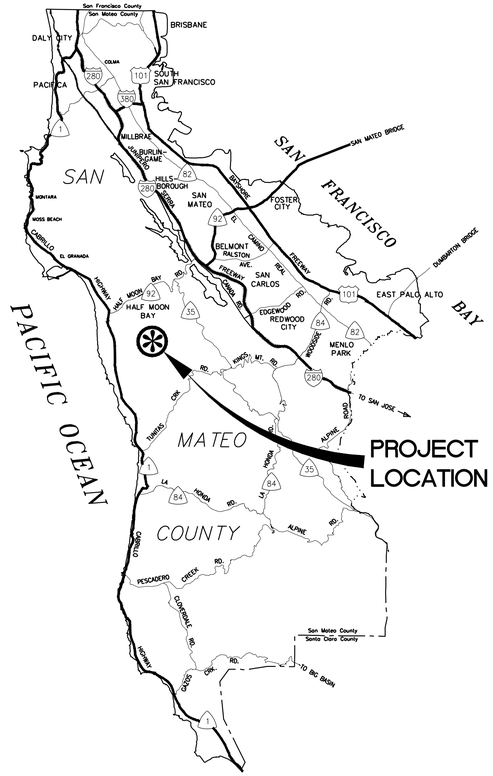
Jaimie Jones, Project Technical Editor

APPENDIX A

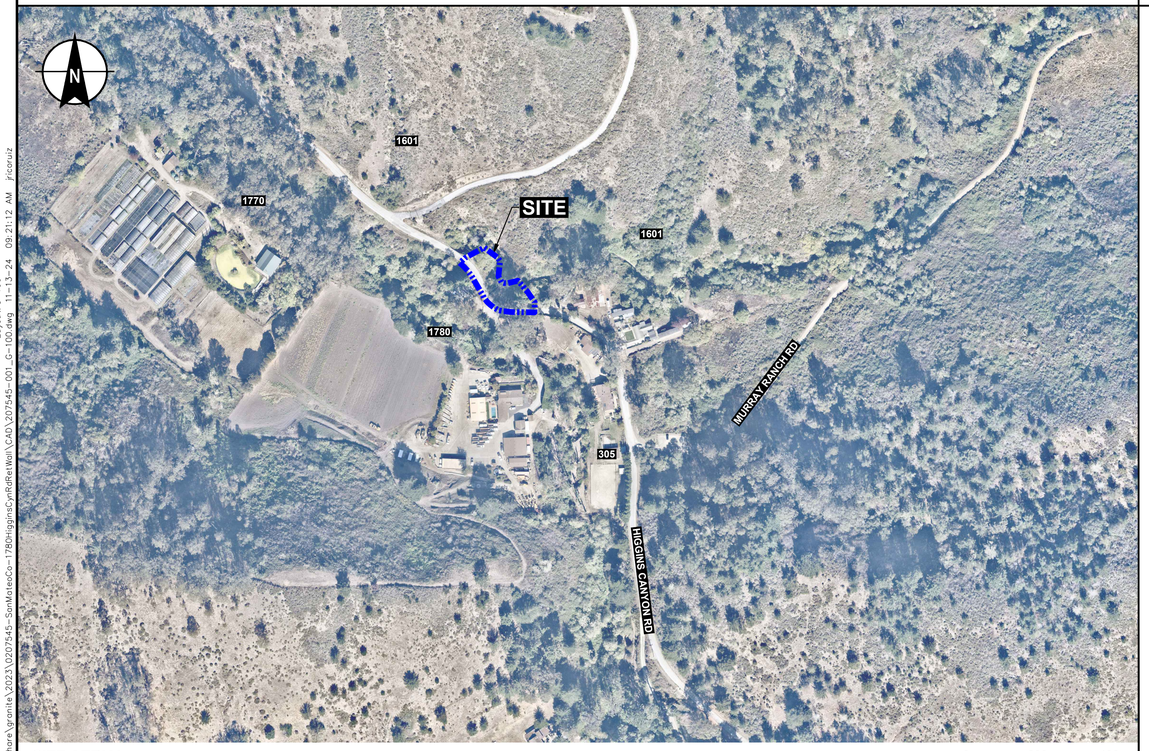
Project Design Plans (May 2024)
and
Revised Project Design (October 2024)

APPENDIX A1

Project Design Plans (May 2024)



VICINITY MAP
NOT TO SCALE



SITE AERIAL
MAP SOURCE: NEARMAP, MARCH 25, 2023

0 200 400
SCALE IN FEET

REGISTERED PROFESSIONAL ENGINEER
ANN MADER STILLMAN
C 47882
EXPIRES 12/31/25
CIVIL
STATE OF CALIFORNIA

APPROVED:

DATE: _____

ANN MADER STILLMAN,
DIRECTOR OF PUBLIC WORKS
R. C. E. # 47882 / EXPIRES 12-31-2025

COUNTY OF SAN MATEO, CALIFORNIA

SLIP-OUT REPAIR AND BANK STABILIZATION
1780 HIGGINS CANYON ROAD
[COUNTY PROJECT NO. 08H17]
[PROJECT FILE NO. E5082]

TO BE SUPPLEMENTED BY STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION STANDARD PLANS DATED MAY 2018 AND ADOPTED BY SAN MATEO COUNTY, FEBRUARY 11, 2020, BY RESOLUTION NO. 077227

SHEET LIST TABLE

SHEET NO.	SHEET TITLE	SHEET DESCRIPTION
01	G-100	TITLE SHEET
02	G-101	ABBREVIATIONS, LEGENDS, AND GENERAL NOTES
03	G-102	TRAFFIC CONTROL PLAN AND HAUL ROUTE
04	G-103	LAYOUT AND CONTROL PLAN
05	G-104	POLLUTION PREVENTION PLAN
06	G-105	EROSION AND SEDIMENT CONTROL PLAN
07	G-106	DEWATERING AND CREEK DIVERSION PLAN
08	G-107	CONSTRUCTION AREA ACCESS PLAN
09	C-100	EXISTING CONDITIONS AND PROPERTY PLAN
10	C-101	DEMOLITION, CLEARING, AND GRUBBING PLAN
11	C-102	EXCAVATION PLAN
12	C-103	FINAL GRADING PLAN
13	C-104	SITE PLAN
14	C-105	PLANTING PLAN
15	C-200	RETAINING WALL PLAN AND PROFILE
16	C-201	CHANNEL PLAN, PROFILE, AND TYPICAL SECTION
17	C-202	ROAD AND CHANNEL CROSS-SECTIONS
18	C-203	TYPICAL CROSS-SECTIONS
19	C-400	EROSION AND SEDIMENT CONTROL DETAILS
20	C-401	RETAINING WALL AND REVETMENT DETAILS I
21	C-402	RETAINING WALL AND REVETMENT DETAILS II
22	C-403	RETAINING WALL AND REVETMENT DETAILS III
23	C-404	RETAINING WALL AND REVETMENT DETAILS IV
24	C-405	CALTRANS STANDARD DETAILS I
25	C-406	CALTRANS STANDARD DETAILS II
26	C-407	CALTRANS STANDARD DETAILS III

NOT FOR CONSTRUCTION

75% DESIGN

HALEY ALDRICH

HALEY & ALDRICH, INC.
785 Ygnacio Valley Road
Walnut Creek, CA 94595
Tel: 925.935.9771
www.haleyaldrich.com

PROJECT NO.: 0207545-007

COUNTY OF SAN MATEO PUBLIC WORKS

REVISION	DATE

DESIGNED BY: H&A (ZG)
DRAWN BY: H&A (KV)
CHECKED BY: H&A (SA)

SLIP-OUT REPAIR AND BANK STABILIZATION
1780 HIGGINS CANYON ROAD
TITLE SHEET

SCALE: AS SHOWN
DATE: **MAY-2024**
FILE NO.: E5082

ANN MADER STILLMAN,
DIRECTOR OF PUBLIC WORKS
COUNTY SAN MATEO

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

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

G-100
SHEET 01 OF 26

\\haleyaldrich\share\granite\2023\0207545-SanMateoCo-1780HigginsCynRdRetWall\CAD\207545-001_G-100.dwg 11-13-24 09:21:12 AM jricoruiz
Layout: G-100

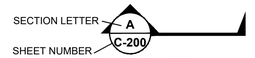
ABBREVIATIONS

AB	AGGREGATE BASE
AC	ASPHALT CONCRETE
ACP	ASBESTOS CEMENT PIPE
APPROX	APPROXIMATE
AS	AGGREGATE SUBBASE
BC	BEGINNING OF HORIZONTAL CURVE
BEG	BEGIN
BKF	BACKFILL
℄	BOUNDARY LINE
BOW, BW	BOTTOM OF WALL
BVC	BEGINNING OF VERTICAL CURVE
BW	BARBED WIRE
B/W	BACK OF SIDEWALK
C-C	CENTER TO CENTER
CF	CUBIC FEET
C&G	CURB AND GUTTER
CIDH	CAST-IN-DRILLED-HOLE
CIP	CAST-IN-PLACE OR CAST IRON PIPE
CIPCP	CAST-IN-PLACE CONCRETE PIPE
℄	CENTERLINE
CL	CLASS OR CHAIN LINK
CLR	CLEAR OR CLEARANCE
CMP	CORRUGATED METAL PIPE
CY	CUBIC YARD
D	DEPTH
DET	DETAIL OR DETOUR
DI	DROP INLET, DRAINAGE INLET
DIA, Ø	DIAMETER
D/S	DOWNSTREAM
DWG	DRAWING
DWY	DRIVEWAY
E	EAST OR ELECTRIC
EA	EACH
EASE	EASEMENT
EBMUD	EAST BAY MUNICIPAL UTILITY DISTRICT
EC	END OF HORIZONTAL CURVE
ELEV	ELEVATION
EP	EDGE OF PAVEMENT
EQ, =	EQUALS
EQ	EQUATION OR EQUALS
ES	EDGE OF SHOULDER
ETW	EDGE OF TRAVELED WAY
EVC	END OF VERTICAL CURVE
EXC	EXCAVATE OR EXCAVATION
EXIST, EX	EXISTING
FC	FACE OF CURB
FG	FINISHED GRADE
FH	FIRE HYDRANT
FL, ℄	FLOW LINE
FO	FIBER OPTIC
FT, '	FEET OR FOOT
G	GAS LINE
GA	GAUGE
GAL	GALLON
GALV	GALVANIZED
GP	GRADING PLANE
GR	GUARD RAILING
H	HEIGHT
HORIZ	HORIZONTAL
HP	HINGE POINT
ID	INSIDE DIAMETER
IN, "	INCH OR INCHES
INV	INVERT (GRADE ELEVATION)
IRR	IRRIGATION
JP	JOINT POLE
L	LENGTH OR LENGTH OF CURVE
LC	LENGTH OF CHORD
LF	LINEAR FOOT OR FEET
LOC	LOCATION
LT	LEFT
MAX	MAXIMUM
MBGR	METAL BEAM GUARD RAILING
MH	MANHOLE
MIN	MINIMUM
MISC	MISCELLANEOUS
ℳ	MONUMENT LINE
MON	MONUMENT
N	NORTH
NTS	NOT TO SCALE
OC	ON CENTER OR OVERCROSSING
OD	OUTSIDE DIAMETER
OG	ORIGINAL GROUND
OH	OVERHEAD
PCC	POINT OF COMPOUND CURVE OR PORTLAND CEMENT CONCRETE
PED	PEDESTRIAN
PG&E	PACIFIC GAS & ELECTRIC CO.
PI	POINT OF INTERSECTION
P/L, ℄	PROPERTY LINE
POC	POINT OF HORIZONTAL CURVE
POT	POINT OF TANGENCY
POVC	POINT OF VERTICAL CURVE
PP	POWER POLE, PLASTIC PIPE OR PIPE PILE
PRC	POINT OF REVERSE CURVE
PRVC	POINT OF REVERSE VERTICAL CURVE
PT	ANGLE POINT
PVMT	PAVEMENT
R	RADIUS OR RADIAL
RCB	REINFORCED CONCRETE BOX
RCP	REINFORCED CONCRETE PIPE
REINF	REINFORCED
REV	REVISED OR REVISION
RR	RAILROAD
RSP	ROCK SLOPE PROTECTION
RT	RIGHT
RW	RETAINING WALL, REDWOOD
R/W	RIGHT-OF-WAY
S	SLOPE OR SOUTH
SD	STORM DRAIN
SHT	SHEET
SQFT	SQUARE FOOT OR SQUARE FEET
SS	SANITARY SEWER
STA	STATION
STD	STANDARD
SW	SIDEWALK
SWPPP	STORM WATER POLLUTION PREVENTION PLAN
SYM	SYMMETRIC OR SYMMETRICAL
T	TANGENT LENGTH OR TELEPHONE
TC	TOP OF CURB
TEL, T	TELEPHONE
TEMP	TEMPORARY
TG	TOP OF GRADE
TOW, TW	TOP OF WALL
TP	TELEPHONE POLE
TS	TRAFFIC SIGNAL, TRANSVERSE OR TUBULAR STEEL
TYP	TYPICAL
UON	UNLESS OTHERWISE NOTED
U/S	UPSTREAM
VAR	VARIES OR VARIABLE
VC	VERTICAL CURVE
VERT	VERTICAL
W	WATER, WEST OR WIDTH
∠	ANGLE
°	DEGREE
Δ	DELTA (ANGLE OF CURVATION)
Ø	DIAMETER
=	EQUALS
'	FEET, FOOT OR ANGULAR MINUTES
"	INCH OR ANGULAR SECONDS
ϕ	PHASE (SIGNAL OR ELECTRICAL)

GENERAL NOTES

1. ALL WORK IS TO BE DONE UNDER THE DIRECTION OF THE ENGINEER.
2. CALTRANS STANDARD SPECIFICATIONS AND STANDARD PLANS, 2018 EDITION, AND THEIR LATEST REVISIONS, SUBSEQUENT AMENDMENTS AND ERRATA, ARE PART OF THESE PLANS.
3. IN ACCORDANCE WITH GENERALLY ACCEPTED CONSTRUCTION PRACTICES, THE CONTRACTOR SHALL BE SOLELY AND COMPLETELY RESPONSIBLE FOR THE CONDITIONS OF THE JOB SITE INCLUDING SAFETY OF ALL PERSONS AND PROPERTY DURING PERFORMANCE OF THE WORK. THIS REQUIREMENT WILL APPLY CONTINUOUSLY AND NOT BE LIMITED TO NORMAL WORK HOURS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR DESIGN AND CONSTRUCTION OF PROPER SHORING OF TRENCHES IN ACCORDANCE WITH THE LATEST OCCUPATIONAL SAFETY LAWS. THE DUTIES OF THE ENGINEER DO NOT INCLUDE REVIEW OF THE ADEQUACY OF THE CONTRACTOR'S SAFETY IN, ON, OR NEAR THE CONSTRUCTION SITE.
4. CONTRACTOR SHALL BE HELD RESPONSIBLE FOR ANY AND ALL DAMAGE TO EXISTING STRUCTURES AND/OR UTILITIES DURING CONSTRUCTION. PROPER REPAIR SHALL BE DONE TO THE SATISFACTION OF THE ENGINEER AND THE RESPECTIVE UTILITY COMPANY.
5. ALL PIPELINES AND OTHER UNDERGROUND FACILITIES MAY NOT BE SHOWN. EXISTING UNDERGROUND FACILITIES AS SHOWN ARE APPROXIMATE ONLY AND WERE OBTAINED FROM AVAILABLE UTILITY RECORDS. HOWEVER, THE COUNTY ASSUMES NO RESPONSIBILITY FOR THEIR ACCURACY OR COMPLETENESS. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO CONTACT ALL UTILITIES AND TO DETERMINE THE EXACT LOCATIONS (BOTH HORIZONTALLY AND VERTICALLY) OF ALL PIPELINES AND OTHER UNDERGROUND FACILITIES (INCLUDING IRRIGATION) WITHIN THE ROADWAY AND PROJECT AREA IN THE FIELD PRIOR TO THE START OF ANY CONSTRUCTION. THE CONTRACTOR SHALL CONTACT UNDERGROUND SERVICE ALERT AT 811 OR 1-800-227-2600 AT LEAST TWO WORKING DAYS PRIOR TO EXCAVATION. THE CONTRACTOR SHALL NOTIFY THE ENGINEER IN ADVANCE IF THERE ARE ANY POTENTIAL CONFLICTS. ALL EXISTING PIPELINES AND OTHER UNDERGROUND FACILITIES SHALL BE PROTECTED IN PLACE UNLESS OTHERWISE NOTED.
6. SLOPES OF ALL EMBANKMENT FILL SHALL BE 2:1 (HORIZONTAL: VERTICAL) UNLESS OTHERWISE NOTED ON PLANS OR AS DIRECTED BY THE ENGINEER. ATTENTION IS DIRECTED TO CALTRANS STANDARD SPECIFICATIONS, SECTION 19, FOR EMBANKMENT CONSTRUCTIONS WHERE APPLICABLE..
7. DUST CONTROL MEASURES, AS APPROVED BY THE ENGINEER, SHALL BE FOLLOWED AT ALL TIMES DURING CONSTRUCTION OPERATIONS.
8. EROSION CONTROL SHALL BE PERFORMED ON ALL DISTURBED AREAS (INCLUDING ALL EMBANKMENT CONSTRUCTION).
9. TREES DESIGNATED ON THE PLANS ARE TO BE REMOVED UNLESS DIRECTED OTHERWISE IN WRITING BY THE ENGINEER.
10. TRIM AND/OR REMOVE EXISTING SHRUBS, BUSHES, TREES, AND LANDSCAPING AS DIRECTED BY THE ENGINEER.
11. ALL ELEVATIONS SHOWN ARE FINISHED ELEVATIONS UNLESS STATED OTHERWISE.
12. THE CONTRACTOR SHALL NOT PERFORM WORK OUTSIDE THE RIGHT OF WAY UNLESS SHOWN ON THE PLANS, OR AS DIRECTED BY THE ENGINEER.
13. SEE SPECIFICATIONS FOR DETAILS NOT SHOWN HEREIN.
14. ALL DRAINAGE FEATURES SHALL BE CONSTRUCTED TO DRAIN AND CONFORM TO EXISTING FLOW PATTERNS.
15. CONTRACTOR SHALL SUBMIT CONSTRUCTION WORK PLAN FOR ENGINEER APPROVAL BEFORE WORK BEGINS DETAILING THE PROPOSED SCHEDULE OF WORK (INCLUDING MAJOR MILESTONES), SEQUENCE OF CONSTRUCTION OPERATIONS, SCHEDULE OF SUBMITTALS, AND PROPOSED LAYDOWN AND OPERATION AREAS.

PLAN SHEET DATA





LIST OF SUBMITTALS

1. CONSTRUCTION WORK PLAN (REQUIRED BEFORE WORK BEGINS)
2. TEMPORARY DEWATERING AND CREEK DIVERSION PLAN (REQUIRED BEFORE WORK BEGINS).
3. TRAFFIC CONTROL PLAN (REQUIRED BEFORE WORK BEGINS)
4. TIEBACK INSTALLATION DETAIL (REQUIRED BEFORE WORK BEGINS)
5. TEMPORARY SHORING PLAN (REQUIRED BEFORE WORK BEGINS)
6. SURVEYED PILE LOCATIONS
7. PILE LEVEL VERIFICATION
8. IMPORT MATERIAL GRADATIONS (REQUIRED BEFORE MATERIAL IMPORT)
9. PLANTING AND SEED GERMINATION CERTIFICATIONS (REQUIRED BEFORE PLANTING OR SEEDING)

REGISTERED PROFESSIONAL ENGINEER
ANN MADER STILLMAN
C 47882
EXPIRES 12/31/25
CIVIL
STATE OF CALIFORNIA

APPROVED:

DATE: _____

ANN MADER STILLMAN,
DIRECTOR OF PUBLIC WORKS
R. C. E. # 47882 / EXPIRES 12-31-2025

NOT FOR CONSTRUCTION

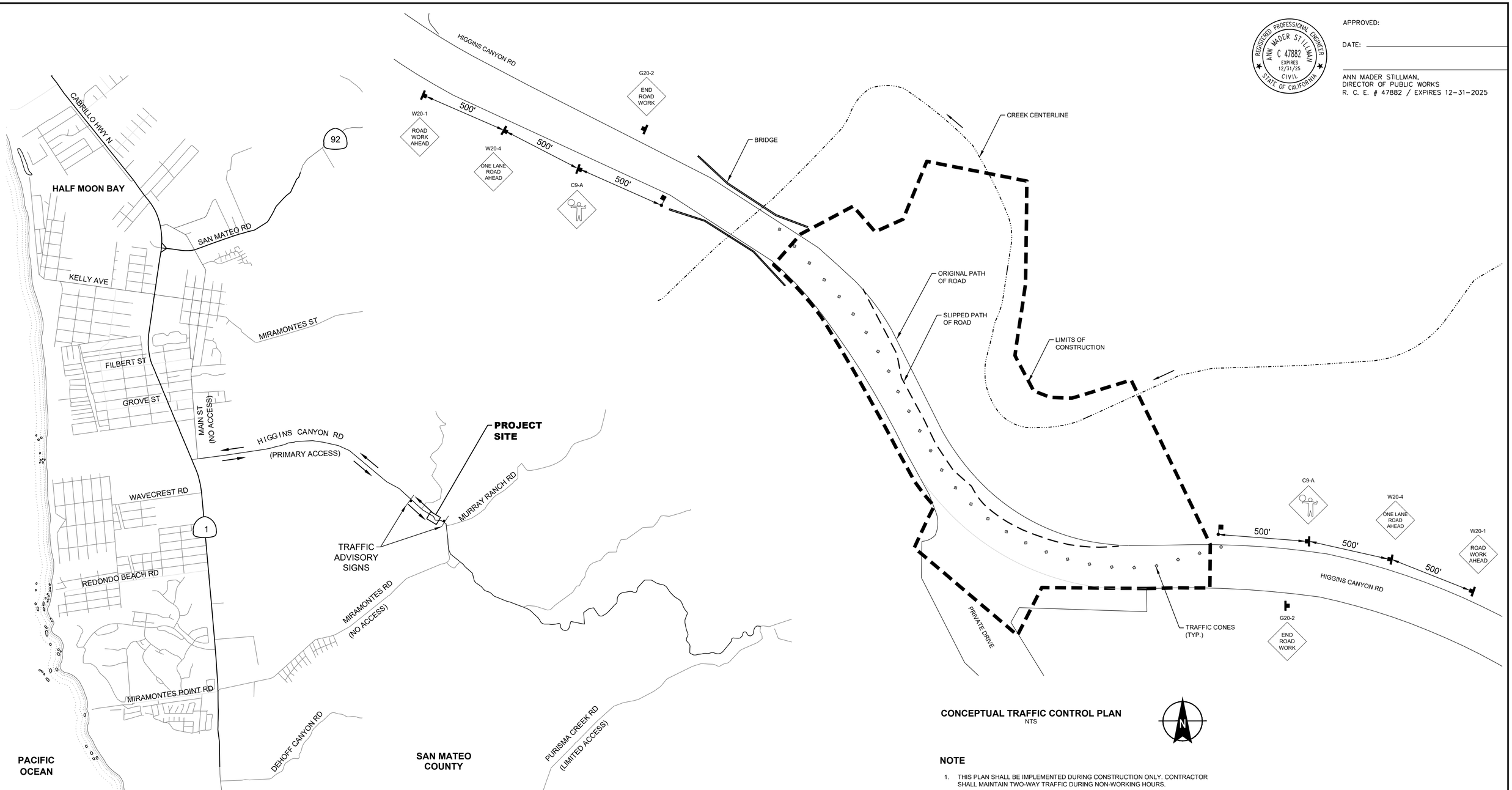
75% DESIGN

HALEY & ALDRICH, INC.
785 Ygnacio Valley Road
Walnut Creek, CA 94595
Tel: 925.935.9771
www.haleyaldrich.com

PROJECT NO.: 0207545-007

REVISION	DATE	DESIGNED BY: H&A (ZG)	SLIP-OUT REPAIR AND BANK STABILIZATION	SCALE: AS SHOWN
		DRAWN BY: H&A (KV)	1780 HIGGINS CANYON ROAD	DATE: MAY-2024
		CHECKED BY: H&A (SA)	**ABBREVIATIONS, LEGENDS, AND GENERAL NOTES**	FILE NO.: E5082
		ANN MADER STILLMAN, DIRECTOR OF PUBLIC WORKS COUNTY SAN MATEO	555 COUNTY CENTER, 5th FLOOR REDWOOD CITY, CALIFORNIA 94063	
		FOR REDUCED PLANS ORIGINAL SCALE IS IN INCHES 0 1 2 3 4		G-101 SHEET 02 OF 26

\\haleyaldrich\share\granite\2023\0207545-SanMateoCo-1780HigginsCynRdRetWall\CAD\207545-001_G-101.dwg 11-13-24 09:21:13 AM jricoruiz
Layout: G-101



HAUL ROUTE

0 0.25 0.50 0.75 1

SCALE IN MILE

CONCEPTUAL TRAFFIC CONTROL PLAN
NTS

NOTE

1. THE CONTRACTOR SHALL KEEP ONE LANE ALONG HIGGINS CANYON ROAD OPEN AT ALL TIMES. THE CONTRACTOR SHALL PREPARE AND SUBMIT A TRAFFIC CONTROL PLAN TO BE REVIEWED AND APPROVED BY THE ENGINEER.

LEGEND

SITE ACCESS

NOTE

1. THIS PLAN SHALL BE IMPLEMENTED DURING CONSTRUCTION ONLY. CONTRACTOR SHALL MAINTAIN TWO-WAY TRAFFIC DURING NON-WORKING HOURS.
2. CONTRACTOR SHALL SUBMIT A TRAFFIC CONTROL PLAN BASED ON THE LATEST EDITION OF THE CA MUTCD FOR REVIEW AND APPROVAL BY THE ENGINEER.

REGISTERED PROFESSIONAL ENGINEER
ANN MADER STILLMAN
C 47882
EXPIRES 12/31/25
CIVIL
STATE OF CALIFORNIA

APPROVED:

DATE: _____

ANN MADER STILLMAN,
DIRECTOR OF PUBLIC WORKS
R. C. E. # 47882 / EXPIRES 12-31-2025

NOT FOR CONSTRUCTION

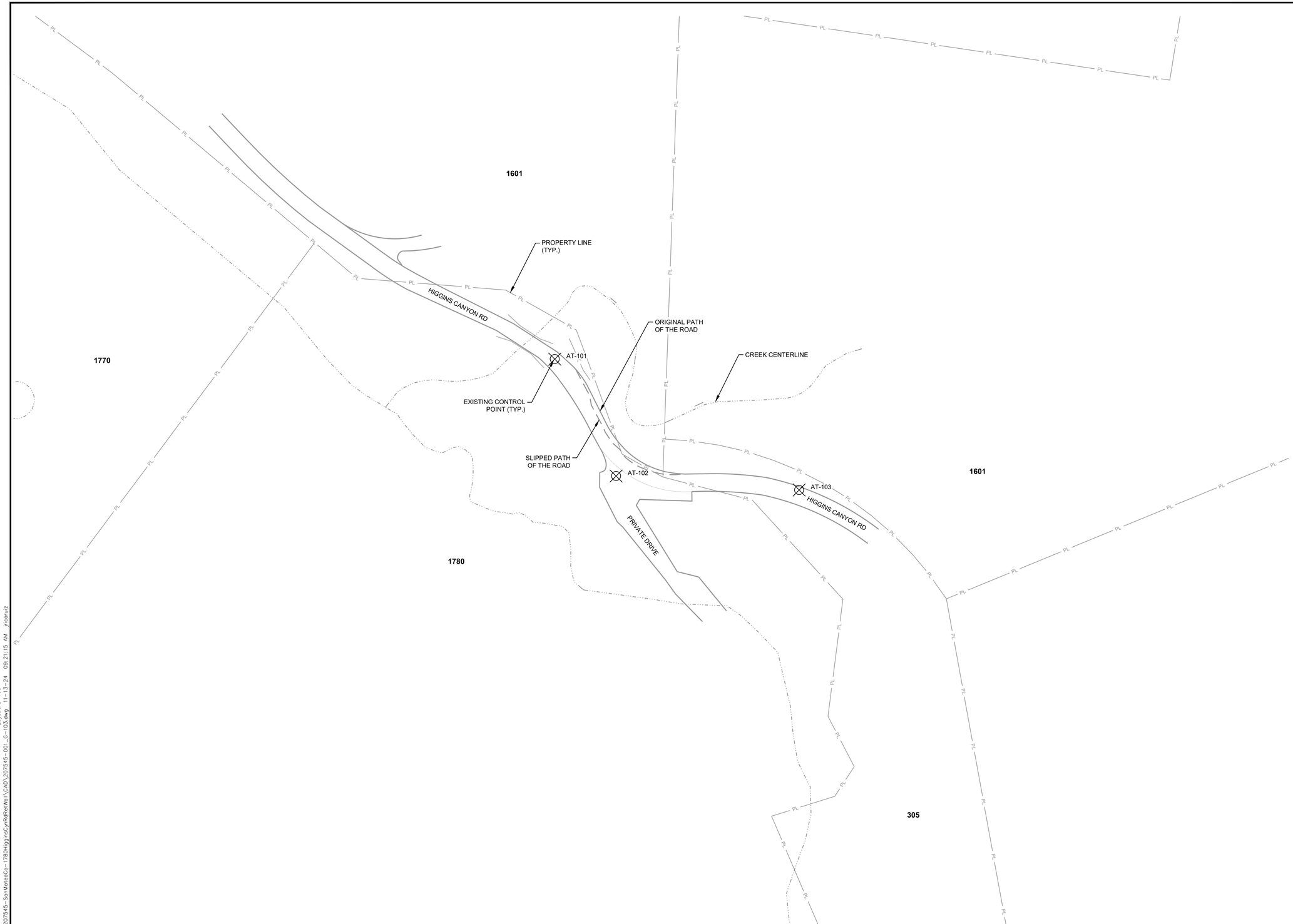
75% DESIGN

HALEY & ALDRICH, INC.
785 Ygnacio Valley Road
Walnut Creek, CA 94595
Tel: 925.935.9771
www.haleyaldrich.com

PROJECT NO.: 0207545-007

REVISION	DATE	DESIGNED BY: H&A (ZG)	SLIP-OUT REPAIR AND BANK STABILIZATION	SCALE: AS SHOWN
		DRAWN BY: H&A (KV)	1780 HIGGINS CANYON ROAD	DATE: MAY-2024
		CHECKED BY: H&A (SA)	**TRAFFIC CONTROL PLAN AND HAUL ROUTE**	FILE NO.: E5082
		ANN MADER STILLMAN, DIRECTOR OF PUBLIC WORKS COUNTY SAN MATEO	555 COUNTY CENTER, 5th FLOOR REDWOOD CITY, CALIFORNIA 94063	
		FOR REDUCED PLANS ORIGINAL SCALE IS IN INCHES 0 1 2 3 4		**G-102** SHEET 03 OF 26

\\haleyaldrich\share\granite\2021\0207545-SanMateoCo-1780HigginsCynRetWall\CAD\207545-001-G-102.dwg 11-13-24 09:21:14 AM jrcruiz
Layout: G-102



REGISTERED PROFESSIONAL ENGINEER
ANN MADER STILLMAN
C 47882
EXPIRES 12/31/25
CIVIL
STATE OF CALIFORNIA

APPROVED:

DATE: _____

ANN MADER STILLMAN,
DIRECTOR OF PUBLIC WORKS
R. C. E. # 47882 / EXPIRES 12-31-2025

LEGEND

- EXISTING PROPERTY LINE
- EXISTING ROADWAY
- EXISTING SLIPPED ROADWAY
- EXISTING CREEK CENTERLINE
- AT-103 — EXISTING CONTROL POINTS
- 1601 — PROPERTY ADDRESS NUMBER

NOTES

1. EASEMENT SURVEY PROVIDED BY BKF, DATED MAY 09, 2023.
2. PROPERTY LINES SHOWN ARE FROM SAN MATEO COUNTY GIS AND ARE TO BE CONSIDERED APPROXIMATE.
3. COORDINATES BASED ON:
   - HORIZONTAL - NAD83, CALIFORNIA STATE PLANES, ZONE III, US FOOT
   - VERTICAL - NAVD88
3. CONTROL POINT COORDINATES

NORTHING	EASTING	ELEVATION	DESCRIPTION
1,990,584.16	6,008,732.37	189.38	AT-101
1,990,453.57	6,008,800.86	199.53	AT-102
1,990,437.92	6,009,005.24	207.59	AT-103

NOT FOR CONSTRUCTION

75% DESIGN

0 50 100 150 200
SCALE IN FEET

HALEY ALDRICH

HALEY & ALDRICH, INC.
785 Ygnacio Valley Road
Walnut Creek, CA 94595
Tel: 925.935.9771
www.haleyaldrich.com

PROJECT NO.: 0207545-007

COUNTY OF SAN MATEO PUBLIC WORKS

REVISION	DATE

DESIGNED BY: H&A (ZG)
DRAWN BY: H&A (KV)
CHECKED BY: H&A (SA)

SLIP-OUT REPAIR AND BANK STABILIZATION
1780 HIGGINS CANYON ROAD
LAYOUT AND CONTROL PLAN

ANN MADER STILLMAN,
DIRECTOR OF PUBLIC WORKS
COUNTY SAN MATEO

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

SCALE: AS SHOWN
DATE: **MAY-2024**
FILE NO.: E5082

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

G-103
SHEET 04 OF 26

\\haleyaldrich\share\granite\2023\0207545-SanMateoCo-1780HigginsCynRdRetWall\CAD\0207545-001_G-103.dwg 11-13-24 09:21:15 AM jrcruiz
Layout: G-103

SAN MATEO COUNTYWIDE
Water Pollution Prevention Program
Clean Water. Healthy Community.

Construction Best Management Practices (BMPs)

Construction projects are required to implement the stormwater best management practices (BMP) on this page, as they apply to your project, all year long.

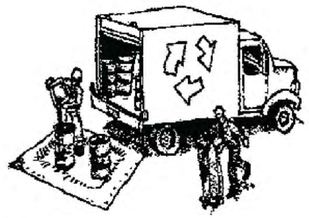
REGISTERED PROFESSIONAL ENGINEER
ANN MADER STILLMAN
C 47882
EXPIRES 12/31/25
CIVIL
STATE OF CALIFORNIA

APPROVED:

DATE: _____

ANN MADER STILLMAN,
DIRECTOR OF PUBLIC WORKS
R. C. E. # 47882 / EXPIRES 12-31-2025

Materials & Waste Management



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.

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.

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.

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.

Equipment Management & Spill Control



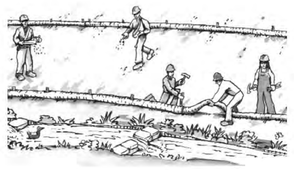
Maintenance and Parking

- ❑ 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 onsite, work in a bermed area away from storm drains and over a drip pan or drop cloths big enough to collect fluids. Recycle or dispose of fluids as hazardous waste.
- ❑ If vehicle or equipment cleaning must be done onsite, 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 onsite using soaps, solvents, degreasers, or steam cleaning equipment.

Spill Prevention and Control

- ❑ Keep spill cleanup materials (e.g., rags, absorbents and cat litter) 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).

Earthmoving



- ❑ Schedule grading and excavation work during dry weather.
- ❑ Stabilize all denuded areas, install and maintain temporary erosion controls (such as erosion control fabric or bonded fiber matrix) until vegetation is established.
- ❑ Remove existing vegetation only when absolutely necessary, and seed or plant vegetation for erosion control on slopes or where construction is not immediately planned.
- ❑ Prevent sediment from migrating offsite and protect storm drain inlets, gutters, ditches, and drainage courses by installing and maintaining appropriate BMPs, such as fiber rolls, silt fences, sediment basins, gravel bags, berms, etc.
- ❑ Keep excavated soil on site and transfer it to dump trucks on site, not in the streets.

Contaminated Soils

- ❑ If any of the following conditions are observed, test for contamination and contact the Regional Water Quality Control Board:
  - Unusual soil conditions, discoloration, or odor.
  - Abandoned underground tanks.
  - Abandoned wells
  - Buried barrels, debris, or trash.

Paving/Asphalt Work



- ❑ Avoid paving and seal coating in wet weather or when rain is forecast, to prevent materials that have not cured from contacting stormwater runoff.
- ❑ Cover storm drain inlets and manholes when applying seal coat, tack coat, slurry seal, fog seal, etc.
- ❑ Collect and recycle or appropriately dispose of excess abrasive gravel or sand. Do NOT sweep or wash it into gutters.
- ❑ Do not use water to wash down fresh asphalt concrete pavement.

Sawcutting & Asphalt/Concrete Removal

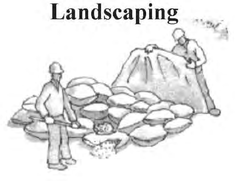
- ❑ Protect nearby storm drain inlets when saw cutting. Use filter fabric, catch basin inlet filters, or gravel bags to keep slurry out of the storm drain system.
- ❑ Shovel, abosorb, or vacuum saw-cut slurry and dispose of all waste as soon as you are finished in one location or at the end of each work day (whichever is sooner!).
- ❑ If sawcut slurry enters a catch basin, clean it up immediately.

Concrete, Grout & Mortar Application



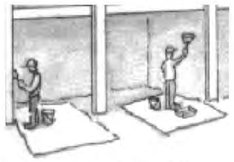
- ❑ Store concrete, grout, and mortar away from storm drains or waterways, and on pallets under cover to protect them from rain, runoff, and wind.
- ❑ Wash out concrete equipment/trucks offsite or in a designated washout area, where the water will flow into a temporary waste pit, and in a manner that will prevent leaching into the underlying soil or onto surrounding areas. Let concrete harden and dispose of as garbage.
- ❑ When washing exposed aggregate, prevent washwater from entering storm drains. Block any inlets and vacuum gutters, hose washwater onto dirt areas, or drain onto a bermed surface to be pumped and disposed of properly.

Landscaping



- ❑ Protect stockpiled landscaping materials from wind and rain by storing them under tarps all year-round.
- ❑ Stack bagged material on pallets and under cover.
- ❑ Discontinue application of any erodible landscape material within 2 days before a forecast rain event or during wet weather.

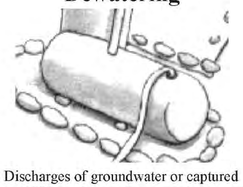
Painting & Paint Removal



Painting Cleanup and Removal

- ❑ Never clean brushes or rinse paint containers into a street, gutter, storm drain, or stream.
- ❑ For water-based paints, paint out brushes to the extent possible, and rinse into a drain that goes to the sanitary sewer. Never pour paint down a storm drain.
- ❑ For oil-based paints, paint out brushes to the extent possible and clean with thinner or solvent in a proper container. Filter and reuse thinners and solvents. Dispose of excess liquids as hazardous waste.
- ❑ Paint chips and dust from non-hazardous dry stripping and sand blasting may be swept up or collected in plastic drop cloths and disposed of as trash.
- ❑ Chemical paint stripping residue and chips and dust from marine paints or paints containing lead, mercury, or tributyltin must be disposed of as hazardous waste. Lead based paint removal requires a state-certified contractor.

Dewatering



- ❑ Discharges of groundwater or captured runoff from dewatering operations must be properly managed and disposed. When possible send dewatering discharge to landscaped area or sanitary sewer. If discharging to the sanitary sewer call your local wastewater treatment plant.
- ❑ Divert run-on water from offsite away from all disturbed areas.
- ❑ When dewatering, notify and obtain approval from the local municipality before discharging water to a street gutter or storm drain. Filtration or diversion through a basin, tank, or sediment trap may be required.
- ❑ In areas of known or suspected contamination, call your local agency to determine whether the ground water must be tested. Pumped groundwater may need to be collected and hauled off-site for treatment and proper disposal.

Storm drain polluters may be liable for fines of up to $10,000 per day!

NOT FOR CONSTRUCTION

75% DESIGN

HALEY & ALDRICH, INC.
785 Ygnacio Valley Road
Walnut Creek, CA 94595
Tel: 925.935.9771
www.haleyaldrich.com

PROJECT NO.: 0207545-007

COUNTY OF SAN MATEO PUBLIC WORKS

REVISION	DATE

DESIGNED BY: H&A (ZG)
DRAWN BY: H&A (KV)
CHECKED BY: H&A (SA)

SLIP-OUT REPAIR AND BANK STABILIZATION
1780 HIGGINS CANYON ROAD
POLLUTION PREVENTION PLAN

SCALE: AS SHOWN
DATE: MAY-2024
FILE NO.: E5082

ANN MADER STILLMAN,
DIRECTOR OF PUBLIC WORKS
COUNTY SAN MATEO

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

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

G-104
SHEET 05 OF 26

Layout: G-104
\\haleyaldrich\share\gramirez\2023\0207545-SanMateoCo-1780HigginsCynRdRetWall\CAD\207545-001_G-104.dwg 11-13-24 09:21:16 AM pterraz

EXISTING CREEK CENTER LINE

DIVERSION DAM (CONTRACTOR-DESIGNED)

EXISTING TREE (WILLOW, TYP.) (SEE TABLE)

EXISTING PROPERTY LINE

EXISTING SLUMPED SOIL AND DEBRIS FROM 2023 STORMS

LIMIT OF CONSTRUCTION

1601

EXISTING CONCRETE RETAINING WALL

EXISTING DRAIN INLET

EXISTING DRAINAGE PIPE

EXISTING VEGETATED REVETMENT

2 C-400 DRAIN INLET PROTECTION

1 C-400 EXCLUSION FENCING

5 C-400 SILT FENCE

EXISTING TIE-BACKS (TYP.)

EXISTING DRAINAGE DITCH

HIGGINS CANYON RD

BRIDGE GUARD RAIL (TYP.)

TREE/VEGETATION LINE (TYP.)

POWER POLE (TYP.)

SLIPPED EDGE OF THE ROAD

ORIGINAL PATH OF THE ROAD

1780

FENCE AND GATE)

FALLEN TREES

EXISTING SLUMPED SOIL AND DEBRIS FROM 2023 STORMS

EXISTING SLUMPED VEGETATED BOULDER REPAIR

DRIVEWAY

1601

DIVERSION DAM (CONTRACTOR-DESIGNED)

OVERHEAD ELECTRIC LINES (TYP.)

APPROXIMATE LOCATION OF UNDERGROUND UTILITIES (SEE NOTE 2)

MUD-ROCK PLATE 8'X12'X1" (TYP. OF 4) SEE NOTE 3

HIGGINS CANYON RD

EXISTING ROAD

REGISTERED PROFESSIONAL ENGINEER
ANN MADER STILLMAN
C 47882
EXPIRES 12/31/25
CIVIL
STATE OF CALIFORNIA

APPROVED:

DATE: _____

ANN MADER STILLMAN,
DIRECTOR OF PUBLIC WORKS
R. C. E. # 47882 / EXPIRES 12-31-2025

LEGEND

- EXISTING PROPERTY LINE
- EXISTING CONTOUR MAJOR
- EXISTING CONTOUR MINOR
- EXISTING OVERHEAD ELECTRIC
- EXISTING UNDERGROUND UTILITIES
- EXISTING CREEK CENTERLINE
- EXISTING ROADWAY
- EXISTING SLIPPED ROADWAY
- EXISTING TREE/VEGETATION LINE
- 1601 PROPERTY ADDRESS NUMBER
- PROPOSED LIMITS OF CONSTRUCTION
- PROPOSED EXCLUSION FENCING
- PROPOSED SILT FENCE



MUD-ROCK PLATE IMAGE

NOTES

1. FOR SURVEY NOTES REFER TO SHEET G-103.
2. LOCATIONS OF UNDERGROUND UTILITIES ARE APPROXIMATE. CONTRACTOR SHALL FIELD VERIFY EXACT LOCATIONS PRIOR TO THE START OF ANY EARTH WORK.
3. REFER TO SAN MATEO COUNTY EROSION AND SEDIMENT CONTROL PLAN REQUIREMENTS: https://www.smcgov.org/planning/erosion-and-sediment-control-plan-requirements
4. EXCLUSION FENCING SHALL BE 4' HIGH ORANGE PLASTIC FENCE WITH 8' MAX SUPPORT SPACING.

NOT FOR CONSTRUCTION

75% DESIGN

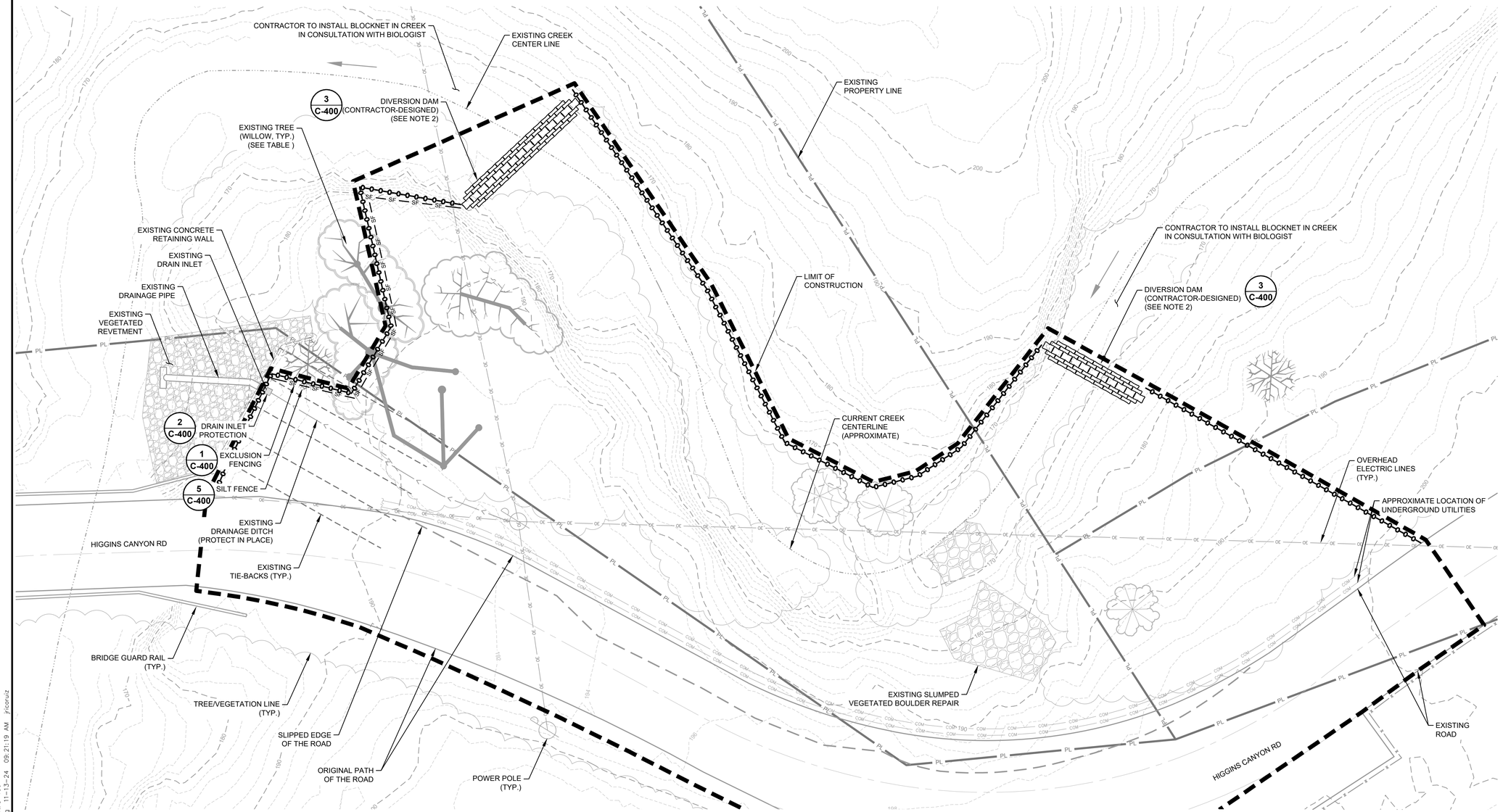
0 10 20 30 40
SCALE IN FEET

HALEY & ALDRICH, INC.
785 Ygnacio Valley Road
Walnut Creek, CA 94595
Tel: 925.935.9771
www.haleyaldrich.com

PROJECT NO.: 0207545-007

REVISION	DATE	DESIGNED BY: H&A (ZG)	SLIP-OUT REPAIR AND BANK STABILIZATION	SCALE: AS SHOWN
		DRAWN BY: H&A (KV)	1780 HIGGINS CANYON ROAD	DATE: MAY-2024
		CHECKED BY: H&A (SA)	**EROSION AND SEDIMENT CONTROL PLAN**	FILE NO.: E5082
		ANN MADER STILLMAN, DIRECTOR OF PUBLIC WORKS COUNTY SAN MATEO		555 COUNTY CENTER, 5th FLOOR REDWOOD CITY, CALIFORNIA 94063
		FOR REDUCED PLANS ORIGINAL SCALE IS IN INCHES 0 1 2 3 4		**G-105** SHEET 06 OF 26

\\haleyaldrich\share\granite\2023\0207545-SanMateoCo-1780HigginsCynRdRetWall\CAD\0207545-001_G-105.dwg 11-13-24 09:21:18 AM jrcruz
Layout: G-105



REGISTERED PROFESSIONAL ENGINEER
ANN MADER STILLMAN
C 47882
EXPIRES 12/31/25
CIVIL
STATE OF CALIFORNIA

APPROVED:

DATE: _____

ANN MADER STILLMAN,
DIRECTOR OF PUBLIC WORKS
R. C. E. # 47882 / EXPIRES 12-31-2025

LEGEND

- EXISTING PROPERTY LINE
- EXISTING CONTOUR MAJOR
- EXISTING CONTOUR MINOR
- EXISTING OVERHEAD ELECTRIC
- EXISTING UNDERGROUND UTILITIES
- EXISTING CREEK CENTERLINE
- EXISTING ROADWAY
- EXISTING SLIPPED ROADWAY
- EXISTING TREE/VEGETATION LINE
- PROPOSED LIMITS OF CONSTRUCTION
- PROPOSED EXCLUSION FENCING
- PROPOSED SILT FENCE

NOTES

1. FOR SURVEY NOTES REFER TO SHEET G-103.
2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR DESIGNING AND SUBMITTING A TEMPORARY DEWATERING AND CREEK DIVERSION PLAN TO THE ENGINEER FOR APPROVAL AND FOR MAINTAINING AND REMOVAL OF THE SYSTEM. THE PLAN SHALL INCLUDE JUSTIFICATION OF ALL OTHER MEANS USED FOR THE DIVERSION.
3. PRIOR TO BEGINNING ANY WORK WITHIN THE CREEK CHANNEL, THE CONTRACTOR SHALL CONSTRUCT A TEMPORARY DIVERSION OF FLOWING CREEK WATER THROUGH THE CONSTRUCTION SITE. THE CONTRACTOR SHALL PROVIDE FOR THE CONTINUAL FLOW OF WATER THROUGH THE DIVERSION AT ALL TIMES. THE DIVERSION METHOD SHALL INCORPORATE GRAVEL BAGS AND PLASTIC SHEETING (OR SIMILAR SYSTEM) WITH BLOCKNETS TO ACT AS UPSTREAM AND DOWNSTREAM COFFERDAMS. WATER SHALL FLOW BY GRAVITY THROUGH TEMPORARY PIPING OR VIA AN ALTERNATE CONTRACTOR DESIGNED METHOD.
4. CONTRACTOR SHALL COORDINATE WITH THE PROJECT BIOLOGIST IN THE FIELD TO CONFIRM THE APPROPRIATE LOCATIONS FOR THE BLOCKNETS AND MAKE FIELD ADJUSTMENTS, AS NEEDED.
5. DIVERSION DAM AND DEWATERING INFRASTRUCTURE SHALL BE IN ACCORDANCE WITH THE SAN MATEO COUNTY ROUTINE MAINTENANCE PLAN MANUAL BMP DW-1.

DEWATERING AND CREEK DIVERSION NOTES

THE DIVERSION PLAN SHOWN IS SCHEMATIC. GENERAL REQUIREMENTS ARE PROVIDED BELOW. THE FULL REQUIREMENTS OF THE DEWATERING AND CREEK DIVERSION PLAN ARE SPECIFIED IN THE PROJECT TECHNICAL SPECIFICATIONS. THE CONTRACTOR SHALL SUBMIT A TEMPORARY DEWATERING AND CREEK DIVERSION PLAN TO THE ENGINEER FOR APPROVAL.

1. GENERAL

1.1 DEWATER THE PROJECT SITE AS REQUIRED TO FACILITATE IN-STREAM CONSTRUCTION AND TO REDUCE POTENTIAL IMPACTS TO WATER QUALITY DOWNSTREAM OF THE PROJECT SITE.

1.2. CONFIRM THAT A FAVORABLE LONG TERM WEATHER FORECAST (1 WEEK, MIN.) IS OBSERVED PRIOR TO PLACEMENT OF DIVERSION STRUCTURES.

1.3. PRIOR TO PLACEMENT OF DIVERSION STRUCTURE, COUNTY SHALL REMOVE FISH FROM THE PROJECT REACH, IN ACCORDANCE WITH NOTE 2.

1.4. DIVERT FLOW ONLY WHEN THE DIVERSION CONSTRUCTION IS OTHERWISE COMPLETE. FOLLOWING ENGINEER'S APPROVAL OF THE COMPLETED WORK, REMOVE DIVERSION BEGINNING AT THE DOWNSTREAM LIMIT, IN AN UPSTREAM DIRECTION.

1.5. THE CONTRACTOR IS ADVISED THAT SOME WATER MAY ENTER THE WORK AREA THROUGH SEEPAGE, RAINFALL, OR OTHER MEANS, AND THAT PORTIONS OF THE CHANNEL MAY REMAIN MUDDY AFTER DEWATERING. THE CONTRACTOR SHOULD USE EQUIPMENT OR MEANS APPROPRIATE FOR WORK IN THIS CONDITION.

2. FISH REMOVAL

2.1 FISH RELOCATION SHALL BE CONDUCTED BY THE COUNTY'S BIOLOGIST PRIOR TO INSTALLING THE TEMPORARY CREEK DIVERSION SYSTEM. PROVIDE NO LESS THAN 72 HOUR NOTIFICATION TO THE COUNTY IN ADVANCE OF TEMPORARY CREEK DIVERSION WORK.

2.2. BLOCK NETS SHALL BE PROVIDED AND INSTALLED BY THE CONTRACTOR IN CONSULTATION WITH THE BIOLOGIST. BLOCK NETS SHALL BE MAINTAINED BY THE CONTRACTOR BOTH UPSTREAM AND DOWNSTREAM OF THE DIVERSION, THROUGHOUT THE PERIOD OF CONSTRUCTION. MAINTENANCE INCLUDES PERIODIC REMOVAL OF ACCUMULATED DEBRIS, AS NECESSARY TO ENSURE FUNCTION. BLOCK NETS SHALL BE REMOVED AFTER THE DIVERSION IS REMOVED AND THE IN CHANNEL WORK AREA IS RE-WATERED.

2.3. THE CONTRACTOR SHALL COORDINATE DIVERSION TIME FRAMES WITH THE COUNTY BIOLOGIST IN ORDER TO AVOID HAVING THE DIVERSION IN PLACE DURING MONTHS WHICH MAY HAVE DISPRAPORTIONATE IMPACTS OF NATIVE FISH SPECIES.

3. DIVERSION SYSTEM

3.1. INSTALL SEALED, TEMPORARY COFFER DAMS UPSTREAM AND DOWNSTREAM OF THE WORK AREA. THE COFFER DAMS MUST BE CONSTRUCTED USING GRAVEL FILLED BAGS TO CAPTURE AND DIVERT STREAM FLOW UPSTREAM OF THE PROJECT SITE. THE DAM AND METHOD OF SEALING SHALL BE PLACED AT AN APPROPRIATE DEPTH TO CAPTURE SUBSURFACE STREAM FLOW, AS NEEDED TO DEWATER THE STREAMBED. GRAVEL SHALL BE WASHED PRIOR TO PLACEMENT IN BAGS. THE USE OF SAND WILL NOT BE ALLOWED. NO OTHER DIVERSION METHOD SHALL BE USED WITHOUT AUTHORIZATION OF THE ENGINEER. IF AN ALTERNATE DIVERSION METHOD IS PREFERRED BY THE CONTRACTOR, THE CONTRACTOR SHALL DESCRIBE IN DETAIL IN THE TEMPORARY DEWATERING AND CREEK DIVERSION PLAN SUBMITTED TO THE ENGINEER FOR APPROVAL.

3.2. CONSTRUCTION OF THE APPROVED DIVERSION PLAN SHALL BE IN ACCORDANCE WITH THE APPROVED TEMPORARY DEWATERING AND CREEK DIVERSION PLAN.

3.3. IN THE EVENT OF A SIGNIFICANT STORM, THE CONTRACTOR SHALL BE PREPARED TO TAKE NECESSARY MEASURES TO ENSURE SAFE PASSAGE OF STORM WATER AND CREEK FLOW THROUGH THE PROJECT AREA, WITHOUT DAMAGE TO EXISTING STRUCTURES, OR INTRODUCTION OF EXCESSIVE SEDIMENT. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL TEMPORARY EROSION CONTROL BMPS.

3.4. THE DIVERSION SHALL BE CAPABLE OF CONTINUOUSLY CONVEYING A MINIMUM OF 50 CFS (AT THE ORDINARY HIGH WATER LEVEL) WITH A MINIMUM OF 12 INCHES FREEBOARD AT THE UPSTREAM AND DOWNSTREAM COFFER DAM STRUCTURES.

3.5. ALL DEWATERING AND DIVERSION METHODS MUST BE INSTALLED SUCH THAT NATURAL FLOW IS MAINTAINED UPSTREAM AND DOWNSTREAM OF THE PROJECT AREA.

3.6. ANY TEMPORARY DAMS OR DIVERSION MUST BE INSTALLED SUCH THAT THE DIVERSION DOES NOT CAUSE EXCESSIVE SEIDMENTION, SILTATION, OR EROSION UPSTREAM OR DOWNSTREAM OF THE PROJECT AREA.

3.7. IF PUMPS ARE USED FOR THE DIVERSION THEY SHALL BE SCREENED PUMPS IN ACCORDANCE WITH THE CDFW'S FISH SCREENING CRITERIA, OR NETTING MUST BE INSTALLED BY THE COUNTY BIOLIGIST WHICH PROVIDES EQUIVALENT PROTECTION.

4. DEWATERING OF CONSTRUCTION AREAS

4.1. THE CONTRACTOR SHALL SUPPLY ALL NECESSARY PUMPS, PIPING, FILTERS, SHORING, AND OTHER TOOLS AND MATERIALS NECESSARY FOR DEWATERING IN ACCORDANCE WITH THE APPROVED TEMPORARY DEWATERING AND CREEK DIVERSION PLAN. IF A PUMPED SYSTEM IS RELIED UPON TO ENSURE DOWNSTREAM WATER QUALITY, A BACKUP PUMP OF EQUAL CAPACITY SHALL BE PROVIDED AT ALL TIMES AND THE PUMP MUST BE CONTINUOUSLY MONITORED.

4.2. DEWATERING ACTIVITIES WHICH MAY BE REQUIRED FOR CONSTRUCTION PURPOSES SHALL COMPLY WITH WATER QUALITY STANDARDS ISSUED BY PROJECT PERMITS.

5. DEWATERING DISCHARGE

5.1. DISCHARGE OF WATER FROM THE DEWATERED CONSTRUCTION SITE, EITHER BY GRAVITY OR PUMPING, SHALL BE PERFORMED IN A MANNER THAT PREVENTS EXCESSIVE TURBIDITY FROM ENTERING THE RECEIVING WATERWAYS AND PREVENTS SCOUR AND EROSION OUTSIDE OF THE CONSTRUCTION SITE. PUMPED WATER SHOULD BE PRE-FILTERED WITH A GRAVEL PACK AROUND SUMPS FOR SUBSURFACE FLOWS AND A SILT FENCE AROUND PUMPS FOR SURFACE FLOW. PUMPED WATER SHALL BE DISCHARGED INTO ISOLATED LOCAL DEPRESSIONS, FILTER BAGS, SETTLING (BAKER) TANKS, OR TEMPORARY SEDIMENT BASINS, AS NECESSARY TO MEET WATER QUALITY REQUIREMENTS. WHERE WATER TO BE DISCHARGED INTO MILLS CREEK WILL CREATE EXCESSIVE TURBIDITY, THE WATER SHALL BE ROUTED THROUGH A SEDIMENT INTERCEPTOR OR OTHER FACILITIES TO REMOVE SEDIMENT FROM WATER.

5.2. DEMONSTRATE COMPLIANCE WITH DISCHARGE REQUIREMENTS. COUNTY MAY CONDUCT TESTING ON DISCHARGED WATER TO VERIFY CONTRACTOR COMPLIANCE.

0 10 20 30 40
SCALE IN FEET

NOT FOR CONSTRUCTION

75% DESIGN

HALEY & ALDRICH, INC.
785 Ygnacio Valley Road
Walnut Creek, CA 94595
Tel: 925.935.9771
www.haleyaldrich.com

PROJECT NO.: 0207545-007

REVISION	DATE	DESIGNED BY: H&A (ZC)	SLIP-OUT REPAIR AND BANK STABILIZATION 1780 HIGGINS CANYON ROAD	SCALE: AS SHOWN
		DRAWN BY: H&A (KV)	**DEWATERING AND CREEK DIVERSION PLAN**	DATE: **MAY-2024**
		CHECKED BY: H&A (SA)		FILE NO.: E5082
		ANN MADER STILLMAN, DIRECTOR OF PUBLIC WORKS COUNTY SAN MATEO	555 COUNTY CENTER, 5th FLOOR REDWOOD CITY, CALIFORNIA 94063	

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

G-106
SHEET 07 OF 26

\\haleyaldrich\share\groniita\2023\0207545-SanMateoCo-1780HigginsCyRdRetWall\CAD\207545-001_G-106.dwg 11-13-24 09:21:19 AM jrcruiz
Layout: G-106

EXISTING CREEK CENTER LINE
DIVERSION DAM (CONTRACTOR-DESIGNED)
EXISTING TREE (WILLOW, TYP.) (SEE TABLE)
EXISTING CONCRETE RETAINING WALL
EXISTING DRAIN INLET
EXISTING DRAINAGE PIPE
EXISTING VEGETATED REVETMENT
POTENTIAL CONSTRUCTION ACCESS POINT 1
HIGGINS CANYON RD
EXISTING TIE-BACKS (TYP.)
EXISTING DRAINAGE DITCH (PROTECT IN PLACE)
BRIDGE GUARD RAIL (TYP.)
TREE/VEGETATION LINE (TYP.)
SLIPPED EDGE OF THE ROAD
ORIGINAL PATH OF THE ROAD
POWER POLE (TYP.)
FENCE AND GATE)
EXISTING PROPERTY LINE
LIMIT OF CONSTRUCTION
CURRENT CREEK CENTERLINE (APPROXIMATE)
DIVERSION DAM (CONTRACTOR-DESIGNED)
OVERHEAD ELECTRIC LINES (TYP.)
APPROXIMATE LOCATION OF UNDERGROUND UTILITIES
POTENTIAL CONSTRUCTION ACCESS POINT 2
EXISTING SLUMPED VEGETATED BOULDER REPAIR
MUD-ROCK PLATE 8'X12'X1" (TYP. OF 4) SEE NOTE 3
HIGGINS CANYON RD
EXISTING ROAD
DRIVEWAY

0 10 20 30 40
SCALE IN FEET

REGISTERED PROFESSIONAL ENGINEER
ANN MADER STILLMAN
C 47882
EXPIRES 12/31/25
CIVIL
STATE OF CALIFORNIA

APPROVED:

DATE: _____

ANN MADER STILLMAN,
DIRECTOR OF PUBLIC WORKS
R. C. E. # 47882 / EXPIRES 12-31-2025

LEGEND

- EXISTING PROPERTY LINE
- EXISTING CONTOUR MAJOR
- EXISTING CONTOUR MINOR
- EXISTING OVERHEAD ELECTRIC
- EXISTING UNDERGROUND UTILITIES
- EXISTING CREEK CENTERLINE
- EXISTING ROADWAY
- EXISTING SLIPPED ROADWAY
- EXISTING TREE/VEGETATION LINE
- PROPOSED LIMITS OF CONSTRUCTION
- PROPOSED EXCLUSION FENCING
- PROPOSED SILT FENCE
- PROPOSED CONSTRUCTION ACCESS

NOTES

1. FOR SURVEY NOTES REFER TO SHEET G-103.
2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR DESIGNING AND SUBMITTING A TEMPORARY DEWATERING AND CREEK DIVERSION PLAN TO THE ENGINEER FOR APPROVAL AND FOR MAINTAINING AND REMOVAL OF THE SYSTEM. THE PLAN SHALL INCLUDE JUSTIFICATION OF ALL OTHER MEANS USED FOR THE DIVERSION.
3. PRIOR TO BEGINNING ANY WORK WITHIN THE CREEK CHANNEL, THE CONTRACTOR SHALL CONSTRUCT A TEMPORARY DIVERSION OF FLOWING CREEK WATER THROUGH THE CONSTRUCTION SITE. THE CONTRACTOR SHALL PROVIDE FOR THE CONTINUAL FLOW OF WATER THROUGH THE DIVERSION AT ALL TIMES. THE DIVERSION METHOD SHALL INCORPORATE GRAVEL BAGS AND PLASTIC SHEETING (OR SIMILAR SYSTEM) WITH BLOCKNETS TO ACT AS UPSTREAM AND DOWNSTREAM COFFERDAMS. WATER SHALL FLOW BY GRAVITY THROUGH TEMPORARY PIPING OR VIA AN ALTERNATE CONTRACTOR DESIGNED METHOD.
4. CONTRACTOR SHALL COORDINATE WITH THE PROJECT BIOLOGIST IN THE FIELD TO CONFIRM THE APPROPRIATE LOCATIONS FOR THE BLOCKNETS AND MAKE FIELD ADJUSTMENTS, AS NEEDED.
5. DIVERSION DAM SHALL BE IN ACCORDANCE WITH THE SAN MATEO COUNTY ROUTINE MAINTENANCE PLAN MANUAL BMP DW-1.

NOT FOR CONSTRUCTION

75% DESIGN

HALEY ALDRICH
HALEY & ALDRICH, INC.
785 Ygnacio Valley Road
Walnut Creek, CA 94595
Tel: 925.935.9771
www.haleyaldrich.com

PROJECT NO.: 0207545-007

COUNTY OF SAN MATEO PUBLIC WORKS

REVISION	DATE	DESIGNED BY: H&A (ZG)	DRAWN BY: H&A (KV)	CHECKED BY: H&A (SA)

SLIP-OUT REPAIR AND BANK STABILIZATION
1780 HIGGINS CANYON ROAD
CONSTRUCTION AREA ACCESS PLAN

SCALE: AS SHOWN
DATE: **MAY-2024**
FILE NO.: E5082

ANN MADER STILLMAN,
DIRECTOR OF PUBLIC WORKS
COUNTY SAN MATEO

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

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

G-107
SHEET 08 OF 26

\\haleyaldrich\share\granite\2023\0207545-SanMateoCo-1780HigginsCynRdRetWall\CAD\0207545-001_G-107.dwg 11-13-24 09:21:20 AM jrieruiz
Layout: G-107

REGISTERED PROFESSIONAL ENGINEER
ANN MADER STILLMAN
C 47882
EXPIRES 12/31/25
CIVIL
STATE OF CALIFORNIA

APPROVED:

DATE: _____

_____
ANN MADER STILLMAN,
DIRECTOR OF PUBLIC WORKS
R. C. E. # 47882 / EXPIRES 12-31-2025

EXISTING CREEK CENTER LINE
EXISTING PROPERTY LINE
EXISTING TREE (TO BE PROTECTED DURING CONSTRUCTION)
EXISTING CONCRETE RETAINING WALL
EXISTING DRAIN INLET
EXISTING DRAINAGE PIPE
EXISTING VEGETATED REVETMENT
EXISTING SLUMPED SOIL AND DEBRIS FROM 2023 STORMS
FALLEN TREES (TYP.)
EXISTING SLUMPED SOIL AND DEBRIS FROM 2023 STORMS
OVERHEAD ELECTRIC LINES (TYP.)
APPROXIMATE LOCATION OF UNDERGROUND UTILITIES (SEE NOTE 2)
EXISTING DRAINAGE DITCH
HIGGINS CANYON RD
EXISTING TIE-BACKS (TYP.)
BRIDGE GUARD RAIL (TYP.)
TREE/VEGETATION LINE (TYP.)
B-1
B-2
B-3
EXISTING SLUMPED VEGETATED BOULDER REPAIR
EXISTING ROAD
POWER POLE (TYP.)
SLIPPED EDGE OF THE ROAD
ORIGINAL PATH OF THE ROAD
HIGGINS CANYON RD
1601
1780
DRIVEWAY

LEGEND

- EXISTING PROPERTY LINE
- EXISTING CONTOUR MAJOR
- EXISTING CONTOUR MINOR
- EXISTING OVERHEAD ELECTRIC
- EXISTING UNDERGROUND UTILITIES
- EXISTING CREEK CENTERLINE
- EXISTING ROADWAY
- EXISTING SLIPPED ROADWAY
- EXISTING ROADWAY CENTERLINE (APPROXIMATE)
- EXISTING TREE/VEGETATION LINE
- EXISTING RIPRAP
- GEOTECHNICAL TEST BORING LOCATION
- 1601 PROPERTY ADDRESS NUMBER
- X 207 EXISTING SURVEY POINT

NOTES

1. FOR SURVEY NOTES REFER TO SHEET G-103.
2. LOCATIONS OF UNDERGROUND UTILITIES ARE APPROXIMATE. CONTRACTOR SHALL FIELD VERIFY EXACT LOCATIONS PRIOR TO START OF ANY EARTH WORK.

TREE SURVEY TABLE

NUMBER	SPECIES	DIAMETER	ACTION
201	Willow	19	Protect
202	Willow	15	Protect
203	Alder	12	Remove
206	Alder	8	Remove
207	Willow	18	Protect
208	Willow	20	Remove
209	Alder	18	Remove
211	Willow	10	Remove
212	Willow	35	Protect
213	Willow	7	Remove
214	Willow	7	Remove
215	Willow	6	Remove
216	Willow	17	Remove
217	Willow	36	Protect
218	Willow	14	Protect
219	Willow	6	Protect
220	Willow	14	Protect
222	Black Elderberry	10	Remove

0 10 20 30 40
SCALE IN FEET

NOT FOR CONSTRUCTION

75% DESIGN

HALEY & ALDRICH, INC.
785 Ygnacio Valley Road
Walnut Creek, CA 94595
Tel: 925.935.9771
www.haleyaldrich.com

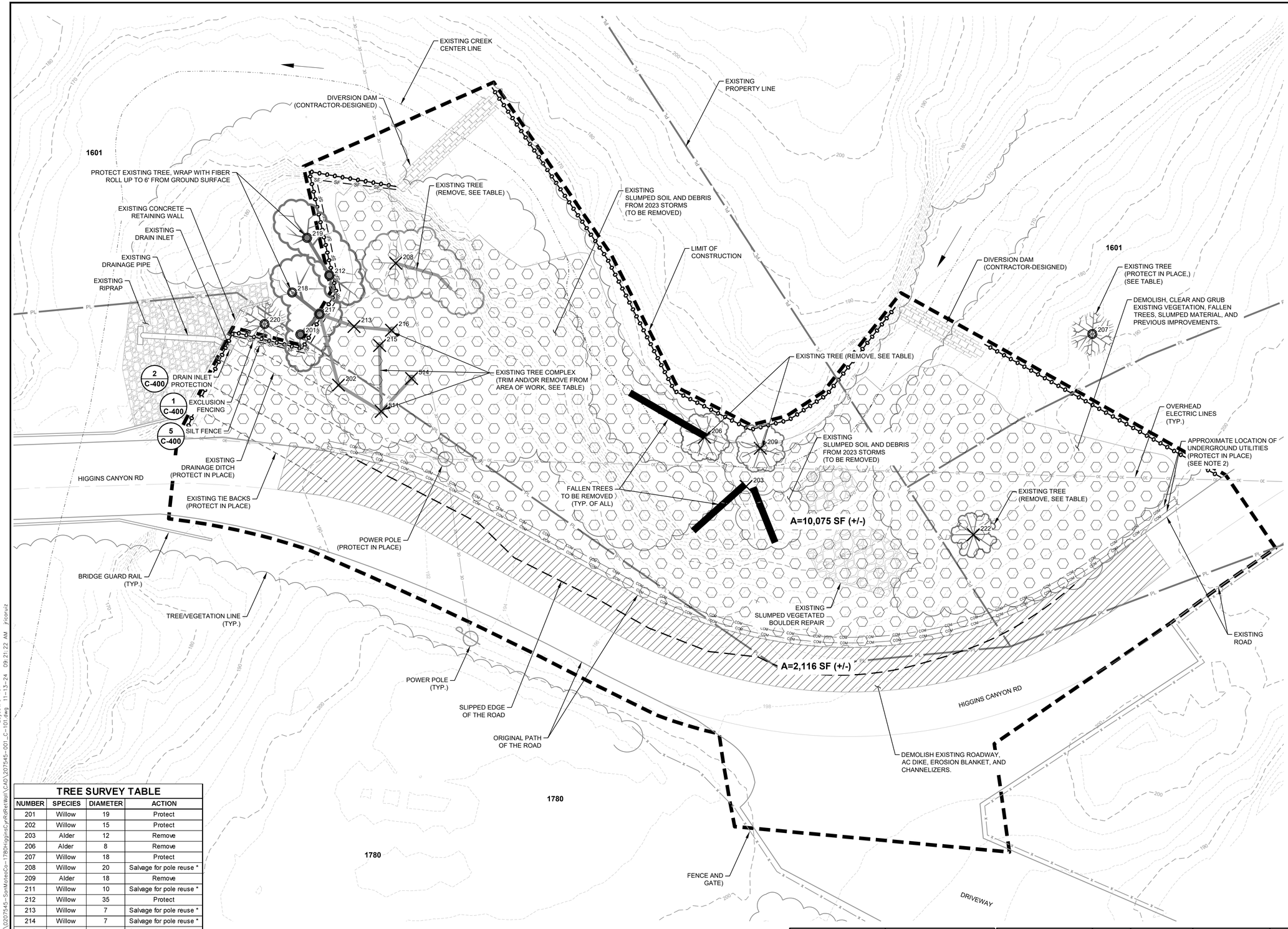
PROJECT NO.: 0207545-007

REVISION	DATE	DESIGNED BY: H&A (ZC)	SLIP-OUT REPAIR AND BANK STABILIZATION	SCALE: AS SHOWN
		DRAWN BY: H&A (KV)	1780 HIGGINS CANYON ROAD	DATE: MAY-2024
		CHECKED BY: H&A (SA)	EXISTING CONDITIONS AND PROPERTY PLAN	FILE NO.: E5082
		ANN MADER STILLMAN, DIRECTOR OF PUBLIC WORKS COUNTY SAN MATEO	555 COUNTY CENTER, 5th FLOOR REDWOOD CITY, CALIFORNIA 94063	

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

C-100
SHEET 09 OF 26

Layout: C-100
\\haleyaldrich\shore\groniita\2023\0207545-SanMateoCo-1780HigginsCyRdRetWall\CAD\207545-001_C-100.dwg 11-13-24 09:21:21 AM jrconuiz



TREE SURVEY TABLE			
NUMBER	SPECIES	DIAMETER	ACTION
201	Willow	19	Protect
202	Willow	15	Protect
203	Alder	12	Remove
206	Alder	8	Remove
207	Willow	18	Protect
208	Willow	20	Salvage for pole reuse *
209	Alder	18	Remove
211	Willow	10	Salvage for pole reuse *
212	Willow	35	Protect
213	Willow	7	Salvage for pole reuse *
214	Willow	7	Salvage for pole reuse *
215	Willow	6	Salvage for pole reuse *
216	Willow	17	Salvage for pole reuse *
217	Willow	36	Protect
218	Willow	14	Protect
219	Willow	6	Protect
220	Willow	14	Protect
222	Black Elderberry	10	Remove

* SALVAGE AT LEAST 5 FEET LONG POLE FOR REUSE

REGISTERED PROFESSIONAL ENGINEER
ANN MADER STILLMAN
C 47882
EXPIRES 12/31/25
CIVIL
STATE OF CALIFORNIA

APPROVED:

DATE: _____

ANN MADER STILLMAN,
DIRECTOR OF PUBLIC WORKS
R. C. E. # 47882 / EXPIRES 12-31-2025

LEGEND

- EXISTING PROPERTY LINE
- EXISTING CONTOUR MAJOR
- EXISTING CONTOUR MINOR
- EXISTING OVERHEAD ELECTRIC
- EXISTING UNDERGROUND UTILITIES
- EXISTING CREEK CENTERLINE
- EXISTING ROADWAY
- EXISTING SLIPPED ROADWAY
- EXISTING TREE/VEGETATION LINE
- 1601 PROPERTY ADDRESS NUMBER
- FALLEN TREES TO BE REMOVED
- 222 EXISTING TREE LOCATION, TO BE REMOVED
- 207 EXISTING TREE LOCATION, TO BE PROTECTED
- PROPOSED LIMITS OF CONSTRUCTION
- PROPOSED EXCLUSION FENCING
- SF SF PROPOSED SILT FENCE
- AREA TO BE DEMOLISHED (ASPHALT REMOVED)
- AREA TO BE CLEARED OF VEGETATION (TREES REMOVED, CLEARED AND GRUBBED)

NOTES

1. FOR SURVEY NOTES REFER TO SHEET G-103.
2. LOCATIONS OF UNDERGROUND UTILITIES ARE APPROXIMATE. CONTRACTOR SHALL FIELD VERIFY EXACT LOCATIONS PRIOR TO START OF ANY EARTH WORK.
3. WRAP EXISTING TREES TO BE PROTECTED WITH FIBER, ROLL IT UP TO 6 FT FROM GROUND SURFACE.
4. PRIOR TO STARTING GRADING, THE AREAS TO BE IMPROVED SHALL BE STRIPPED OF ANY VEGETATION THAT IS NOT MARKED AS "PROTECT IN PLACE."
5. SURFACE VEGETATION AND ORGANICALLY CONTAMINATED TOPSOIL SHOULD BE REMOVED FROM AREAS TO BE GRADED. A GEOTECHNICAL ENGINEER SHALL CERTIFY COMPLETION OF REMOVAL OF SURFACE MATERIAL PRIOR TO MATERIAL IMPORT AND PLACEMENT OF PROPOSED DESIGN ELEMENTS.
6. VOIDS RESULTING FROM THE REMOVAL OF BURIED OBSTRUCTIONS THAT EXTEND BELOW FINISHED SITE GRADES SHOULD BE BACKFILLED WITH ENGINEERED FILL COMPACTED TO THE 95% PROCTOR COMPACTION IF THEY ARE BELOW THE SUBGRADE OR THE MATERIAL SPECIFIED IN THIS PLAN SET IF THEY ARE ABOVE THE SUBGRADE.
7. ROAD DEMOLITION TO INCLUDE EXISTING AC DIKE, EROSION BLANKET, AND CHANNELIZERS.

NOT FOR CONSTRUCTION

75% DESIGN

HALEY & ALDRICH, INC.
785 Ygnacio Valley Road
Walnut Creek, CA 94595
Tel: 925.935.9771
www.haleyaldrich.com

PROJECT NO.: 0207545-007

REVISION	DATE	DESIGNED BY: H&A (ZG)	DRAWN BY: H&A (KV)	CHECKED BY: H&A (SA)

SLIP-OUT REPAIR AND BANK STABILIZATION
1780 HIGGINS CANYON ROAD
DEMOLITION, CLEARING, AND GRUBBING PLAN

ANN MADER STILLMAN,
DIRECTOR OF PUBLIC WORKS
COUNTY SAN MATEO

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

SCALE: AS SHOWN
DATE: **MAY-2024**
FILE NO.: E5082

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

C-101
SHEET 10 OF 26

Layout: C-101
\\haleyaldrich\share\granite\2023\0207545-SanMateoCo-1780HigginsCynRdRetWall\CAD\0207545-001_C-101.dwg 11-13-24 09:21:22 AM jrsouz

EXISTING CREEK CENTER LINE

DIVERSION DAM (CONTRACTOR-DESIGNED)

EXISTING PROPERTY LINE

PROTECT EXISTING TREE

EXISTING CONCRETE RETAINING WALL

EXISTING DRAIN INLET

EXISTING DRAINAGE PIPE

EXISTING VEGETATED REVETMENT

LIMIT OF CONSTRUCTION

DIVERSION DAM (CONTRACTOR-DESIGNED)

TRANSITION FOR CHANNEL BANK (TYP. BOTH ENDS) 6 / C-404

2 / C-400 DRAIN INLET PROTECTION

1 / C-400 EXCLUSION FENCING

5 / C-400 SILT FENCE

OVERHEAD ELECTRIC LINES (TYP.)

APPROXIMATE LOCATION OF UNDERGROUND UTILITIES (SEE NOTE 2)

HIGGINS CANYON RD

EXISTING DRAINAGE DITCH (PROTECT IN PLACE)

EXISTING TIE BACKS (PROTECT IN PLACE)

POWER POLE (PROTECT IN PLACE)

BRIDGE GUARD RAIL (TYP.)

TREE/VEGETATION LINE (TYP.)

EXISTING ROAD

POWER POLE (TYP.)

4 / C-400 ROAD EXCAVATION AND BACKFILL

APPROXIMATE LIMITS OF REPAIRED ROAD SEE NOTE 3

SOLDIER PILE BEAM (TYP.) 1 / C-401

RETAINING WALL 1 / C-401

HIGGINS CANYON RD

FENCE AND GATE)

DRIVEWAY

CUT TABLE

VOLUME	DESCRIPTION
3,265 CY	DEBRIS AND EXISTING MATERIAL
120 CY	ROAD EXCAVATION

NOTES:

1. CUT REQUIRED FOR ROAD IS BASED ON MINIMUM AMOUNT REQUIRED FOR REPAIR.
2. CUT FOR DEBRIS AND REVETMENT BASED ON GRADES AS INDICATED.

0 10 20 30 40
SCALE IN FEET

REGISTERED PROFESSIONAL ENGINEER
ANN MADER STILLMAN
C 47882
EXPIRES 12/31/25
CIVIL
STATE OF CALIFORNIA

APPROVED:

DATE: _____

ANN MADER STILLMAN,
DIRECTOR OF PUBLIC WORKS
R. C. E. # 47882 / EXPIRES 12-31-2025

LEGEND

- EXISTING PROPERTY LINE
- EXISTING CONTOUR MAJOR
- EXISTING CONTOUR MINOR
- EXISTING OVERHEAD ELECTRIC
- EXISTING UNKNOWN UNDERGROUND UTILITIES
- EXISTING CREEK CENTERLINE
- EXISTING ROADWAY
- EXISTING SLIPPED ROADWAY
- EXISTING TREE/VEGETATION LINE
- PROPOSED LIMITS OF CONSTRUCTION
- PROPOSED EXCLUSION FENCING
- PROPOSED SILT FENCE
- PROPOSED CREEK CENTERLINE
- PROPOSED TREE/VEGETATION LINE
- PROPOSED CONTOUR MAJOR
- PROPOSED CONTOUR MINOR

NOTES

1. FOR SURVEY NOTES REFER TO SHEET G-103.
2. LOCATIONS OF UNDERGROUND UTILITIES ARE APPROXIMATE. CONTRACTOR SHALL FIELD VERIFY EXACT LOCATIONS PRIOR TO START OF ANY EARTH WORK AND REPLACE PRIOR TO INSTALLING THE GUARDRAIL.
3. LIMITS OF ASPHALT SHOWN AT THE ENDS OF NEW WORK ALONG HIGGINS CANYON ROAD ARE APPROXIMATE. THE ACTUAL LIMIT OF PAVING WILL BE FIELD DETERMINED BASED ON THE QUALITY AND COMPETENCE OF THE EXISTING PAVEMENT TO BE TIED INTO.
4. PROPOSED CONTOURS SHOWN HEREON ARE THE ELEVATION OF THE SUBGRADE AND NOT THE FINISHED GRADE. FOR FINISHED GRADE ELEVATIONS SEE SHEET C-103.
5. IT IS ANTICIPATED THAT EXCAVATION OF ONSITE SOILS MAY BE ACCOMPLISHED WITH STANDARD EARTHMOVING AND TRENCHING EQUIPMENT.
6. THE CHANNEL BED AND BANKS IN THE AREA TO BE IMPROVED IS KNOWN TO CONTAIN ROCK FORMATIONS. PRELIMINARY INVESTIGATIONS INDICATE THAT THE ROCKS ARE GENERALLY SEDIMENTARY IN NATURE AND MAY BE DESCRIBED AS PURISIMA FORMATION. THE EXCAVATION OF THESE ROCK FORMATIONS WILL VARY WITH RESPECT TO DIFFICULTY. STANDARD EARTHMOVING AND TRENCHING EQUIPMENT MAY BE APPROPRIATE TO EXCAVATE FRACTURED / WEATHERED ZONES OF THE BEDROCK. HOWEVER BASED ON PREVIOUS EXPERIENCE WITH PURISIMA FOUNDATION IT SHOULD BE ANTICIPATED THAT RELATIVELY UNFRACTURED, VERY DENSE, MEDIUM STRONG TO STRONG ROCK MAY BE ENCOUNTERED IN AREAS TO BE EXCAVATED. EQUIPMENT CAPABLE OF EXCAVATING THROUGH ROCK SHOULD BE ANTICIPATED FOR CONSTRUCTION OF THIS PROJECT.

NOT FOR CONSTRUCTION

75% DESIGN

HALEY & ALDRICH, INC.
785 Ygnacio Valley Road
Walnut Creek, CA 94595
Tel: 925.935.9771
www.haleyaldrich.com

PROJECT NO.: 0207545-007

REVISION	DATE	DESIGNED BY: H&A (ZG)	DRAWN BY: H&A (KV)	CHECKED BY: H&A (SA)

SLIP-OUT REPAIR AND BANK STABILIZATION
1780 HIGGINS CANYON ROAD
EXCAVATION PLAN

ANN MADER STILLMAN,
DIRECTOR OF PUBLIC WORKS
COUNTY SAN MATEO

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

SCALE: AS SHOWN
DATE: **MAY-2024**
FILE NO.: E5082

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

C-102
SHEET 11 OF 26

I:\haleyaldrich\share\granite\2023\0207545-SanMateoCo-1780HigginsCynRdRetWall\CAD\207545-001_C-102.dwg 11-13-24 09:21:24 AM jcoruz
Layout: C-102

REGISTERED PROFESSIONAL ENGINEER
ANN MADER STILLMAN
C 47882
EXPIRES 12/31/25
CIVIL
STATE OF CALIFORNIA

APPROVED:

DATE: _____

ANN MADER STILLMAN,
DIRECTOR OF PUBLIC WORKS
R. C. E. # 47882 / EXPIRES 12-31-2025

EXISTING CREEK CENTER LINE
DIVERSION DAM (CONTRACTOR-DESIGNED)
EXISTING TREE (WILLOW, TYP.) (SEE TABLE)
CONFORM EDGES TO EXISTING BANK SLOPE
EXISTING PROPERTY LINE
PROTECT EXISTING TREE
EXISTING CONCRETE RETAINING WALL
EXISTING DRAIN INLET
EXISTING DRAINAGE PIPE
EXISTING VEGETATED REVETMENT
RESTORED CREEK THALWEG
LIMIT OF CONSTRUCTION
DIVERSION DAM (CONTRACTOR-DESIGNED)
TRANSITION FOR CHANNEL BANK (TYP. BOTH ENDS) 6/C-404
CONFORM EDGES TO EXISTING BANK SLOPE
OVERHEAD ELECTRIC LINES (TYP.)
APPROXIMATE LOCATION OF UNDERGROUND UTILITIES (SEE NOTE 2)
2/C-400 DRAIN INLET PROTECTION
1/C-400 EXCLUSION FENCING
5/C-400 SILT FENCE
EXISTING DRAINAGE DITCH (PROTECT IN PLACE)
HIGGINS CANYON RD
EXISTING TIE BACKS (PROTECT IN PLACE)
POWER POLE (PROTECT IN PLACE)
TREE/VEGETATION LINE (TYP.)
BRIDGE GUARD RAIL (TYP.)
POWER POLE (TYP.)
EXISTING ROAD
HIGGINS CANYON RD
APPROXIMATE LIMITS OF REPAIRED ROAD SEE NOTE 3
SOLDIER PILE BEAM (TYP.) 1/C-401
RETAINING WALL 1/C-401
FENCE AND GATE)
DRIVEWAY
1.5:1
2.0:1
1.5:1 MIN.

LEGEND

- EXISTING PROPERTY LINE
- EXISTING CONTOUR MAJOR
- EXISTING CONTOUR MINOR
- EXISTING OVERHEAD ELECTRIC
- EXISTING UNKNOWN UNDERGROUND UTILITIES
- EXISTING CREEK CENTERLINE
- EXISTING ROADWAY
- EXISTING SLIPPED ROADWAY
- EXISTING TREE/VEGETATION LINE
- PROPOSED LIMITS OF CONSTRUCTION
- PROPOSED EXCLUSION FENCING
- PROPOSED SILT FENCE
- PROPOSED CREEK CENTERLINE
- PROPOSED TREE/VEGETATION LINE
- PROPOSED CONTOUR MAJOR
- PROPOSED CONTOUR MINOR

FILL TABLE

VOLUME	MATERIAL
90 CY	CREEK BED MATERIAL
165 CY	ENGINEERED CREED BED BASE (COMPRISED OF BOULDER REVETMENT MATERIAL AND VOIDS FILLED WITH UNIVERSAL GRAVEL)
505 CY	VEGETATED BOULDER REVETMENT (COMPRISED OF BOULDER REVETMENT MATERIAL AND VOIDS FILLED WITH ENGINEERED REVETMENT FILL)
150 CY	INNER REVETMENT MATERIAL
65 CY	UNIVERSAL GRAVEL FILTER MATERIAL (NOT INCLUDING VOLUME IN ENGINEERED CREEK BED BASE)
565 CY	TOP SOIL
70 CY	ROAD FILL
70 CY	ROAD BASE

NOTES

1. INDIVIDUAL LAYERS AND VOLUMES ARE BASED ON VOLUME RATIOS AS DEFINED BY LAYER THICKNESS. ACTUAL VOLUMES MAY VARY BY 10%.

NOTES

1. FOR SURVEY NOTES REFER TO SHEET G-103.
2. LOCATIONS OF UNDERGROUND UTILITIES ARE APPROXIMATE. CONTRACTOR SHALL FIELD VERIFY EXACT LOCATIONS PRIOR TO START OF ANY EARTH WORK AND REPLACE PRIOR TO INSTALLING THE GUARDRAIL.
3. LIMITS OF ASPHALT SHOWN AT THE ENDS OF NEW WORK ALONG HIGGINS CANYON ROAD ARE APPROXIMATE. THE ACTUAL LIMIT OF PAVING WILL BE FIELD DETERMINED BASED ON THE QUALITY AND COMPETENCE OF THE EXISTING PAVEMENT TO BE TIED INTO.

NOT FOR CONSTRUCTION

75% DESIGN

0 10 20 30 40
SCALE IN FEET

HALEY & ALDRICH, INC.
785 Ygnacio Valley Road
Walnut Creek, CA 94595
Tel: 925.935.9771
www.haleyaldrich.com

PROJECT NO.: 0207545-007

REVISION	DATE	DESIGNED BY: H&A (ZG)	DRAWN BY: H&A (KV)	CHECKED BY: H&A (SA)

SLIP-OUT REPAIR AND BANK STABILIZATION
1780 HIGGINS CANYON ROAD
FINAL GRADING PLAN

ANN MADER STILLMAN,
DIRECTOR OF PUBLIC WORKS
COUNTY SAN MATEO

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

SCALE: AS SHOWN
DATE: **MAY-2024**
FILE NO.: E5082

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

C-103
SHEET 12 OF 26

\\haleyaldrich\share\granite\2023\0207545-SanMateoCo-1780HigginsCynRdRetWall\CAD\207545-001_C-103.dwg 11-13-24 09:21:25 AM jcoruz
Layout: C-103

APPROVED:

DATE: _____

ANN MADER STILLMAN,
DIRECTOR OF PUBLIC WORKS
R. C. E. # 47882 / EXPIRES 12-31-2025

REGISTERED PROFESSIONAL ENGINEER
ANN MADER STILLMAN
C 47882
EXPIRES 12/31/25
CIVIL
STATE OF CALIFORNIA

EXISTING CREEK CENTER LINE
DIVERSION DAM (CONTRACTOR-DESIGNED)
5 C-400 SILT FENCE
EXISTING PROPERTY LINE
TRANSITION FOR CHANNEL BANKS AND CREEK (TYP. BOTH ENDS) 6, 7 C-404
SPECIMEN BOULDER 2 C-404
EXISTING CONCRETE RETAINING WALL
EXISTING DRAIN INLET
EXISTING DRAINAGE PIPE
EXISTING VEGETATED REVETMENT
RESTORED CREEK THALWEG
LIMIT OF CONSTRUCTION
ROOTWAD 1 C-404
TYPICAL VEGETATED REVETMENT SECTION 1 C-403
ENGINEERED CREEK BED 1 C-403
1 C-400 EXCLUSION FENCING
5 C-400 SILT FENCE
5 C-402 6" CRUSHED STONE SWALE (A=220 SF)
HIGGINS CANYON RD
EXISTING TIE BACKS (PROTECT IN PLACE)
MSKT TERMINAL END (TYP 2 PLACES)
POWER POLE (PROTECT IN PLACE)
BRIDGE GUARD RAIL (TYP.)
A87B C-406 TYPE F AC DIKES
TREE/VEGETATION LINE (TYP.)
POWER POLE (TYP.)
A = 3,115 SF (+/-)
ORIGINAL PATH OF THE ROAD
A77L1 C-405 GUARD RAIL
APPROXIMATE LIMITS OF REPAIRED ROAD SEE NOTE 3
CONTRACTOR TO COORDINATE WITH PROPERTY OWNER FOR AC PAVING REPAIRS
FENCE AND GATE)
DRIVEWAY
DIVERSION DAM (CONTRACTOR-DESIGNED)
TRANSITION FOR CHANNEL BANK (TYP. BOTH ENDS) 6 C-404
VEGETATED BOULDER REVETMENT 1 C-403
VEGETATED SOIL LIFTS 1 C-403
OVERHEAD ELECTRIC LINES (TYP.)
APPROXIMATE LOCATION OF UNDERGROUND UTILITIES (PROTECT IN PLACE) (SEE NOTE 2)
EXISTING ROAD
HIGGINS CANYON RD
SOLDIER PILE BEAM (TYP.) 1 C-401
RETAINING WALL 1 C-401

LEGEND

- EXISTING PROPERTY LINE
- EXISTING CONTOUR MAJOR
- EXISTING CONTOUR MINOR
- EXISTING OVERHEAD ELECTRIC
- EXISTING UNKNOWN UNDERGROUND UTILITIES
- EXISTING CREEK CENTERLINE
- EXISTING ROADWAY
- EXISTING SLIPPED ROADWAY
- EXISTING TREE/VEGETATION LINE
- PROPOSED LIMITS OF CONSTRUCTION
- PROPOSED EXCLUSION FENCING
- PROPOSED SILT FENCE
- PROPOSED CREEK CENTERLINE
- PROPOSED TREE/VEGETATION LINE
- PROPOSED CONTOUR MAJOR
- PROPOSED CONTOUR MINOR
- PROPOSED ASPHALT (NOTE 3)
- PROPOSED GUARDRAIL
- PROPOSED ENGINEERED CREEK BED
- PROPOSED VEGETATED BOULDER REVETMENT
- PROPOSED VEGETATED SOIL LIFTS
- PROPOSED WALL BASE AND ROAD SHOULDER

NOTES

1. FOR SURVEY NOTES REFER TO SHEET G-103.
2. LOCATIONS OF UNDERGROUND UTILITIES ARE APPROXIMATE. CONTRACTOR SHALL FIELD VERIFY EXACT LOCATIONS PRIOR TO START OF ANY EARTH WORK AND REPLACE PRIOR TO INSTALLING THE GUARDRAIL.
3. LIMITS OF ASPHALT SHOWN AT THE ENDS OF NEW WORK ALONG HIGGINS CANYON ROAD ARE APPROXIMATE. THE ACTUAL LIMIT OF PAVING WILL BE FIELD DETERMINED BASED ON THE QUALITY AND COMPETENCE OF THE EXISTING PAVEMENT TO BE TIED INTO.

NOT FOR CONSTRUCTION

75% DESIGN

0 10 20 30 40
SCALE IN FEET

HALEY & ALDRICH, INC.
785 Ygnacio Valley Road
Walnut Creek, CA 94595
Tel: 925.935.9771
www.haleyaldrich.com

PROJECT NO.: 0207545-007

COUNTY OF SAN MATEO PUBLIC WORKS

REVISION	DATE	DESIGNED BY: H&A (ZG)	SLIP-OUT REPAIR AND BANK STABILIZATION	SCALE: AS SHOWN
		DRAWN BY: H&A (KV)	1780 HIGGINS CANYON ROAD	DATE: MAY-2024
		CHECKED BY: H&A (SA)	SITE PLAN	FILE NO.: E5082
		ANN MADER STILLMAN, DIRECTOR OF PUBLIC WORKS COUNTY SAN MATEO		555 COUNTY CENTER, 5th FLOOR REDWOOD CITY, CALIFORNIA 94063

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

C-104
SHEET 13 OF 26

Layout: C-104
\\haleyaldrich\shore\grenile\2023\0207545-SanMateoCo-1780HigginsCynRdRetWall\CAD\207545-001_C-104.dwg 11-13-24 09:21:28 AM jrlorusz

APPROVED:

DATE: _____

ANN MADER STILLMAN,
DIRECTOR OF PUBLIC WORKS
R. C. E. # 47882 / EXPIRES 12-31-2025

REGISTERED PROFESSIONAL ENGINEER
ANN MADER STILLMAN
C 47882
EXPIRES 12/31/25
CIVIL
STATE OF CALIFORNIA

EXISTING CREEK CENTER LINE
DIVERSION DAM (CONTRACTOR-DESIGNED)
EXISTING PROPERTY LINE
RESTORED CREEK THALWEG
LIMIT OF CONSTRUCTION
EXISTING CONCRETE RETAINING WALL
EXISTING DRAIN INLET
EXISTING DRAINAGE PIPE
EXISTING VEGETATED REVETMENT
RIPARIAN UPPER BANK REVEGETATION
RIPARIAN LOWER BANK REVEGETATION
HIGGINS CANYON RD
EXISTING TIE BACKS
POWER POLE
BRIDGE GUARD RAIL (TYP.)
TREE/VEGETATION LINE (TYP.)
POWER POLE (TYP.)
ORIGINAL PATH OF THE ROAD
GUARD RAIL
FENCE AND GATE)
APPROXIMATE LIMITS OF REPAIRED ROAD SEE NOTE 3
DRIVEWAY
OVERHEAD ELECTRIC LINES (TYP.)
APPROXIMATE LOCATION OF UNDERGROUND UTILITIES (SEE NOTE 2)
EXISTING ROAD
SOLDIER PILE BEAM (TYP.)
RETAINING WALL

LEGEND

- EXISTING PROPERTY LINE
- EXISTING CONTOUR MAJOR
- EXISTING CONTOUR MINOR
- EXISTING OVERHEAD ELECTRIC
- EXISTING UNKNOWN UNDERGROUND UTILITIES
- EXISTING CREEK CENTERLINE
- EXISTING ROADWAY
- EXISTING SLIPPED ROADWAY
- EXISTING TREE/VEGETATION LINE
- PROPOSED LIMITS OF CONSTRUCTION
- PROPOSED CREEK CENTERLINE
- PROPOSED TREE/VEGETATION LINE
- PROPOSED EXCLUSION FENCING
- PROPOSED SILT FENCE
- PROPOSED CONTOUR MAJOR
- PROPOSED CONTOUR MINOR
- PROPOSED ASPHALT (NOTE 3)
- PROPOSED GUARDRAIL
- PROPOSED ENGINEERED CREEK BED
- PROPOSED VEGETATED BOULDER REVETMENT
- PROPOSED VEGETATED SOIL LIFTS
- PROPOSED WALL BASE AND ROAD SHOULDER
- ENGINEERED CREEK BED MATERIAL
- RIPARIAN LOWER BANKS REVEGETATION
- RIPARIAN UPPER BANKS REVEGETATION
- REVEGETATION

NOTES

1. FOR SURVEY NOTES REFER TO SHEET G-103.
2. LOCATIONS OF UNDERGROUND UTILITIES ARE APPROXIMATE. CONTRACTOR SHALL FIELD VERIFY EXACT LOCATIONS PRIOR TO START OF ANY EARTH WORK AND REPLACE PRIOR TO INSTALLING THE GUARDRAIL.
3. LIMITS OF ASPHALT SHOWN AT THE ENDS OF NEW WORK ALONG HIGGINS CANYON ROAD ARE APPROXIMATE. THE ACTUAL LIMIT OF PAVING WILL BE FIELD DETERMINED BASED ON THE QUALITY AND COMPETENCE OF THE EXISTING PAVEMENT TO BE TIED INTO.

PLANTING ZONE	SCIENTIFIC NAME	COMMON NAME	SIZE	LAYOUT
RIPARIAN LOWER BANK	SALIX LAPSIOLEPSIS	ARROYO WILLOW	8' LIVE STEM	1.5 - 3' ON CENTER
	CORNUS SERICEA	RED OSIER DOGWOOD	8' LIVE STEM	1.5 - 3' ON CENTER
	SEE BELOW	SEED MIX	HYDROSEEDED	HYDROSEEDED
RIPARIAN UPPER BANK	LONICERA INVOLUCRATA	TWINBERRY	1 GAL	SCATTERED AND IN GROUPS, 5' ON CENTER
	RUBUS URSINUS	CALIFORNIA BLACKBERRY	1 GAL	SCATTERED AND IN GROUPS, 5' ON CENTER
	RUBUS PARVIFLORUS	THIMBLEBERRY	D-16	SCATTERED AND IN GROUPS, 3' ON CENTER
	ARTEMISIA DOUGLASIANA	MUGWORT	D-16	SCATTERED AND IN GROUPS, 3' ON CENTER
	SCROPHULARIA CALIFORNICA	BEE PLANT	D-16	SCATTERED AND IN GROUPS, 3' ON CENTER
	SEE BELOW	SEED MIX	HYDROSEEDED	HYDROSEEDED

SEED MIX **LBS/ACRE**

- SYMPHYOTRICHUM CHILENSE, CALIFORNIA ASTER 2
- BOMUS CARINATUS, CALIFORNIA BROME 12
- HORDEUM BRACHYANTHERUM, MEADOW BARLEY 10
- FESTUCA RUBRA "MOLATE", MOLATE RED FESCUE 8
- LEYMUS TRITICOIDES, CREEPING WILDRYE 8

PLANTING NOTES

1. APPLY HYRDOSEED MIX TO ALL DISTURBED AREAS ABOVE THE OHW AND WITHOUT DURABLE COVER (ASPHALT OR GRAVEL).
2. PLANTING PALETTE SHALL BE AS INDICATED OR USING APPROVED EQUAL BASED ON AVAILABILITY.

0 10 20 30 40
SCALE IN FEET

NOT FOR CONSTRUCTION

75% DESIGN

HALEY & ALDRICH, INC.
785 Ygnacio Valley Road
Walnut Creek, CA 94595
Tel: 925.935.9771
www.haleyaldrich.com

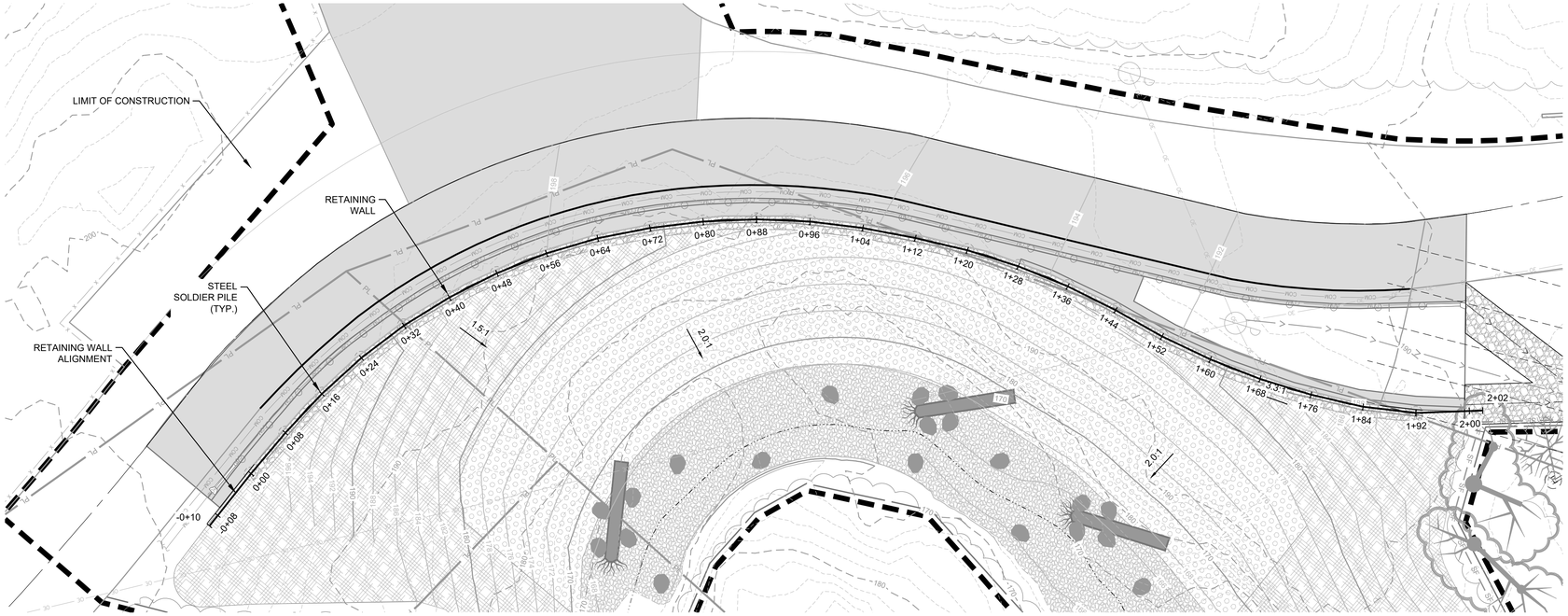
PROJECT NO.: 0207545-007

REVISION	DATE	DESIGNED BY: H&A (ZG)	SLIP-OUT REPAIR AND BANK STABILIZATION	SCALE: AS SHOWN
		DRAWN BY: H&A (KV)	1780 HIGGINS CANYON ROAD	DATE: MAY-2024
		CHECKED BY: H&A (SA)	**PLANTING PLAN**	FILE NO.: E5082
		ANN MADER STILLMAN, DIRECTOR OF PUBLIC WORKS COUNTY SAN MATEO		555 COUNTY CENTER, 5th FLOOR REDWOOD CITY, CALIFORNIA 94063

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

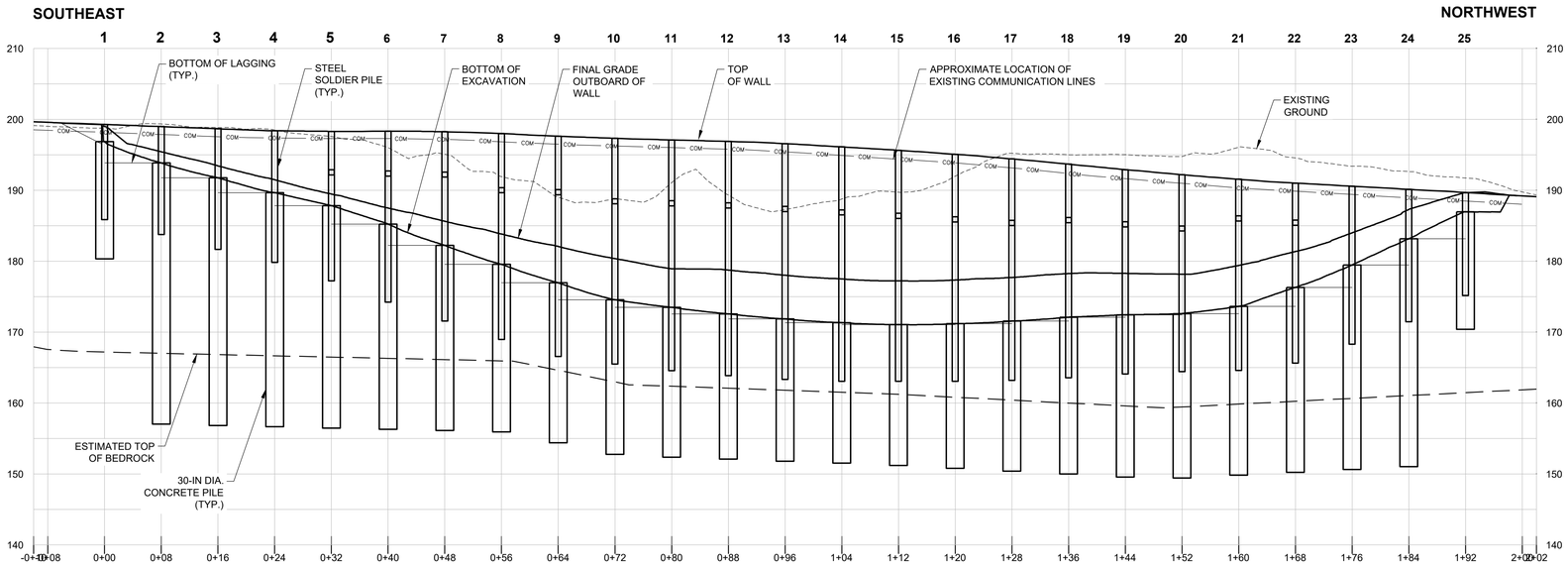
C-105
SHEET 14 OF 26

Layout: C-105
\\haleyaldrich\share\grantle\2023\0207545-SanMateoCo-1780HigginsCynRdRetWall\CAD\207545-001_C-105.dwg 11-13-24 09:21:32 AM jricruiz



RETAINING WALL PLAN

0 10 20 30 40
SCALE IN FEET



RETAINING WALL PROFILE

HORIZ. 0 10 20 30 40
VERT. 0 10 20 30 40
SCALE IN FEET

LEGEND

- EXISTING PROPERTY LINE
- 310 EXISTING CONTOUR MAJOR
- EXISTING CONTOUR MINOR
- EXISTING SLIP BOUNDARY
- OE EXISTING OVERHEAD ELECTRIC
- ES EXISTING PROPERTY EASEMENT
- EXISTING ROADWAY
- EXISTING SLIPPED ROADWAY
- PROPOSED LIMITS OF CONSTRUCTION
- 290 PROPOSED CONTOUR MAJOR
- 289 PROPOSED CONTOUR MINOR
- 290 PROPOSED CONTOUR MAJOR (EXCAVATION)
- PROPOSED CONTOUR MINOR (EXCAVATION)
- PROPOSED ROADWAY
- PROPOSED GUARDRAIL
- LIMITS OF ASPHALT
- PROPOSED ENGINEERED CREEK BED
- PROPOSED VEGETATED BOULDER REVETMENT
- PROPOSED VEGETATED SOIL LIFTS
- PROPOSED GRAVEL SHOULDER

REGISTERED PROFESSIONAL ENGINEER
ANN MADER STILLMAN
C 47882
EXPIRES 12/31/25
CIVIL
STATE OF CALIFORNIA

APPROVED:

DATE: _____

ANN MADER STILLMAN,
DIRECTOR OF PUBLIC WORKS
R. C. E. # 47882 / EXPIRES 12-31-2025

NOTES

1. FOR SURVEY NOTES REFER TO SHEET G-103.
2. MAXIMUM UNBRACED HEIGHT OF WALL IS 12 FT. DEGRADE BEHIND WALL OR ADD FILL IN FRONT OF WALL AS NEEDED PRIOR TO INSTALLING TIEBACKS.
3. CONTRACTOR SHALL SUBMIT TEMPORARY SHORING PLAN FOR SUPPORT OF EXCAVATION DURING CONSTRUCTION.

NOT FOR CONSTRUCTION

75% DESIGN

HALEY & ALDRICH, INC.
785 Ygnacio Valley Road
Walnut Creek, CA 94595
Tel: 925.935.9771
www.haleyaldrich.com

PROJECT NO.: 0207545-007

REVISION	DATE

DESIGNED BY: H&A (ZG)
DRAWN BY: H&A (KV)
CHECKED BY: H&A (SA)

SLIP-OUT REPAIR AND BANK STABILIZATION
1780 HIGGINS CANYON ROAD
RETAINING WALL PLAN AND PROFILE

SCALE: AS SHOWN
DATE: **MAY-2024**
FILE NO.: E5082

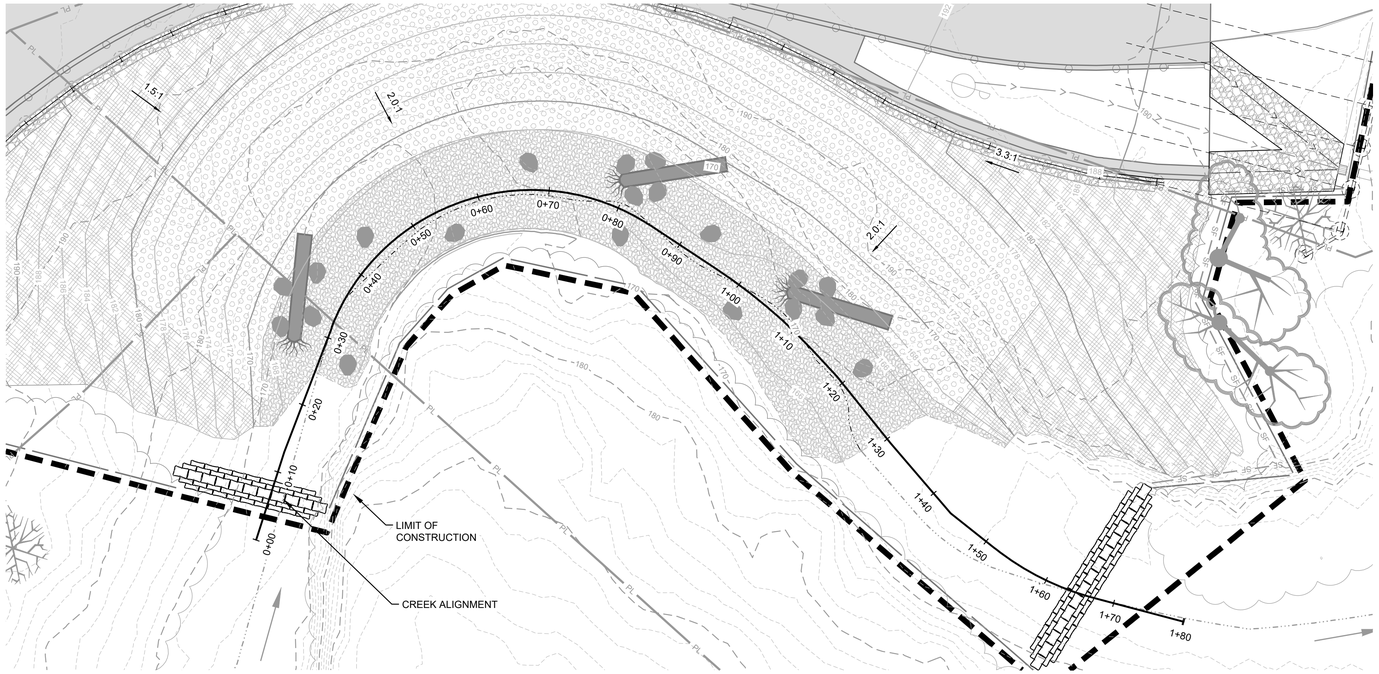
ANN MADER STILLMAN,
DIRECTOR OF PUBLIC WORKS
COUNTY SAN MATEO

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

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

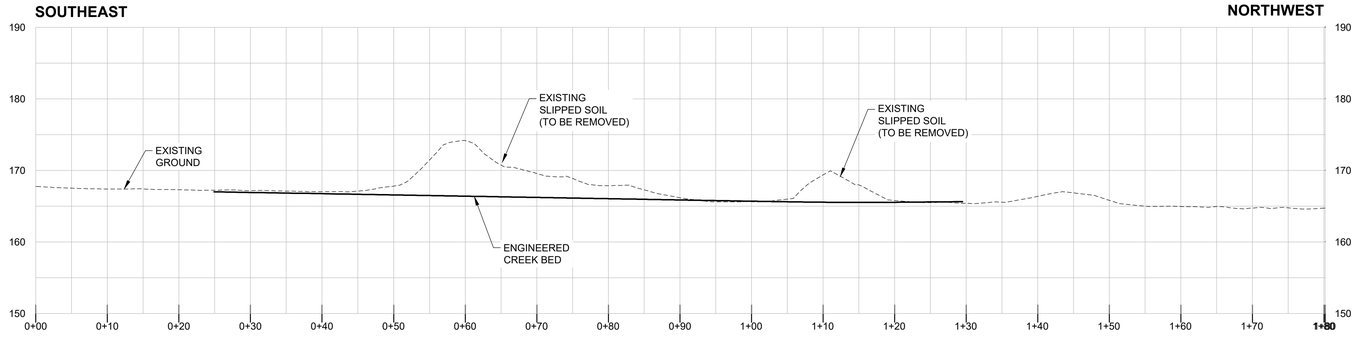
C-200
SHEET 15 OF 26

\\haleyaldrich\share\granite\2023\0207545-SanMateoCo-1780HigginsCynRdRetWall\CAD\0207545-001_C-200s.dwg 11-13-24 09:21:36 AM jriconuz
Layout: C-200

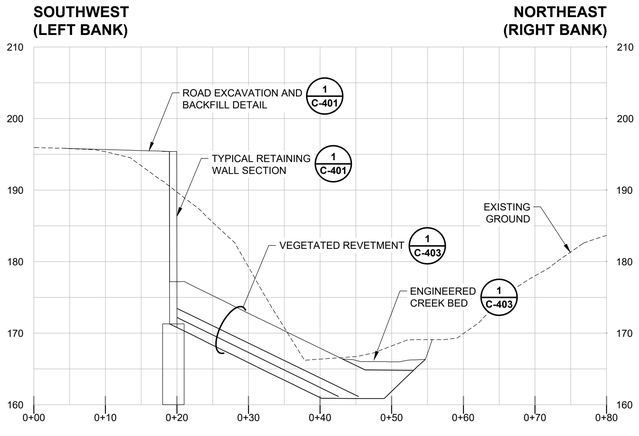


CHANNEL PLAN

0 10 20 30 40
SCALE IN FEET



CHANNEL PROFILE



TYPICAL CHANNEL SECTION

HORIZ. 0 10 20 30 40
VERT. 0 10 20 30 40
SCALE IN FEET

REGISTERED PROFESSIONAL ENGINEER
ANN MADER STILLMAN
C 47882
EXPIRES 12/31/25
CIVIL
STATE OF CALIFORNIA

APPROVED:

DATE: _____

ANN MADER STILLMAN,
DIRECTOR OF PUBLIC WORKS
R. C. E. # 47882 / EXPIRES 12-31-2025

LEGEND

- EXISTING PROPERTY LINE
- EXISTING CONTOUR MAJOR (310)
- EXISTING CONTOUR MINOR
- EXISTING SLIP BOUNDARY
- EXISTING OVERHEAD ELECTRIC (OE)
- EXISTING PROPERTY EASEMENT (ES)
- EXISTING ROADWAY
- EXISTING SLIPPED ROADWAY
- PROPOSED LIMITS OF CONSTRUCTION
- PROPOSED CONTOUR MAJOR (290)
- PROPOSED CONTOUR MINOR (289)
- PROPOSED CONTOUR MAJOR (EXCAVATION) (290)
- PROPOSED CONTOUR MINOR (EXCAVATION)
- PROPOSED ENGINEERED CREEK BED
- PROPOSED VEGETATED BOULDER REVETMENT
- PROPOSED VEGETATED SOIL LIFTS
- PROPOSED GRAVEL SHOULDER
- LIMITS OF ASPHALT

NOTES

1. FOR SURVEY NOTES REFER TO SHEET G-103.

NOT FOR CONSTRUCTION

75% DESIGN

HALEY & ALDRICH, INC.
785 Ygnacio Valley Road
Walnut Creek, CA 94595
Tel: 925.935.9771
www.haleyaldrich.com

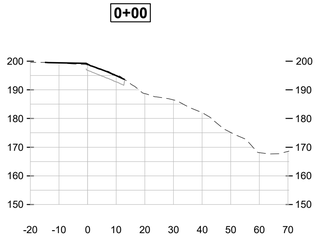
PROJECT NO.: 0207545-007

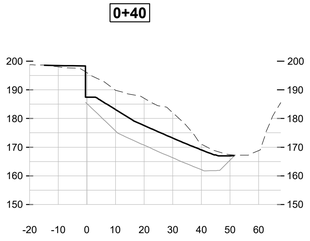
REVISION	DATE	DESIGNED BY: H&A (ZG)	SLIP-OUT REPAIR AND BANK STABILIZATION 1780 HIGGINS CANYON ROAD	SCALE: AS SHOWN
		DRAWN BY: H&A (KV)	**CHANNEL PLAN, PROFILE, AND TYPICAL SECTION**	DATE: **MAY-2024**
		CHECKED BY: H&A (SA)		FILE NO.: E5082
		ANN MADER STILLMAN, DIRECTOR OF PUBLIC WORKS COUNTY SAN MATEO	555 COUNTY CENTER, 5th FLOOR REDWOOD CITY, CALIFORNIA 94063	

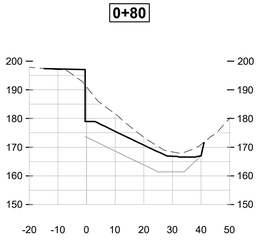
FOR REDUCED PLANS ORIGINAL SCALE IS IN INCHES 0 1 2 3 4

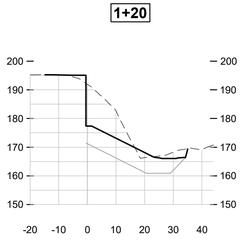
C-201
SHEET 16 OF 26

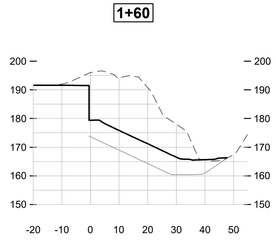
\\haleyaldrich\share\granite\2023\0207545-SanMateoCo-1780HigginsCynRdRetWall\CAD\207545-001_C-200s.dwg 11-13-24 09:21:41 AM jricaruiz
Layout: C-201

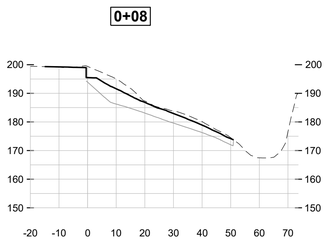


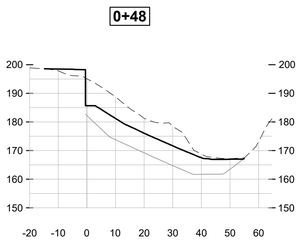


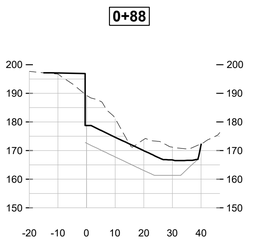


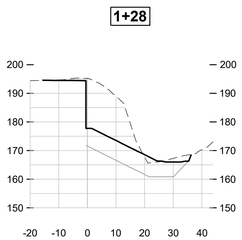


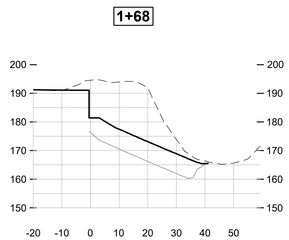


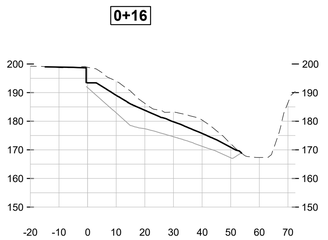


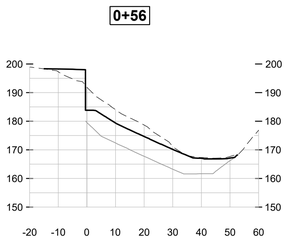


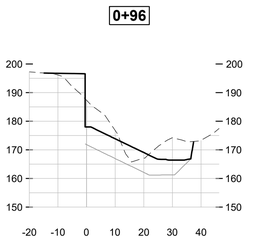


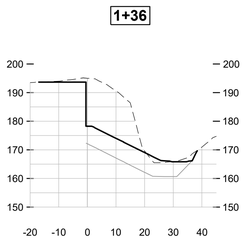


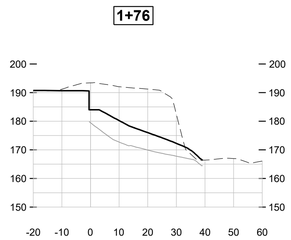


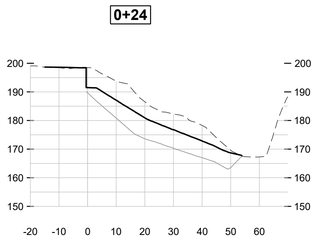


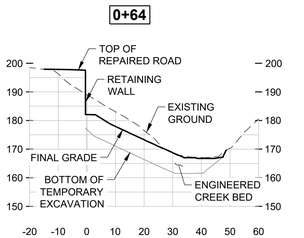


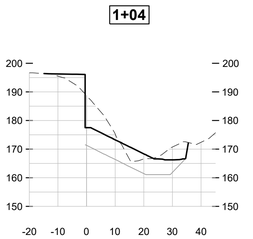


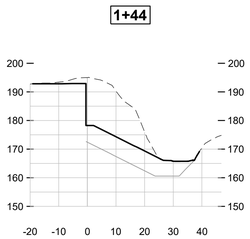


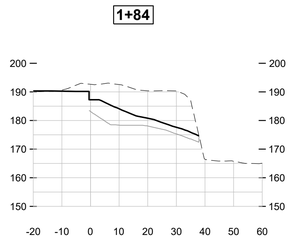


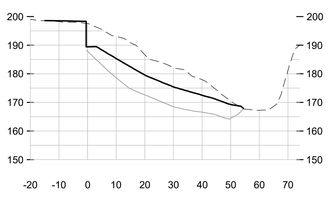


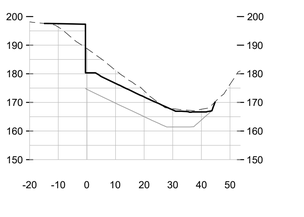


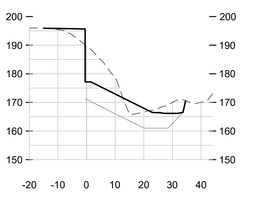


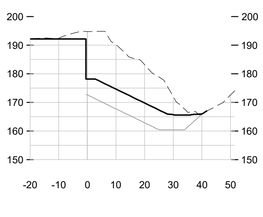


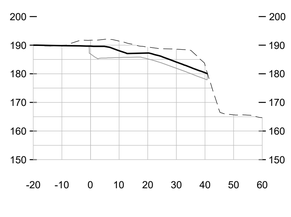


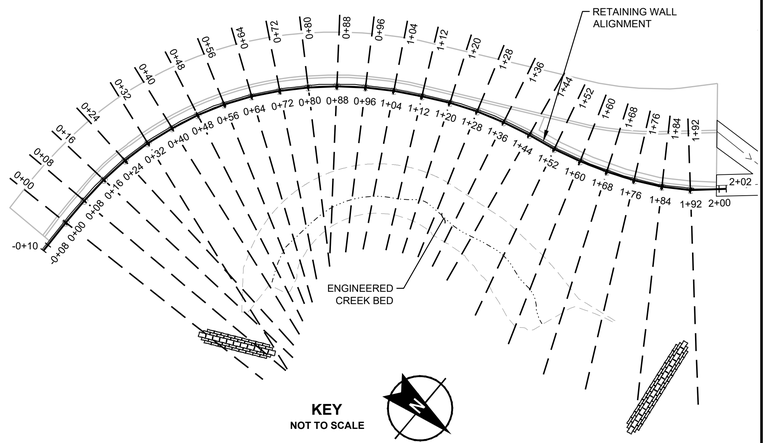












REGISTERED PROFESSIONAL ENGINEER
ANN MADER STILLMAN
C 47882
EXPIRES 12/31/25
CIVIL
STATE OF CALIFORNIA

APPROVED:

DATE: _____

ANN MADER STILLMAN,
DIRECTOR OF PUBLIC WORKS
R. C. E. # 47882 / EXPIRES 12-31-2025

NOT FOR CONSTRUCTION

75% DESIGN

HORIZ. 0 25 50 75 100
VERT. 0 25 50 75 100
SCALE IN FEET

HALEY & ALDRICH, INC.
785 Ygnacio Valley Road
Walnut Creek, CA 94595
Tel: 925.935.9771
www.haleyaldrich.com

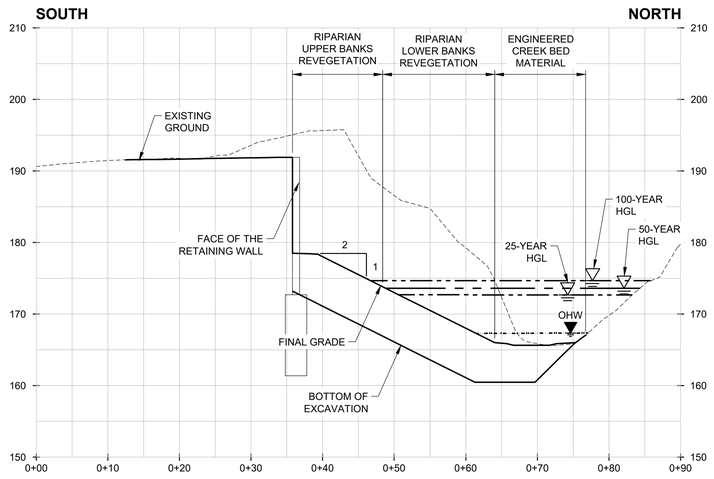
PROJECT NO.: 0207545-007

REVISION	DATE	DESIGNED BY: H&A (ZG)	SLIP-OUT REPAIR AND BANK STABILIZATION	SCALE: AS SHOWN
		DRAWN BY: H&A (KV)	1780 HIGGINS CANYON ROAD	DATE: **MAY-2024**
		CHECKED BY: H&A (SA)	**ROAD AND CHANNEL CROSS-SECTIONS**	FILE NO.: E5082
		ANN MADER STILLMAN, DIRECTOR OF PUBLIC WORKS COUNTY SAN MATEO		555 COUNTY CENTER, 5th FLOOR REDWOOD CITY, CALIFORNIA 94063

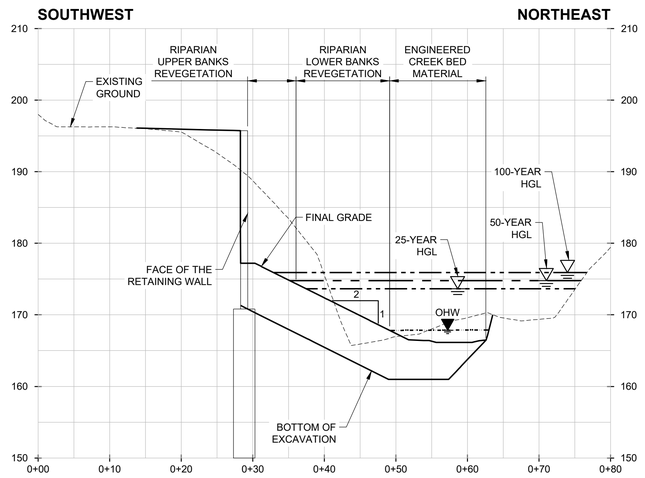
FOR REDUCED PLANS ORIGINAL SCALE IS IN INCHES 0 1 2 3 4

C-202
SHEET 17 OF 26

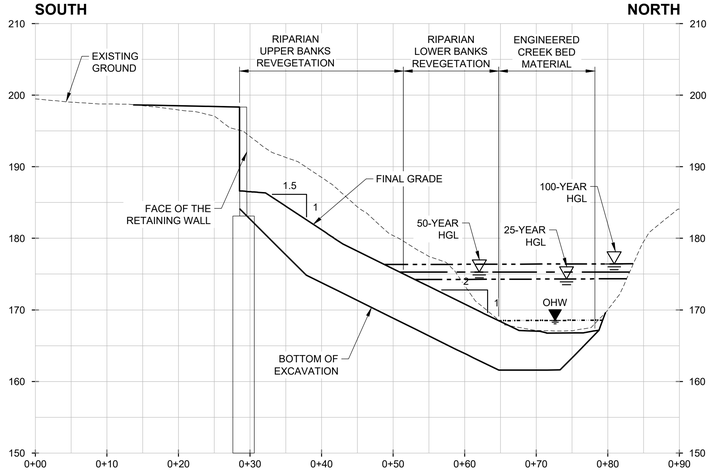
\\haleyaldrich\share\granite\2023\0207545-SanMateoCo-1780HigginsCynRetWall\CAD\207545-001_C-200s.dwg 11-13-24 09:21:44 AM jriconuz
Layout: C-202



C C-203 **CROSS-SECTION**



B C-203 **CROSS-SECTION**



A C-203 **CROSS-SECTION**

LEGEND

- EXISTING PROPERTY LINE
- 310 EXISTING CONTOUR MAJOR
- EXISTING CONTOUR MINOR
- EXISTING SLIP BOUNDARY
- OE EXISTING OVERHEAD ELECTRIC
- ES EXISTING PROPERTY EASEMENT
- EXISTING ROADWAY
- EXISTING SLIPPED ROADWAY
- PROPOSED LIMITS OF CONSTRUCTION
- 290 PROPOSED CONTOUR MAJOR
- 289 PROPOSED CONTOUR MINOR
- SF SF PROPOSED SILT FENCE
- PROPOSED BOUNDARY FENCE
- PROPOSED ENGINEERED CREEK BED
- PROPOSED VEGETATED BOULDER REVETMENT
- PROPOSED VEGETATED SOIL LIFTS
- PROPOSED GRAVEL SHOULDER
- LIMITS OF ASPHALT

NOTES

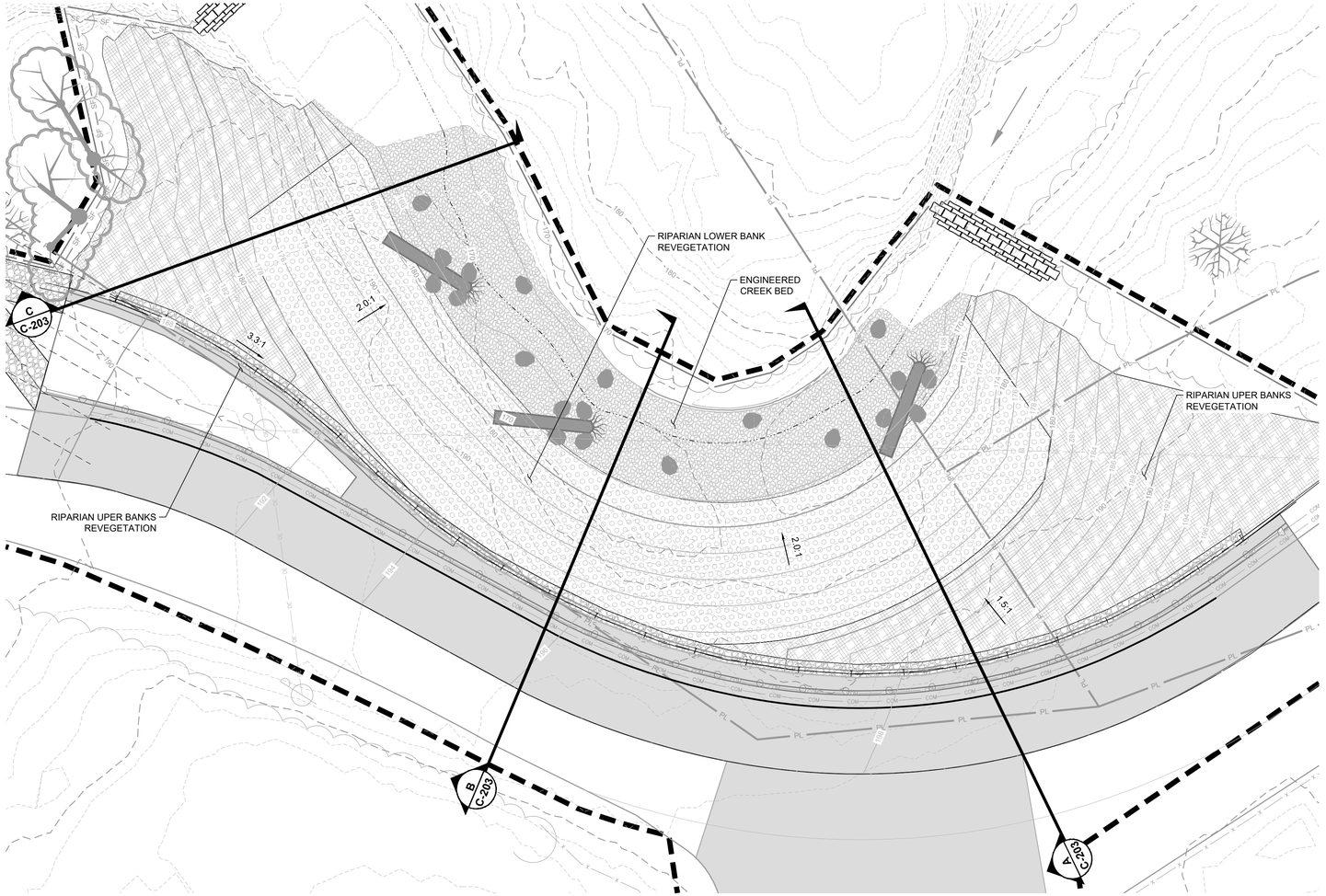
1. FOR SURVEY NOTES REFER TO SHEET G-103.
2. HGL = HYDRAULIC GRADE LINE (WATER LEVEL)

REGISTERED PROFESSIONAL ENGINEER
ANN MADER STILLMAN
C 47882
EXPIRES 12/31/25
CIVIL
STATE OF CALIFORNIA

APPROVED:

DATE: _____

ANN MADER STILLMAN,
DIRECTOR OF PUBLIC WORKS
R. C. E. # 47882 / EXPIRES 12-31-2025



CROSS-SECTION LOCATIONS PLAN

0 10 20 30 40
SCALE IN FEET

NOT FOR CONSTRUCTION

75% DESIGN

HORIZ. 0 10 20 30 40
VERT. 0 10 20 30 40
SCALE IN FEET

HALEY & ALDRICH, INC.
785 Ygnacio Valley Road
Walnut Creek, CA 94595
Tel: 925.935.9771
www.haleyaldrich.com

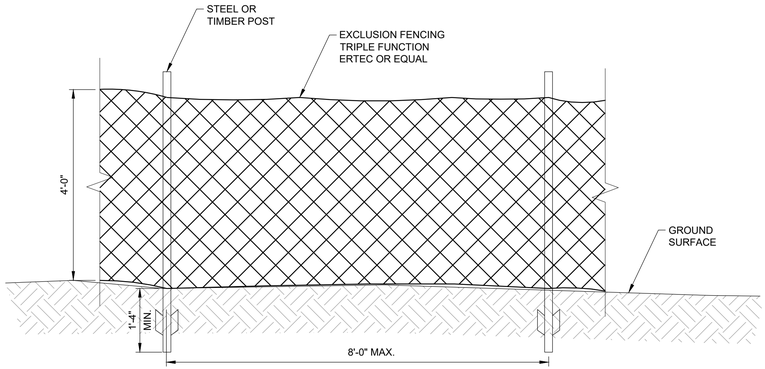
PROJECT NO.: 0207545-007

REVISION	DATE	DESIGNED BY: H&A (ZG)	SLIP-OUT REPAIR AND BANK STABILIZATION 1780 HIGGINS CANYON ROAD **TYPICAL CROSS-SECTIONS**	SCALE: AS SHOWN
		DRAWN BY: H&A (KV)		DATE: **MAY-2024**
		CHECKED BY: H&A (SA)		FILE NO.: E5082
			ANN MADER STILLMAN, DIRECTOR OF PUBLIC WORKS COUNTY SAN MATEO	555 COUNTY CENTER, 5th FLOOR REDWOOD CITY, CALIFORNIA 94063

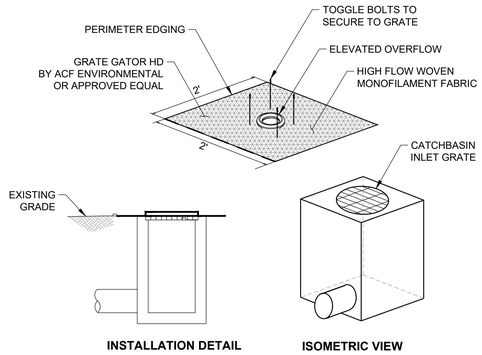
FOR REDUCED PLANS ORIGINAL SCALE IS IN INCHES 0 1 2 3 4

C-203
SHEET 18 OF 26

Layout: C-203
\\haleyaldrich\share\gromlet\2023\0207545-SanMateoCo-1780HigginsCynRdRetWall\CAD\207545-001_C-203s.dwg 11-13-24 09:21:50 AM jricoruiz



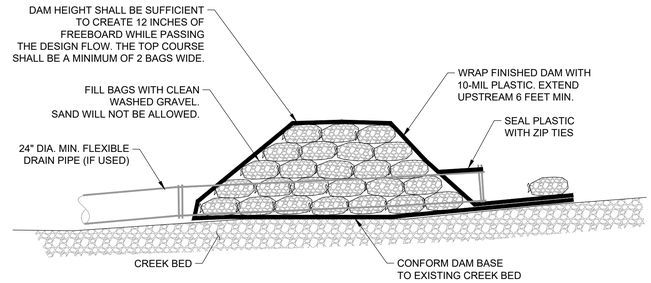
1 EXCLUSION FENCING
NOT TO SCALE



NOTES:

1. FIBER ROLLS SECURED WITH SAND BAGS MAY BE USED TO PROVIDE INLET PROTECTION AROUND GRATES IN LIEU OF GRATE GATOR HD IF APPROVED BY CONSTRUCTION MANAGER.
2. INSPECT AND CLEAN INLET FILTERS AFTER EVERY STORM.
3. REMOVE INLET FILTERS AT COMPLETION OF WORK.

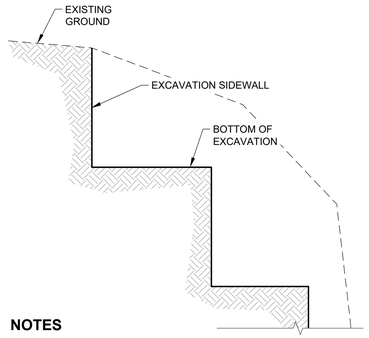
2 DRAIN INLET PROTECTION
NOT TO SCALE



NOTE

1. CONTRACTOR MAY USE ALTERNATE DAM DETAIL, SUBJECT TO APPROVAL OF THE ENGINEER AND THE PERMITTING AGENCIES.
2. PUMPS NOT SHOWN FOR CLARITY. CONTRACTOR TO UTILIZE PUMPS AS NEEDED TO CONTROL NUISANCE WATER.
3. DIVERSION DAM SHALL BE IN ACCORDANCE WITH THE SAN MATEO COUNTY ROUTINE MAINTENANCE PLAN MANUAL BMP DW-1.

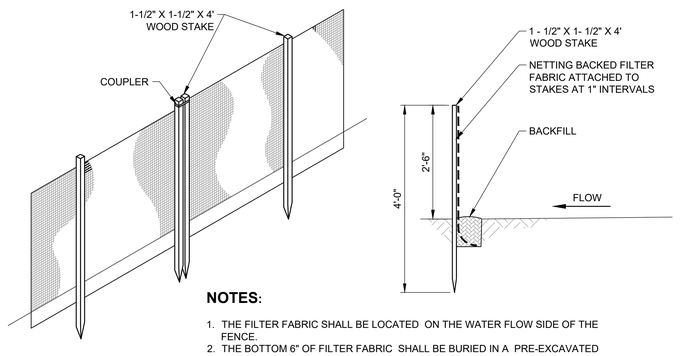
3 DIVERSION DAM
NOT TO SCALE



NOTES

1. TEMPORARY EXCAVATION SHALL CONFORM TO OSHA 1926 SUBPART P.
2. TEMPORARY EXCAVATION GREATER THAN 20 VERTICAL FEET SHALL REQUIRE ENGINEER DESIGNED OR APPROVED SUPPORT OF EXCAVATION.
3. PRIOR TO PLACING FILL OVER NATIVE SOILS EXCAVATE TO CREATE A HORIZONTAL FLAT SURFACE.
4. MAXIMUM CUT HEIGHT IN ACCORDANCE WITH OSHA REGULATIONS.
5. PREPARE SUBGRADE BY STATIC PROOF ROLL.
6. PRIOR TO PLACING FILL SUBGRADE SHALL BE FIRM AND DRY.
7. INSTALL FILL BY PLACING 1 FT MAXIMUM LIFTS AND COMPACT TO AT LEAST 95% OF MAXIMUM DRY DENSITY WITH MOISTURE CONTENT WITHIN 3% UNDER TO 1% OVER OPTIMUM PER ASTM D1557.

4 ROAD EXCAVATION AND BACKFILL DETAIL
NOT TO SCALE



NOTES:

1. THE FILTER FABRIC SHALL BE LOCATED ON THE WATER FLOW SIDE OF THE FENCE.
2. THE BOTTOM 6" OF FILTER FABRIC SHALL BE BURIED IN A PRE-EXCAVATED TRENCH WHICH SHALL BE BACKFILLED AND TAMPED FOR STABILITY.

5 SILT FENCE
NOT TO SCALE

REGISTERED PROFESSIONAL ENGINEER
ANN MADER STILLMAN
C 47882
EXPIRES 12/31/25
CIVIL
STATE OF CALIFORNIA

APPROVED:

DATE: _____

ANN MADER STILLMAN,
DIRECTOR OF PUBLIC WORKS
R. C. E. # 47882 / EXPIRES 12-31-2025

NOT FOR CONSTRUCTION

75% DESIGN

HALEY & ALDRICH, INC.
785 Ygnacio Valley Road
Walnut Creek, CA 94595
Tel: 925.935.9771
www.haleyaldrich.com

PROJECT NO.: 0207545-007

REVISION	DATE

DESIGNED BY: H&A (ZG)
DRAWN BY: H&A (KV)
CHECKED BY: H&A (SA)

SLIP-OUT REPAIR AND BANK STABILIZATION
1780 HIGGINS CANYON ROAD
EROSION AND SEDIMENT CONTROL DETAILS

SCALE: AS SHOWN
DATE: MAY-2024
FILE NO.: E5082

ANN MADER STILLMAN,
DIRECTOR OF PUBLIC WORKS
COUNTY SAN MATEO

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

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

C-400
SHEET 19 OF 26

\\haleyaldrich\share\granite\2023\0207545-SanMateoCo-1780HigginsCynRdRetWall\CAD\207545-001_C-400s.dwg 11-13-24 09:22:03 AM jcoruz
Layout: C-400

RETAINING WALL DESIGN TABLE

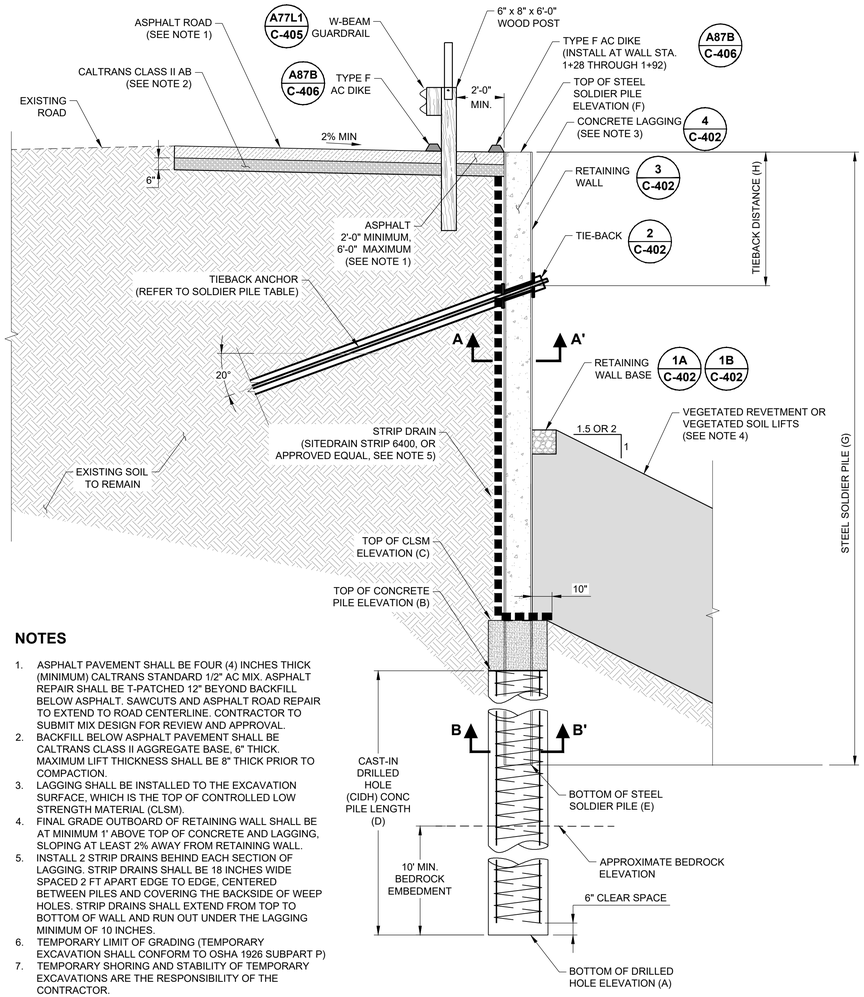
PILE LOCATION					ROCK		CONCRETE PILE						STEEL PILE				WALL				TIEBACKS								
PILE ID	STATION	PILE SPACING, FT	NORTHING	EASTING	ESTIMATED TOP OF ROCK ELEVATION	REQUIRED MIN. EMBEDMENT INTO ROCK, FT	ESTIMATED BOTTOM CONCRETE PILE ELEVATION (A)	TOP CONCRETE PILE ELEVATION (B)	TOP OF CLSM ELEVATION (C)	ESTIMATED CONCRETE LENGTH, FT (D)	STEEL REINFORCEMENT	CONCRETE DIAMETER, INCH	BOTTOM STEEL PILE ELEVATION (E)	TOP STEEL PILE ELEVATION (F)	STEEL PILE LENGTH, FT (G)	STEEL SECTION	GROUND SURFACE ELEVATION AT WALL TOE	UP-STATION BOTTOM OF LAGGING ELEVATION	UP-STATION PERMANENT WALL HEIGHT, FT	UP-STATION TEMPORARY WALL HEIGHT, FT	STATION	ANCHOR PLATE ELEVATION	TOP OF WALL TO ANCHOR PLATE, FT (H)	UNBONDED LENGTH, FT	DESIGN LOAD, KIPS	SEISMIC LOAD, KIPS	TEST LOAD, KIPS	LOCK-OFF LOAD, KIPS	STRAND COUNT #
1	0+00		1990460.93	6008885.43	167.2	NOT REQUIRED	180.0	194.0	196.9	14.0			184.3	199.3	15.0		199.2	194.0	0.1	3.9	0+00	NOT REQUIRED							
2	0+08		1990460.95	6008877.43	167.0	10.0	157.0	191.8	194.0	34.8			179.0	199.0	20.0		195.5	191.8	3.5	6.1	0+08	NOT REQUIRED							
3	0+16		1990461.40	6008869.44	166.8	10.0	156.8	189.8	191.8	33.1			178.7	198.7	20.0		193.6	189.8	5.1	7.9	0+16	NOT REQUIRED							
4	0+24		1990462.46	6008861.51	166.5	10.0	156.5	188.0	189.8	31.5			178.4	198.4	20.0		191.6	188.0	6.8	9.5	0+24	NOT REQUIRED							
5	0+32		1990464.23	6008853.71	166.3	10.0	156.3	185.4	188.0	29.1			173.3	198.3	25.0		189.6	185.4	8.7	11.6	0+32	192.3							
6	0+40		1990466.75	6008846.12	166.1	10.0	156.1	182.3	186.3	26.2			173.3	198.3	25.0		187.6	182.3	10.7	14.5	0+40	192.3	6	12	80	110	110	80	3
7	0+48		1990469.87	6008838.75	165.4	10.0	155.4	179.7	186.2	24.3			168.2	198.2	30.0		185.8	179.7	12.4	17.2	0+48	192.2							
8	0+56		1990473.63	6008831.70	163.4	10.0	153.4	177.1	186.0	23.7			168.0	198.0	30.0		184.0	177.1	14.0	19.6	0+56	190.0	8	13	105	145	145	105	4
9	0+64		1990478.06	6008825.03	162.5	10.0	152.5	174.7	185.6	22.2			162.6	197.6	35.0		182.2	174.7	15.4	21.7	0+64	197.6							
10	0+72		1990483.09	6008818.81	162.0	10.0	152.0	173.7	185.3	21.7			162.3	197.3	35.0		180.5	173.7	16.8	23.1	0+72	188.3							
11	0+80		1990488.56	6008812.97	161.7	10.0	151.7	172.7	185.1	21.0	#9 x 10 VERTICAL		162.1	197.1	35.0		179.0	172.7	18.1	23.9	0+80	188.1							
12	0+88		1990494.48	6008807.57	161.3	10.0	151.3	172.0	184.9	20.7			161.9	196.9	35.0		178.9	172.0	18.0	24.6	0+88	187.9							
13	0+96	8	1990500.80	6008802.69	160.8	10.0	150.8	171.6	184.6	20.8	WRAPPED WITH	30	161.6	196.6	35.0	HP 12x84	178.2	171.6	18.4	24.8	0+96	187.6	9	15	130	195	195	130	5
14	1+04		1990507.50	6008798.32	160.3	10.0	150.3	171.2	184.1	20.9	#4 AT 6" PITCH		161.1	196.1	35.0		177.6	171.2	18.5	24.8	1+04	187.1							
15	1+12		1990514.49	6008794.43	159.8	10.0	149.8	171.2	183.6	21.4	SPIRAL		160.6	195.6	35.0		177.4	171.2	18.2	24.4	1+12	186.6							
16	1+20		1990521.63	6008790.82	159.3	10.0	149.3	171.2	183.1	21.9			160.1	195.1	35.0		177.5	171.3	17.6	23.9	1+20	186.1							
17	1+28		1990529.02	6008787.75	159.9	10.0	149.9	171.3	182.4	21.4			159.4	194.4	35.0		177.9	171.7	16.5	22.9	1+28	185.4							
18	1+36		1990536.63	6008785.29	160.4	10.0	150.4	171.7	181.7	21.3			163.7	193.7	30.0		178.3	172.2	15.4	21.8	1+36	185.7							
19	1+44		1990544.40	6008783.40	160.4	10.0	150.4	172.2	180.9	21.8			162.9	192.9	30.0		178.4	172.5	14.5	20.6	1+44	184.9	8	13	105	145	145	105	4
20	1+52		1990552.27	6008781.95	160.4	10.0	150.4	172.5	180.1	22.1			162.1	192.1	30.0		178.3	172.8	13.8	19.5	1+52	184.1							
21	1+60		1990560.01	6008779.93	160.4	10.0	150.4	172.8	179.6	22.4			161.6	191.6	30.0		179.7	173.8	11.9	18.3	1+60	185.6	6	12	80	110	110	80	3
22	1+68		1990567.59	6008777.38	160.4	10.0	150.4	173.8	179.0	23.4			161.0	191.0	30.0		181.6	176.6	9.4	15.8	1+68	185.0							
23	1+76		1990574.98	6008774.31	160.4	10.0	150.4	176.6	179.6	26.2			165.6	190.6	25.0		184.2	179.6	6.4	12.5	1+76	NOT REQUIRED							
24	1+84		1990582.10	6008770.69	160.4	10.0	150.4	179.6	183.3	29.2			170.1	190.1	20.0		187.5	183.3	2.6	8.7	1+84	NOT REQUIRED							
25	1+92		1990588.78	6008766.27	160.9	NOT REQUIRED	169.3	183.3	183.3	14.0			174.7	189.7	15.0		189.6	--	--	--	1+92	NOT REQUIRED							

REGISTERED PROFESSIONAL ENGINEER
ANN MADER STILLMAN
C 47882
EXPIRES 12/31/25
CIVIL
STATE OF CALIFORNIA

APPROVED:

DATE: _____

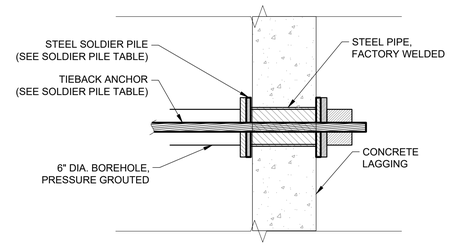
ANN MADER STILLMAN,
DIRECTOR OF PUBLIC WORKS
R. C. E. # 47882 / EXPIRES 12-31-2025



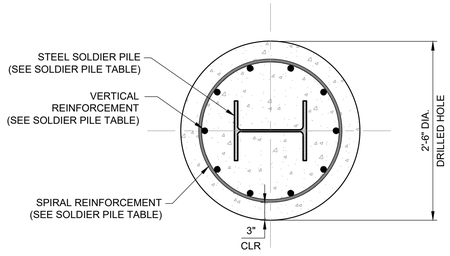
NOTES

1. ASPHALT PAVEMENT SHALL BE FOUR (4) INCHES THICK (MINIMUM) CALTRANS STANDARD 1/2" AC MIX. ASPHALT REPAIR SHALL BE T-PATCHED 12" BEYOND BACKFILL BELOW ASPHALT. SAWCUTS AND ASPHALT ROAD REPAIR TO EXTEND TO ROAD CENTERLINE. CONTRACTOR TO SUBMIT MIX DESIGN FOR REVIEW AND APPROVAL.
2. BACKFILL BELOW ASPHALT PAVEMENT SHALL BE CALTRANS CLASS II AGGREGATE BASE, 6" THICK. MAXIMUM LIFT THICKNESS SHALL BE 8" THICK PRIOR TO COMPACTION.
3. LAGGING SHALL BE INSTALLED TO THE EXCAVATION SURFACE, WHICH IS THE TOP OF CONTROLLED LOW STRENGTH MATERIAL (CLSM).
4. FINAL GRADE OUTBOARD OF RETAINING WALL SHALL BE AT MINIMUM 1' ABOVE TOP OF CONCRETE AND LAGGING, SLOPING AT LEAST 2% AWAY FROM RETAINING WALL.
5. INSTALL 2 STRIP DRAINS BEHIND EACH SECTION OF LAGGING. STRIP DRAINS SHALL BE 18 INCHES WIDE SPACED 2 FT APART EDGE TO EDGE, CENTERED BETWEEN PILES AND COVERING THE BACKSIDE OF WEEP HOLES. STRIP DRAINS SHALL EXTEND FROM TOP TO BOTTOM OF WALL AND RUN OUT UNDER THE LAGGING MINIMUM OF 10 INCHES.
6. TEMPORARY LIMIT OF GRADING (TEMPORARY EXCAVATION SHALL CONFORM TO OSHA 1926 SUBPART P)
7. TEMPORARY SHORING AND STABILITY OF TEMPORARY EXCAVATIONS ARE THE RESPONSIBILITY OF THE CONTRACTOR.

1 TYPICAL RETAINING WALL SECTION
NOT TO SCALE



SECTION A-A'



SECTION B-B'

TIE-BACK REQUIREMENTS

1. TIE-BACKS SHALL BE DOUBLE CORROSION PROTECTION PTI CLASS I.
2. INSTALL AND TEST TIE-BACKS ACCORDING TO THE RETAINING WALL DESIGN TABLE.
3. INSTALL TIE-BACKS AT 20 DEGREE ANGLE DOWNWARD FROM HORIZONTAL.
4. MINIMUM DIAMETER OF TIEBACK DRILLHOLE SHALL BE 6 INCHES.
5. INSTALL CENTRALIZERS ALONG TIE-BACK TENDON EVERY 10 FT AND WITHIN 3 FT OF THE TOP AND BOTTOM OF TIE-BACK. INSTALL MINIMUM OF 2 CENTRALIZERS PER TIE-BACK.
6. TIE-BACK TENDON SHALL BE COATED WITH A BONDBREAKER SLEEVE FROM BEHIND THE ANCHOR PLATE TO THE END OF THE UNBONDED ZONE.
7. PRESSURE GROUT TIE-BACKS TO ACHIEVE THE TEST LOAD ACCORDING TO THE RETAINING WALL DESIGN TABLE.
8. CONTRACTOR SHALL PROVIDE DESIGN DRAWINGS FOR THE TIE-BACK ANCHOR SYSTEM BASED ON THE MINIMUM REQUIREMENTS SHOWN. DESIGN SHALL BE CONSISTENT WITH THE FHWA GEOTECHNICAL ENGINEERING CIRCULAR NO. 4 GROUNDWATER ANCHOR AND ANCHORED SYSTEMS (FHWA-IF99-015). DESIGN DRAWING SHALL BE PREPARED BY A CIVIL ENGINEER REGISTERED IN THE STATE OF CALIFORNIA.
9. CONTRACTOR DESIGNED TIEBACK SHALL BE APPROVED BY THE ENGINEER PRIOR TO INSTALLATION.
10. PERFORMANCE TEST MINIMUM OF 3 TIE-BACKS FOR EACH TIE-BACK STRAND GROUP (TEST A MINIMUM OF 3 TIE-BACKS FOR GROUP OF TIE-BACKS WITH 3 STRANDS, 3 TIE-BACKS FOR GROUP OF TIE-BACKS WITH 4 STRANDS, AND 3 TIE-BACKS FOR GROUP OF TIE-BACKS WITH 5 STRANDS). IF ALL PERFORMANCE TESTS FOR A TIE-BACK STRAND GROUP PASS, REMAINING TIE-BACKS IN TIE-BACK STRAND GROUP MAY BE PROOF TESTED, OTHERWISE, PERFORMANCE TESTING OF ALL TIE-BACKS IN TIE-BACK STRAND GROUP IS REQUIRED.

PILE REQUIREMENTS

1. CIDH CONC PILE: F'_c = 4,000 PSI, 3/8-INCH MAX AGGREGATE
2. STRUCTURAL STEEL SOLDIER BEAMS : F_y = 60,000 PSI (GRADE 60)
3. LOCATION DATA (NORTHING AND EASTING) IS FOR A POINT AT THE CENTER OF THE PROPOSED CONCRETE PILE.
4. BEDROCK ELEVATIONS SHOWN IN TABLE ARE APPROXIMATE. FINAL DEPTHS OF BOREHOLES WILL BE DETERMINED IN THE FIELD BASED ON GEOTECHNICAL ENGINEER'S OBSERVATIONS.
5. IF THE DEPTH TO COMPETENT BEDROCK IS DEEPER THAN THE DESIGN, THE LENGTH AND SIZE OF THE CIDH PILE WILL CHANGE.
6. AUGER HOLE SHALL BE FLUSHED AND DEWATERED IMMEDIATELY PRIOR TO INSTALLING CONCRETE SUCH THAT DRILLED HOLE IS FREE OF SEDIMENT, WATER, AND DEBRIS.
7. MAXIMUM UNBRACED HEIGHT FOR TEMPORARY CONDITION OF CANTILEVERED SOLDIER BEAMS IS 12 FT. PILE AT STA 1+76 MAXIMUM UNBRACED HEIGHT IS 13 FT.
8. PRIOR TO INSTALLING TIE-BACK GROUND ANCHORS MAXIMUM UNBRACED HEIGHT FOR SOLDIER BEAMS IS 12 FT. LIMIT EXCAVATION IN FRONT OF THE WALL OR DEGRADE BEHIND WALL TO MAINTAIN MAXIMUM 12 FT UNBRACED HEIGHT OF WALL DURING TIEBACK INSTALLATION.
9. CIDH AND SOLDIER BEAMS SHALL BE INSTALLED WITHIN 1" OF PLANNED LOCATIONS.
10. CIDH AND SOLDIER BEAMS SHALL BE VERTICAL WITHIN 1% OF PLUMB.
11. CONCRETE SHALL BE TREMIED IN PLACE PRIOR TO STEEL PILE INSTALLATION.
12. CONCRETE TREMIE PIPE SHALL BE WITHIN 2 INCHES OF THE BOTTOM OF DRILLED HOLES UNTIL CONCRETE IS AT LEAST 5 FT ABOVE TREMIE PIPE. THEN MAINTAIN AT LEAST 5 FT OF CONCRETE ABOVE TIP OF TREMIE PIPE.
13. REMOVE EXCESS CONCRETE FOLLOWING INSTALLATION OF STEEL PILE.
14. FILL DRILLED PILE HOLE WITH CLSM FROM TOP OF CONCRETE TO 12 FT BELOW TOP OF WALL TO LIMIT UNBRACED HEIGHT. REMOVE CLSM AS WORK PROGRESSES FOR LAGGING INSTALLATION.
15. STEEL PILE SECTION SHALL BE CENTERED WITHIN CONCRETE.
16. TIE-BACK PIPE WALL AND STEEL PLATE THICKNESS SHALL BE EQUAL TO OR THICKER THAN PILE WEB THICKNESS.
17. INSTALL GRANULAR FILL BEHIND WALL TO WITHIN 1 FT OF TOP OF WALL PRIOR TO TENSIONING OR TESTING TIEBACKS.

LAGGING REQUIREMENTS

1. LAGGING SHALL BE INSTALLED FULL WIDTH OF STEEL SECTION WITH 4,000 PSI CONCRETE.
2. TWO MATS OF REINFORCEMENT STEEL SHALL BE INSTALLED WITHIN THE LAGGING SPACED APPROXIMATELY 6 INCHES APART IN SECTION WITH MINIMUM 3 INCHES COVER AT EACH FACE.
3. REINFORCEMENT SHALL BE INSTALLED AS SHOWN ON DETAIL 4 OF SHEET C-402.
4. WEEP HOLES SHALL BE INSTALLED THROUGH LAGGING WITH FULL PENETRATION SUCH THAT WATER CAN DRAIN FREELY THOUGH. WEEP HOLES SHALL BE 1-INCH DIAMETER AND COVERED WITH GEOSYNTHETIC FILTER FABRIC ON THE BACK OF THE LAGGING. LOCATE WEEP HOLES SUCH THAT THEY ARE AT LEAST 2 INCHES FROM REINFORCEMENT.
5. WEEP HOLES SHALL BE SPACED 1.5 FT VERTICALLY FROM BOTTOM OF LAGGING TO 3 FT ABOVE OUTBOARD GRADE AND SPACED 3 FT VERTICALLY WHERE HIGHER THAN 3 FT ABOVE THE OUTBOARD GRADE. HORIZONTAL SPACING OF WEEP HOLES SHALL BE 3.5 FT SUCH THAT TWO COLUMNS OF WEEP HOLES ARE INSTALLED IN EACH SECTION OF LAGGING CENTERED ON THE STRIP DRAINS. THE LOWEST ROW OF WEEPHOLES SHALL BE WITHIN 4 TO 12 INCHES OF THE BOTTOM OF LAGGING AND THE TOP ROW OF WEEP HOLES SHALL BE WITHIN 3 FT OF THE TOP OF LAGGING.
6. BACKPACK VOIDS BEHIND LAGGING WITH GRANULAR FILL SUCH AS PEA STONE OR CLEAN SAND.
7. DO NOT ALLOW UNCURED CEMENTITIOUS MATERIALS SUCH AS LEAN CONCRETE OR FLOWFILL TO COME INTO CONTACT WITH STRIP DRAINS.

NOT FOR CONSTRUCTION

75% DESIGN

HALEY & ALDRICH, INC.
785 Ygnacio Valley Road
Walnut Creek, CA 94595
Tel: 925.935.9771
www.haleyaldrich.com

PROJECT NO.: 0207545-007

REVISION	DATE	DESIGNED BY: H&A (ZG)
		DRAWN BY: H&A (KV)
		CHECKED BY: H&A (SA)

SLIP-OUT REPAIR AND BANK STABILIZATION
1780 HIGGINS CANYON ROAD
RETAINING WALL AND REVETMENT DETAILS I

SCALE: AS SHOWN
DATE: MAY-2024
FILE NO.: E5082

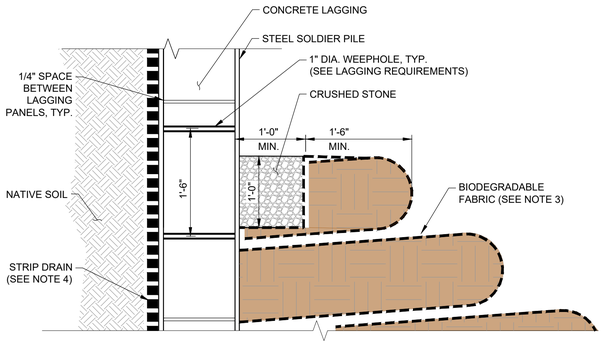
ANN MADER STILLMAN,
DIRECTOR OF PUBLIC WORKS
COUNTY SAN MATEO

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

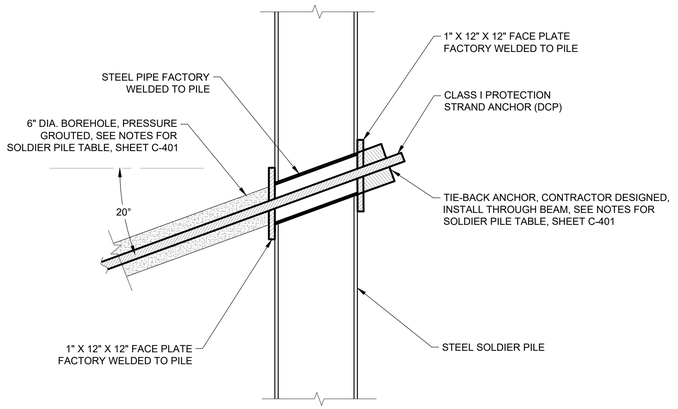
FOR REDUCED PLANS
ORIGINAL SCALE IS IN INCHES
0 1 2 3 4

C-401
SHEET 20 OF 26

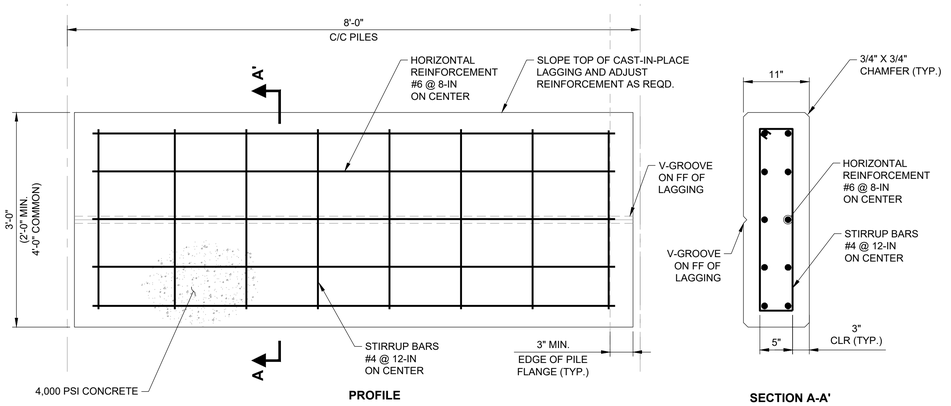
\\haleyaldrich\share\groinlw\2023\0207545-SanMateoCo-1780HigginsCynRdRetWall\CAD\207545-001_C-400s.dwg 11-13-24 09:22:08 AM jcsouz
Layout: C-401



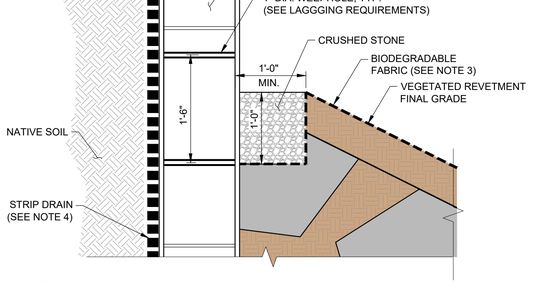
1A RETAINING WALL BASE - VEGETATED SOIL LIFTS
NOT TO SCALE



2 TIE-BACK
NOT TO SCALE



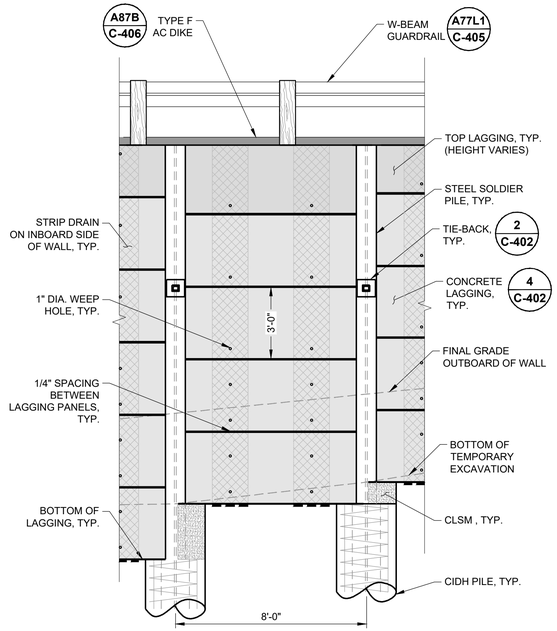
4 CONCRETE LAGGING
NOT TO SCALE



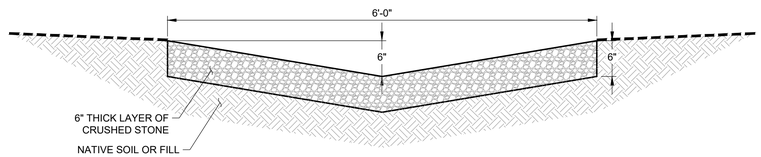
1B RETAINING WALL BASE - VEGETATED REVETMENT
NOT TO SCALE

RETAINING WALL BASE NOTES

1. CRUSHED STONE SHALL RUN THE FULL LENGTH OF THE WALL AND SHALL BE WRAPPED IN BIODEGRADABLE FABRIC.
2. CRUSHED STONE SHALL HAVE A MINIMUM THICKNESS OF 12 INCHES.
3. BIODEGRADABLE FABRIC SHALL BE GEOCOIR-900 EROSION CONTROL BLANKET OR APPROVED EQUAL. BIODEGRADABLE FABRIC SHALL BE USED TO SEPARATE DRAIN ROCK IN FRONT OF WALL FROM VEGETATED SOIL LIFTS AND VEGETATED BOULDER REVETMENT.
4. STRIP DRAIN SHALL BE 18-INCH WIDTH SITEDRAIN STRIP 6400 OR APPROVED EQUAL, EXTENDED FROM THE TOP OF THE WALL TO THE BOTTOM OF THE WALL, AND BEYOND TOE OF WALL 10 INCHES.



3 RETAINING WALL - TYPICAL FRONT VIEW
NOT TO SCALE



5 6' CRUSHED STONE SWALE
NOT TO SCALE

REGISTERED PROFESSIONAL ENGINEER
ANN MADER STILLMAN
C 47882
EXPIRES 12/31/25
CIVIL
STATE OF CALIFORNIA

APPROVED:

DATE: _____

ANN MADER STILLMAN,
DIRECTOR OF PUBLIC WORKS
R. C. E. # 47882 / EXPIRES 12-31-2025

NOT FOR CONSTRUCTION

75% DESIGN

HALEY & ALDRICH, INC.
785 Ygnacio Valley Road
Walnut Creek, CA 94595
Tel: 925.935.9771
www.haleyaldrich.com

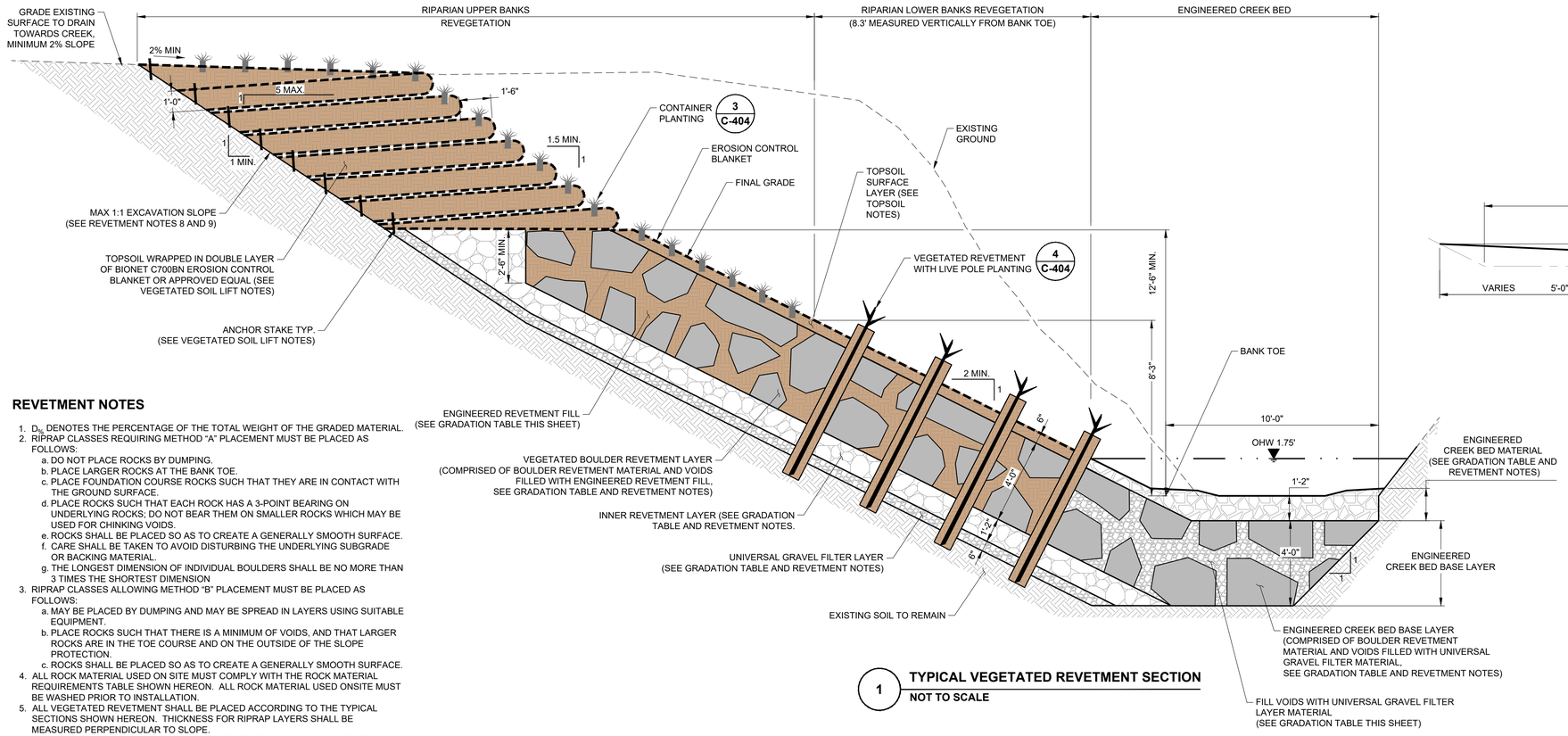
PROJECT NO.: 0207545-007

REVISION	DATE	DESIGNED BY: H&A (ZG)	SLIP-OUT REPAIR AND BANK STABILIZATION 1780 HIGGINS CANYON ROAD	SCALE: AS SHOWN
		DRAWN BY: H&A (KV)		DATE: MAY-2024
		CHECKED BY: H&A (SA)	RETAINING WALL AND REVETMENT DETAILS II	FILE NO.: E5082
		ANN MADER STILLMAN, DIRECTOR OF PUBLIC WORKS COUNTY SAN MATEO		555 COUNTY CENTER, 5th FLOOR REDWOOD CITY, CALIFORNIA 94063

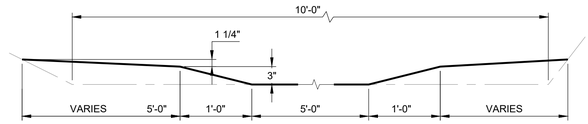
FOR REDUCED PLANS ORIGINAL SCALE IS IN INCHES 0 1 2 3 4

C-402
SHEET 21 OF 26

\\haleyaldrich\share\groinke\2023\0207545-SanMateoCo-1780HigginsCynRdRetWall\CAD\207545-001_C-400s.dwg 11-13-24 09:22:12 AM jcoruiz
Layout: C-402



1 TYPICAL VEGETATED REVETMENT SECTION
NOT TO SCALE



CREEK BED DIMENSIONS

APPROVED:

DATE: _____

ANN MADER STILLMAN,
DIRECTOR OF PUBLIC WORKS
R. C. E. # 47882 / EXPIRES 12-31-2025

REVETMENT NOTES

1. D_{xx} DENOTES THE PERCENTAGE OF THE TOTAL WEIGHT OF THE GRADED MATERIAL.
2. RIPRAP CLASSES REQUIRING METHOD "A" PLACEMENT MUST BE PLACED AS FOLLOWS:
   a. DO NOT PLACE ROCKS BY DUMPING.
   b. PLACE LARGER ROCKS AT THE BANK TOE.
   c. PLACE FOUNDATION COURSE ROCKS SUCH THAT THEY ARE IN CONTACT WITH THE GROUND SURFACE.
   d. PLACE ROCKS SUCH THAT EACH ROCK HAS A 3-POINT BEARING ON UNDERLYING ROCKS; DO NOT BEAR THEM ON SMALLER ROCKS WHICH MAY BE USED FOR CHINKING VOIDS.
   e. ROCKS SHALL BE PLACED SO AS TO CREATE A GENERALLY SMOOTH SURFACE.
   f. CARE SHALL BE TAKEN TO AVOID DISTURBING THE UNDERLYING SUBGRADE OR BACKING MATERIAL.
   g. THE LONGEST DIMENSION OF INDIVIDUAL BOULDERS SHALL BE NO MORE THAN 3 TIMES THE SHORTEST DIMENSION
3. RIPRAP CLASSES ALLOWING METHOD "B" PLACEMENT MUST BE PLACED AS FOLLOWS:
   a. MAY BE PLACED BY DUMPING AND MAY BE SPREAD IN LAYERS USING SUITABLE EQUIPMENT.
   b. PLACE ROCKS SUCH THAT THERE IS A MINIMUM OF VOIDS, AND THAT LARGER ROCKS ARE IN THE TOE COURSE AND ON THE OUTSIDE OF THE SLOPE PROTECTION.
   c. ROCKS SHALL BE PLACED SO AS TO CREATE A GENERALLY SMOOTH SURFACE.
4. ALL ROCK MATERIAL USED ON SITE MUST COMPLY WITH THE ROCK MATERIAL REQUIREMENTS TABLE SHOWN HEREON. ALL ROCK MATERIAL USED ONSITE MUST BE WASHED PRIOR TO INSTALLATION.
5. ALL VEGETATED REVETMENT SHALL BE PLACED ACCORDING TO THE TYPICAL SECTIONS SHOWN HEREON. THICKNESS FOR RIPRAP LAYERS SHALL BE MEASURED PERPENDICULAR TO SLOPE.
6. ENGINEERED REVETMENT FILL SHALL BE COMPRISED OF RACK AND A SUITABLE VOLUME OF TOPSOIL TO BE CAPABLE OF SUSTAINING HEALTHY PLANT LIFE.
7. VEGETATED BOULDER REVETMENT LAYER SHALL BE COMPRISED OF BOULDER REVETMENT AND VOIDS FILLED WITH ENGINEERED REVETMENT FILL.
8. TEMPORARY LIMIT OF GRADING (TEMPORARY EXCAVATION SHALL CONFORM TO OSHA 1926 SUBPART P).
9. TEMPORARY EXCAVATION GREATER THAN 20 VERTICAL FEET SHALL REQUIRE ENGINEER DESIGNED OR APPROVED SUPPORT OF EXCAVATION.

VEGETATED SOIL LIFT NOTES

1. VEGETATED SOIL LIFTS SHALL BE WRAPPED IN BIONET C700BN EROSION CONTROL BLANKET OR APPROVED EQUAL.
2. EACH VEGETATED SOIL LIFT SHALL BE APPROXIMATELY 12" IN HEIGHT. THE HEIGHT OF THE VEGETATED SOIL LIFTS SHALL INCLUDE THE HEIGHT OF THE SOIL AND THE TOP AND BOTTOM OF THE BIONET FABRIC. VARIATION IN SOIL LIFT THICKNESS ON THE UPPER LAYER IS PERMISSIBLE TO PROMOTE POSITIVE DRAINAGE.
3. SOIL PLACED BETWEEN THE FABRIC SHALL BE COMPRISED OF TOPSOIL. THE TOPSOIL SHALL BE CONSISTENT WITH TOPSOIL NOTES ON THIS SHEET.
4. THE OUTER LAYERS OF THE VEGETATED SOIL LIFT SHALL BE SEEDED IN ACCORDANCE WITH THE SEED MIX ON SHEET C-105.
5. ANCHOR STAKES USED FOR THE VEGETATED SOIL LIFTS SHALL BE HARDWOOD OR BIODEGRADABLE LANDSCAPE STAKES. THE STAKES SHALL EXTEND A MINIMUM OF 6" INTO THE UNDERLYING SUBGRADE TO ENSURE ANCHORING. THE STAKES SHALL BE PLACED A MINIMUM OF 12" FROM THE TERMINATION OF THE EROSION CONTROL BLANKET ON THE SUBGRADE SIDE. STAKES SHALL BE DRIVEN A MINIMUM OF 1 INCH BELOW THE SURFACE OF THE EROSION CONTROL BLANKET AND BE PLACED A MAXIMUM OF 24 INCHES ON CENTER MEASURED PARALLEL WITH THE TERMINATION OF THE RIPRAP BLANKET.

TOPSOIL NOTES

1. TOPSOIL SURFACE SHALL BE PLACED OVER VEGETATED BOULDER REVETMENT AS SHOWN IN THE TYPICAL VEGETATED REVETMENT SECTION HEREON.
2. TOPSOIL SHALL BE COVERED IN BIONET C700BN EROSION CONTROL BLANKET OR APPROVED EQUAL.
3. THE TOPSOIL SHALL BE FERTILE, FRIABLE SOIL OF LOAMY CHARACTER WITH A PH RANGE BETWEEN 6 AND 8 THAT CONTAINS ORGANIC MATTER IN QUANTITIES NATURAL TO THE REGIONAL AND CAPABLE OF SUSTAINING HEALTHY PLANT LIFE. TOPSOIL SHALL BE FREE OF DELETERIOUS SUBSTANCES SUCH AS LITTER, REFUSE, TOXIC WASTE, STONES LARGER THAN 1 INCH IN SIZE, COARSE SAND, HEAVY OR STIFF CLAY, BRUSH, STICKS, GRASSES, ROOTS, NOXIOUS WEED SEED, WEEDS, AND OTHER SUBSTANCES DETRIMENTAL TO PLANT, ANIMAL, AND HUMAN HEALTH. TOPSOIL TO BE USED ON SITE SHALL BE SUBMITTED FOR APPROVAL PRIOR TO USE ON THE PROJECT.
4. THE TOPSOIL SURFACE SHALL BE SEEDED IN ACCORDANCE WITH THE SEED MIX ON SHEET C-105.
5. ANCHOR STAKES USED FOR THE VEGETATED SOIL LIFTS SHALL BE HARDWOOD OR BIODEGRADABLE LANDSCAPE STAKES. THE STAKES SHALL EXTEND A MINIMUM OF 6" INTO THE UNDERLYING TOPSOIL FOR ANCHORING.
6. THE STAKES SHALL BE PLACED AT APPROXIMATELY 24 INCHES ON CENTER PARALLEL WITH THE BANK SLOPE AND PERPENDICULAR WITH THE BANK SLOPE.
7. THICKNESS FOR TOPSOIL SURFACE LAYER SHALL BE MEASURED PERPENDICULAR TO SLOPE

GRADATION TABLE FOR BOULDER REVETMENT MATERIAL

CLASS	NOMINAL WEIGHT	D_{15}[1] (LBS)		D_{50}[1] (LBS)		D_{100}[1] (LBS)	D50 (IN)	D100 (IN)	PLACEMENT METHOD
(---)	(TONS)	MIN	MAX	MIN	MAX	MAX			
VIII	1-TON	520	1450	1900	3300	9000	30	48	A[2]

1 = SEE REVETMENT NOTE 1
2 = SEE REVETMENT NOTE 2

GRADATION TABLE FOR INNER REVETMENT MATERIAL

CLASS	D_5[1] (LBS)	D_{50}[1] (LBS)	D_{100}[1] (LBS)	D50[1] (IN)	D100[1] (IN)	PLACEMENT METHOD
(---)	(LBS)	(LBS)	(LBS)	(IN)	(IN)	
LIGHT	24	198	485	10.5	14	B[3]

1 =SEE REVETMENT NOTE 1
2 = SEE REVETMENT NOTE 2
3 = SEE REVETMENT NOTE 3

GRADATION TABLE FOR UNIVERSAL GRAVEL FILTER MATERIAL

CLASS	D_{10}[1] (IN)	D_{25}[1] (IN)	D_{35}[1] (IN)	D_{50}[1] (IN)	D_{85}[1] (IN)	D_{100}[1] (IN)	PLACEMENT METHOD
(---)							
FILTER	1	1.5	2	3	4	6	B[3]

1 = SEE REVETMENT NOTE 1
2 = SEE REVETMENT NOTE 2
3 = SEE REVETMENT NOTE 3

GRADATION TABLE FOR ENGINEERED CREEK BED MATERIAL

CLASS	D_{10}[1] (IN)	D_{15}[1] (IN)	D_{50}[1] (IN)	D_{75}[1] (IN)	D_{100}[1] (IN)	PLACEMENT METHOD
(---)						
N.A.	0.0787	0.75	2.5	6	14	B[3]

1 = SEE REVETMENT NOTE 1
2 = SEE REVETMENT NOTE 2
3 = SEE REVETMENT NOTE 3

GRADATION TABLE FOR ENGINEERED REVETMENT FILL

CLASS	D_{10}[1] (IN)	D_{15}[1] (IN)	D_{25}[1] (IN)	D_{35}[1] (IN)	D_{50}[1] (IN)	D_{85}[1] (IN)	D_{100}[1] (IN)	PLACEMENT METHOD
(---)								
N.A.	0.0787	0.75	1.5	2	3	4	6	N/A

ENGINEERING REVETMENT FILL SHALL CONSIST OF ROCK AND A SUITABLE VOLUME OF TOPSOIL TO BE CAPABLE OF SUSTAINING HEALTHY PLANT LIFE.
1 = SEE REVETMENT NOTE 1

ROCK MATERIAL REQUIREMENTS TABLE

QUALITY / CHARACTERISTIC	TEST METHOD	REQUIREMENT
APPARENT SPECIFIC GRAVITY (MIN)	CALIFORNIA TEST 206	2.5
ABSORPTION (MAX PERCENTAGE)	CALIFORNIA TEST 206	4.2
DURABILITY INDEX (MIN)	CALIFORNIA TEST 229	52

VEGETATED BOULDER REVETMENT INSTALLATION STEPS

STEP 1 : EXCAVATE TO GRADES REQUIRED
STEP 2 : INSTALL LIVE POLE PLANTING TUBE
STEP 3 : INSTALL UNIVERSAL GRAVEL FILTER (NOTE: PHOTO INCLUDES A COIR BLANKET AT SOIL INTERFACE WHICH IS NOT REQUIRED)



STEP 4 : INSTALL INNER REVETMENT LAYER UP NO MORE THAN 5 VERTICAL FEET
STEP 5 : INSTALL VEGETATED BOULDER REVETMENT LAYER UP TO EXTENT OF INNER REVETMENT LAYER INTERLOCKING WITH INNER REVETMENT LAYER



STEP 6 : BACKFILL VOIDS OF VEGETATED BOULDER REVETMENT WITH ENGINEERED REVETMENT FILL



STEP 7 : CONTINUE INNER REVETMENT LAYER AND VEGETATED BOULDER REVETMENT INSTALLATION 5 VERTICAL FEET AT A TIME, BACKFILLING THE VEGETATED BOULDER REVETMENT VOIDS AS WORK PROGRESSES



STEP 8 : PLACE TOPSOIL LAYER OVER VEGETATED BOULDER REVETMENT LAYER



STEP 9 : PLACE BIODEGRADABLE FABRIC OVER FINAL GRADE



STEP 10 : INSTALL PLANTINGS

NOT FOR CONSTRUCTION

75% DESIGN

HALEY & ALDRICH, INC.
785 Ygnacio Valley Road
Walnut Creek, CA 94595
Tel: 925.935.9771
www.haleyaldrich.com

PROJECT NO.: 0207545-007

REVISION	DATE

DESIGNED BY: H&A (ZG)
DRAWN BY: H&A (KV)
CHECKED BY: H&A (SA)

SLIP-OUT REPAIR AND BANK STABILIZATION
1780 HIGGINS CANYON ROAD
RETAINING WALL AND REVETMENT DETAILS III

ANN MADER STILLMAN,
DIRECTOR OF PUBLIC WORKS
COUNTY SAN MATEO

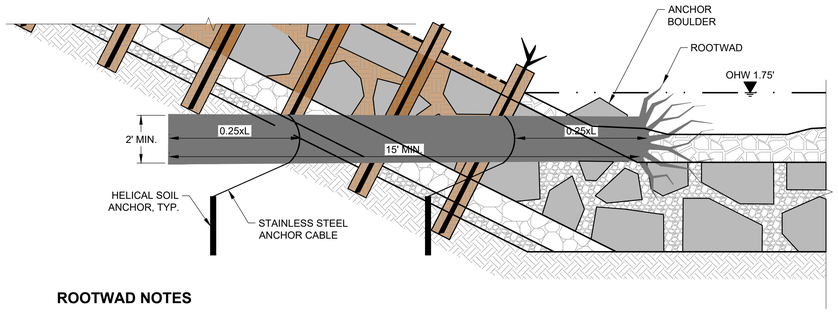
555 COUNTY CENTER, 5th FLOOR
REDWOOD CITY, CALIFORNIA 94063

SCALE: AS SHOWN
DATE: MAY-2024
FILE NO.: E5082

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

C-403
SHEET 22 OF 26

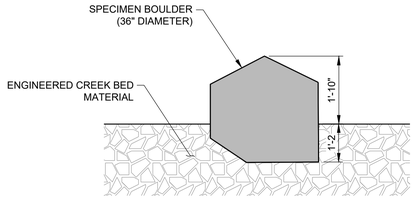
\\haleyaldrich\share\granite\2023\0207545-SanMateoCo-1780HigginsCynRdRetWall\CAD\0207545-001_C-403s.dwg 11-13-24 09:22:17 AM jrconiz
Layout: C-403



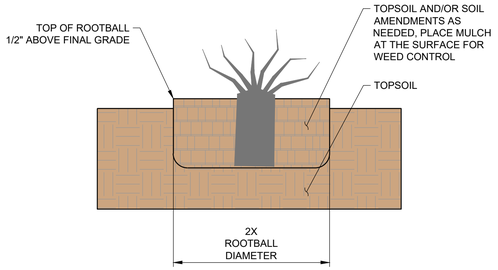
ROOTWAD NOTES

1. ROOTWAD SHALL BE REDWOOD OR APPROVED EQUAL.
2. ROOTWAD LOG SHALL HAVE A MINIMUM DIAMETER OF 2 FEET WITH A MINIMUM ROOT DIAMETER OF 4'.
3. ROOTWAD LOG SHALL BE CROOKED WITH AN IRREGULAR (NOT SMOOTH) SURFACE, TO THE EXTENT PRACTICABLE.
4. ROOTWAD LOG SHALL BE PLACED SUCH THAT PRIMARY BRACE ROOTS ARE FLUSH WITH EXPOSED SURFACE (LESS THAN 1 FOOT EXPOSED BOLE).
5. ROOTWAD LOG BOLE SHALL BE AT LEAST 15 FEET IN LENGTH.
6. ROOTWAD LOG SHALL BE INSTALLED DIRECTLY INTO ONCOMING FLOW, A MAXIMUM OF 15 DEGREES AWAY FROM THE FLOW DIRECTION.
7. ANCHOR BOULDERS SHALL HAVE A MINIMUM DIAMETER OF 48 INCHES.
8. AT LEAST TWO ANCHOR BOULDERS SHALL BE PLACED ALONG EITHER SIDE OF ROOTWAD (FOUR TOTAL PER ROOTWAD).
9. HELICAL SOIL ANCHORS SHALL BE INSTALLED A MINIMUM OF 5 FEET INTO COMPETENT SOIL.
10. HELICAL ANCHORS SHALL BE CAPABLE OF 5,000 LBS UPLIFT. SECURE TO THE ROOTWAD USING STAINLESS STEEL CABLING. CABLING SHALL HAVE NO SLACK AROUND THE ROOTWAD OR BETWEEN THE ROOTWAD AND THE ANCHOR.
11. ENGINEER SHALL LOCATE SOIL ANCHORS SUCH THAT THEY ARE INSTALLED IN SUITABLE SOIL TO THE BEARING CAPACITY INDICATED HEREIN.
12. STAINLESS STEEL CABLING SHALL BE SECURED TO THE ROOTWAD 25% OF THE TOTAL BOLE LENGTH AWAY FROM EACH END.
13. HELICAL SOIL ANCHORS AND ANCHOR CABLES SHALL HAVE A MINIMUM TENSILE STRENGTH OF 5,000 POUNDS.

1 ROOTWAD
NOT TO SCALE



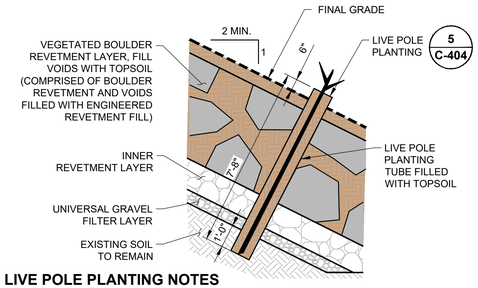
2 SPECIMEN BOULDER
NOT TO SCALE



CONTAINER PLANTING NOTES

1. CONTAINER PLANTS SHALL BE SIZE D-16, SCATTERED AND IN GROUPS 2 FEET ON CENTER.
2. CONTAINER PLANTS SHALL BE PLACED WITH STEM UPRIGHT.
3. CONTAINER PLANTS SHALL BE SUFFICIENTLY WATER SUBSEQUENT TO PLANTING.
4. SCARIFY SOIL ON OUTER INCH OF ROOTBALL AND SPREAD ROOTS, REST ROOTBALL ON TOPSOIL.
5. REFER TO PLANTING PALLETE. ON SHEET C-105.

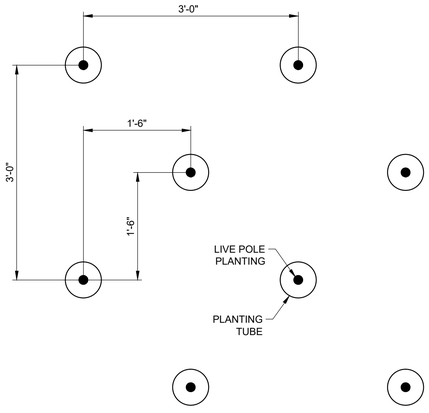
3 CONTAINER PLANTING
NOT TO SCALE



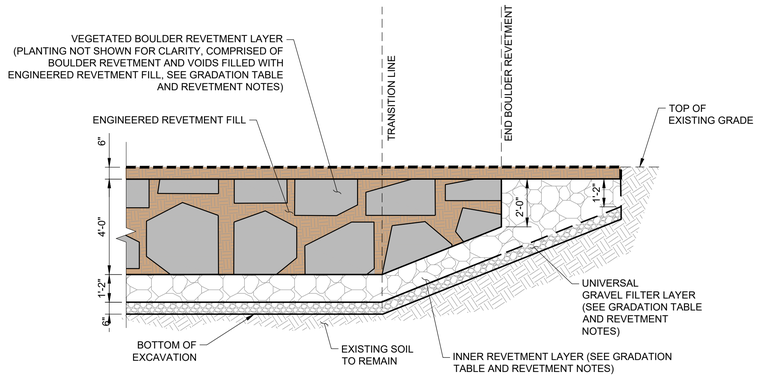
LIVE POLE PLANTING NOTES

1. LIVE POLE SHALL BE HARVESTED AND PLANTED DURING THE DORMANT SEASON. COORDINATE WITH COUNTY BIOLOGIST ON HARVESTING AND PLANTING.
2. LIVE POLE SHALL BE NO LESS THAN 3/4 INCH IN DIAMETER AND NO GREATER THAN 3 INCHES IN DIAMETER.
3. LIVE POLE SHALL BE AT LEAST 5 FEET IN LENGTH.
4. LIVE POLE SHALL BE AT LEAST 1 YEAR OLD AT TIME OF HARVEST.
5. LIVE POLE PLANTING SHALL BE CUT SQUARE AT THE TOP WITH 2 TO 5 BUDS EXPOSED ABOVE THE PLANTING TUBE.
6. LIVE POLE SHALL BE ANGLED CUT AT THE BOTTOM.
7. BRANCHES AND BUDS WITHIN THE PLANTING TUBE SHALL BE TRIMMED ALLOWING NO MORE THAN 1/2 INCH BEYOND THE POLE.
8. LIVE POLE SHALL BE SOAKED AT LEAST 24 HOURS PRIOR TO PLANTING. DO NOT ALLOW LIVE POLES TO DRY OUT PRIOR TO INSTALLATION. LIVE POLES MUST BE PLANTED THE SAME DAY THEY ARE REMOVED FROM WATER.
9. LIVE POLE PLANTING SHALL BE SPACED NO MORE THAN 3 FEET APART AND NO CLOSER THAN 1.5 FEET APART.
10. PLANTING TUBE SHALL BE BIODEGRADABLE CARDBOARD WITH AN INNER DIAMETER NO LESS THAN TWICE THE DIAMETER OF THE LIVE POLE.
11. PLANTING TUBE SHALL BE 7'-8" MINIMUM AND EMBEDDED AT LEAST 1 FOOT INTO NATIVE SOIL.
12. PLANTING TUBES SHALL BE BACKFILLED WITH TOPSOIL AND WATER.
13. REFER TO PLANTING PALETTE ON SHEET C-105.

4 VEGETATED REVETMENT WITH LIVE POLE PLANTING
NOT TO SCALE



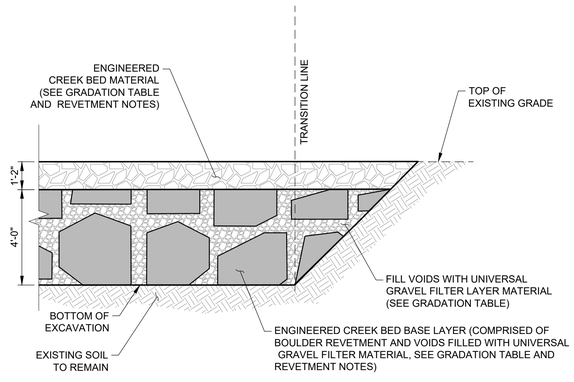
5 LIVE POLE PLANTING
NOT TO SCALE



NOTES

1. SEE TYPICAL VEGETATED REVETMENT SECTION, DETAIL 1, SHEET C-402, FOR NOTES REGARDING VEGETATION AND CONSTRUCTION.
2. GRADUAL TRANSITION STONE SIZE. LIMIT STONE SIZE IN TRANSITION TO THICKNESS OF TRANSITION.
3. LAYER THICKNESS IS MEASURED AS PERPENDICULAR TO THE SLOPE.

6 TYPICAL TRANSITION FOR CHANNEL BANKS
NOT TO SCALE



NOTES

1. SEE TYPICAL VEGETATED REVETMENT SECTION, DETAIL 1, SHEET C-402, FOR NOTES REGARDING VEGETATION AND CONSTRUCTION.
2. GRADUAL TRANSITION STONE SIZE. LIMIT STONE SIZE IN TRANSITION TO THICKNESS OF TRANSITION.
3. LAYER THICKNESS IS MEASURED AS PERPENDICULAR TO THE SLOPE.

7 TYPICAL TRANSITION FOR CREEK
NOT TO SCALE

REGISTERED PROFESSIONAL ENGINEER
ANN MADER STILLMAN
C 47882
EXPIRES 12/31/25
CIVIL
STATE OF CALIFORNIA

APPROVED:

DATE: _____

ANN MADER STILLMAN,
DIRECTOR OF PUBLIC WORKS
R. C. E. # 47882 / EXPIRES 12-31-2025

NOT FOR CONSTRUCTION

75% DESIGN

HALEY & ALDRICH, INC.
785 Ygnacio Valley Road
Walnut Creek, CA 94595
Tel: 925.935.9771
www.haleyaldrich.com

PROJECT NO.: 0207545-007

REVISION	DATE

DESIGNED BY: H&A (ZG)
DRAWN BY: H&A (KV)
CHECKED BY: H&A (SA)

SLIP-OUT REPAIR AND BANK STABILIZATION
1780 HIGGINS CANYON ROAD
RETAINING WALL AND REVETMENT DETAILS IV

SCALE: AS SHOWN
DATE: MAY-2024
FILE NO.: E5082

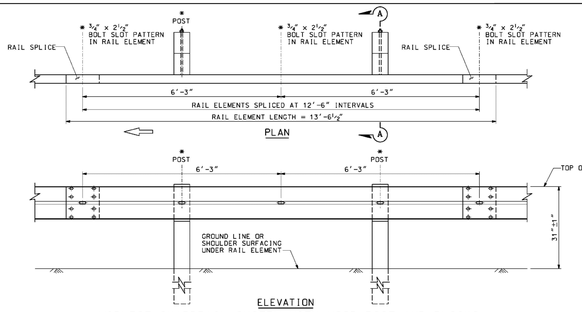
ANN MADER STILLMAN,
DIRECTOR OF PUBLIC WORKS
COUNTY SAN MATEO

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

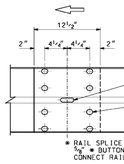
FOR REDUCED PLANS
ORIGINAL SCALE IS IN INCHES
0 1 2 3 4

C-404
SHEET 23 OF 26

\\haleyaldrich\share\granite\2023\0207545-SanMateoCo-1780HigginsCynRdRetWall\CAD\207545-001_C-403s.dwg 11-13-24 09:22:23 AM jcoruiz
Layout: C-404



MIDWEST GUARDRAIL SYSTEM WITH WOOD POST AND BLOCKS

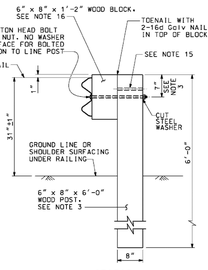


RAIL ELEMENT SPLICE DETAIL

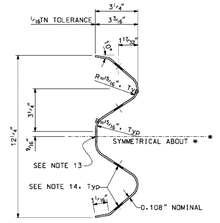
a) Connect the overlapped end of the rail elements with 5/8" * x 1 1/4" button head oval shoulder splice bolts inserted into the 13/16" x 1 1/4" slots and bolted together with 5/8" * recessed hex nuts. Recess of hex nut points toward rail element. A total of 8 bolts and nuts are to be used at each rail splice connection.

b) The ends of the rail elements are to be overlapped in the direction of traffic (see details).

c) Where end cap is to be attached to the end of a rail element, a total of 4 of the above described splice bolts and nuts are to be used.



SECTION A-A
TYPICAL WOOD LINE POST INSTALLATION
See Note 4



SECTION THRU RAIL ELEMENT

NOTES:

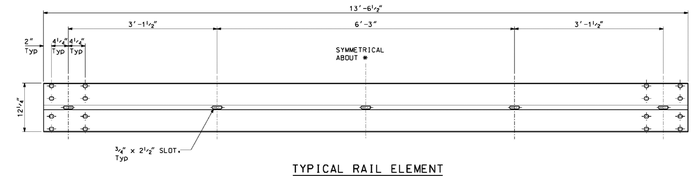
1. For details of steel post installations, see Standard Plan A77L2.
2. For details of standard hardware used to construct MGS, see Standard Plan A77M1.
3. For details of wood posts and wood blocks used to construct MGS, see Standard Plan A77N1.
4. For additional installation details, see Standard Plan A77N3.
5. MGS post spacing to be 6'-3" center to center, except as otherwise noted.
6. For MGS typical layouts, see the A77P, A77Q and A77R series of Standard Plans.
7. If railing is connected to terminal system end treatment, use 31" height terminal system end treatment.
8. For MGS end anchor details, see Standard Plans A77S1 and A77T2.
9. For details of MGS transition to bridge railing, see Standard Plan A77U4.
10. For additional details of MGS connection to bridge railing, see Standard Plans A77U1, A77U2 and A77V1.
11. For MGS connection details to abutments and walls, see Standard Plan A77U3.
12. For typical MGS delineation and dike positioning details, see Standard Plan A77N4.
13. Slotted hole for bolted connection of rail element to block and post.
14. Slotted holes for splice bolts to overlap ends of rail element.
15. Additional hole in uppermost portion of line post is for potential future adjustments of railing height. See Standard Plan A77N1.
16. 6" x 12" x 1'-2" block must be used with 6" Type A dike.
17. Install posts in soil.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

MIDWEST GUARDRAIL SYSTEM
STANDARD RAILING SECTION
(WOOD POST WITH WOOD BLOCK)

NO SCALE

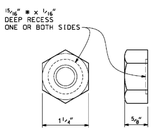
A77L1



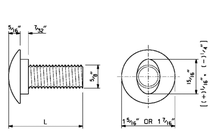
TYPICAL RAIL ELEMENT

NOTE:

1. Slotted holes for splice bolts to overlap ends of rail element.



5/8" * RECESS NUT

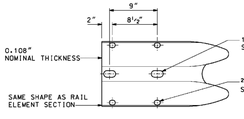


5/8" * BUTTON HEAD BOLT

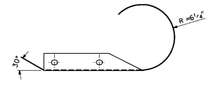
BUTTON HEAD BOLT	
L	THREAD LENGTH
1 1/4"	FULL THREAD LENGTH
2"	FULL THREAD LENGTH
10"	4" Min THREAD LENGTH
18"	4" Min THREAD LENGTH
20"	4" Min THREAD LENGTH
22"	4" Min THREAD LENGTH
26"	4" Min THREAD LENGTH
36"	4" Min THREAD LENGTH
** 2 1/2"	2" Min THREAD LENGTH
** 19"	4" Min THREAD LENGTH

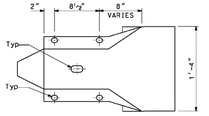
** For nested rail applications





END CAP (TYPE A)





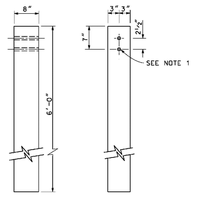
END CAP (TYPE B)

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

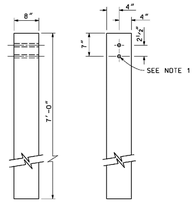
MIDWEST GUARDRAIL SYSTEM
STANDARD HARDWARE

NO SCALE

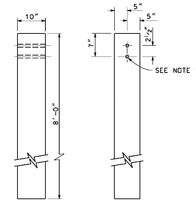
A77M1



6" x 8" WOOD POST
See Note 3



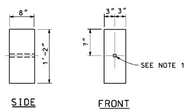
8" x 8" WOOD POST
See Note 4



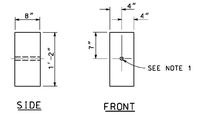
10" x 10" WOOD POST
See Note 5

NOTES:

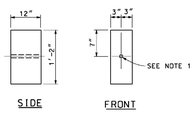
1. All holes in wood posts and blocks shall be 3/4" Dia ± 1/16".
2. Dimensions shown for wood post are nominal.
3. This post and block combination used for standard line post sections of MGS.
4. This post and 8" x 8" block combination used for line post sections of MGS on narrow roadways.
5. This post and 8" x 8" block combination is typically used where strengthened line post sections of MGS are warranted to shield fixed objects.
6. To be used with 8" x 8" x 7'-0" wood post if installed with 6" height dike.
7. To be used with 6" x 8" x 6'-0" wood post if installed with 6" height dike.



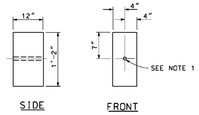
6" x 8" WOOD BLOCK
See Note 3



8" x 8" WOOD BLOCK
See Note 4



6" x 12" WOOD BLOCK
See Note 7



8" x 12" WOOD BLOCK
See Note 6

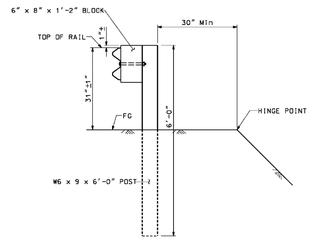
STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

MIDWEST GUARDRAIL SYSTEM
WOOD POST AND
WOOD BLOCK DETAILS

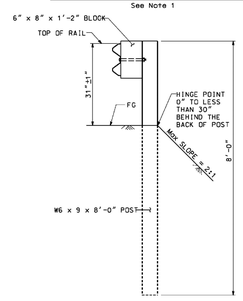
NO SCALE

RSP A77N1 DATED OCTOBER 21, 2022 SUPERSEDES STANDARD PLAN A77N1 DATED AUGUST 1, 2022 - PAGE 67 OF THE STANDARD PLANS BOOK DATED 2022.

REVISED STANDARD PLAN RSP A77N1

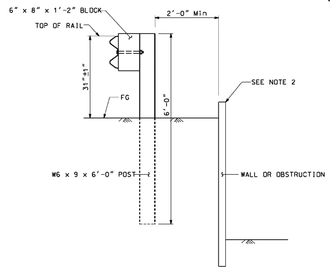


DETAIL A
TYPICAL ROADWAY INSTALLATION
See Note 1

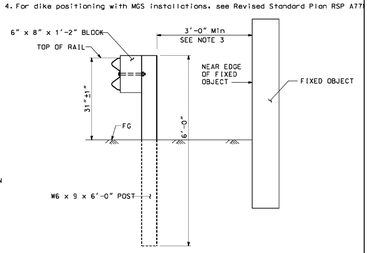


DETAIL B
NARROW ROADWAY INSTALLATION
See Note 1

POST EMBEDMENT



DETAIL C
AT OR BELOW GRADE



DETAIL D
ABOVE GRADE

INSTALLATION AT
WALLS OR OBSTRUCTIONS

NOTES:

1. These installation details are also applicable to wood line post installations for Detail A, C, and D, where wood line post installations are constructed. 6" x 8" x 1'-2" blocks are to be used in place steel post and block. For Detail B, where wood line post installations are constructed. 6" x 8" post, 8'-0" in length, with blocks are to be used in plac of the steel post and block shown. For additional installation details, see Standard Plans A77L1 and A77L2.
2. When maximum height of obstruction behind guardrail post is 6" above grade, see Detail D.
3. If distance from back of post to the near edge of fixed object is less than 3'-0", see Strengthened Rail Section as shown in layout pages.
4. For dike positioning with MGS installations, see Revised Standard Plan RSP A77

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

MIDWEST GUARDRAIL SYSTEM
TYPICAL LINE POST EMBEDMENT
AND HINGE POINT OFFSET DETAILS

NO SCALE

RSP A77N3 DATED OCTOBER 21, 2022 SUPERSEDES STANDARD PLAN A77N3 DATED AUGUST 1, 2022 - PAGE 69 OF THE STANDARD PLANS BOOK DATED 2022.

REVISED STANDARD PLAN RSP A77N3

REGISTERED PROFESSIONAL ENGINEER
ANN MADER STILLMAN
C 47882
EXPIRES 12/31/25
CIVIL
STATE OF CALIFORNIA

APPROVED:

DATE: _____

ANN MADER STILLMAN,
DIRECTOR OF PUBLIC WORKS
R. C. E. # 47882 / EXPIRES 12-31-2025

NOT FOR CONSTRUCTION

75% DESIGN

HALEY ALDRICH

HALEY & ALDRICH, INC.
785 Ygnacio Valley Road
Walnut Creek, CA 94595
Tel: 925.935.9771
www.haleyaldrich.com

PROJECT NO.: 0207545-007

COUNTY OF SAN MATEO PUBLIC WORKS

REVISION	DATE	DESIGNED BY: H&A (ZG)	SLIP-OUT REPAIR AND BANK STABILIZATION 1780 HIGGINS CANYON ROAD	SCALE: AS SHOWN
		DRAWN BY: H&A (KV)	**CALTRANS STANDARD DETAILS I**	DATE: MAY-2024
		CHECKED BY: H&A (SA)		FILE NO.: E5082
		ANN MADER STILLMAN, DIRECTOR OF PUBLIC WORKS COUNTY SAN MATEO	555 COUNTY CENTER, 5th FLOOR REDWOOD CITY, CALIFORNIA 94063	

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

C-405
SHEET 24 OF 26

\\haleyaldrich\share\granite\2023\0207545-SanMateoCo-1780HigginsCynRdRetWall\CAD\207545-001_C-400s.dwg 11-13-24 09:22:29 AM jricaruiz
Layout: C-405

APPROVED:

DATE: _____

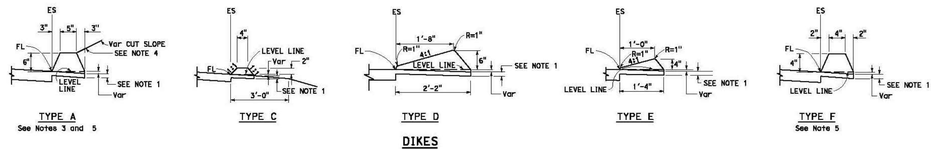
ANN MADER STILLMAN,
DIRECTOR OF PUBLIC WORKS
R. C. E. # 47882 / EXPIRES 12-31-2025

DIST#	COUNTY	ROUTE	POST MILES: TOTAL PROJECT	SHEET TOTAL No. SHEETS

REGISTERED CIVIL ENGINEER

August 1, 2022
PLANS APPROVAL DATE

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED ASPECT OF THIS PLAN SHEET.



TYPE A
See Notes 3 and 5

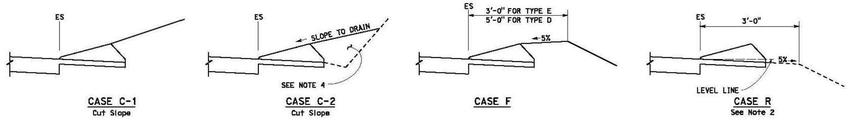
TYPE C

TYPE D

TYPE E

TYPE F
See Note 5

DIKES



CASE C-1
Cut Slope

CASE C-2
Cut Slope

CASE F

CASE R
See Note 2

TYPE D AND E BACKFILL DETAILS

NOTES:

1. For HMA shoulders only, extend top layer of HMA placed on the shoulder under dike with no joint at the ES. For projects with OGFC shoulders, do not extend OGFC under dike. See project plans for modified dike detail.
2. Case R applies to retrofit only projects where restrictive conditions do not provide enough width for Case F backfill.
3. Type A dike only to be used where restrictive slope conditions do not provide enough width to use Type D or Type E dike.
4. Fill and compact with excavated material to top of dike.
5. Use Type A or F dike, where dike is required with guardrail installations. See Standard Plan A77N4 for dike positioning details. See Standard Plan A77N5 for hinge point offsets with guardrail.

DIKE QUANTITIES

TYPE	CUBIC YARDS PER LINEAR FOOT
A	0.0135
C	0.0038
D	0.0293
E	0.0130
F	0.0066

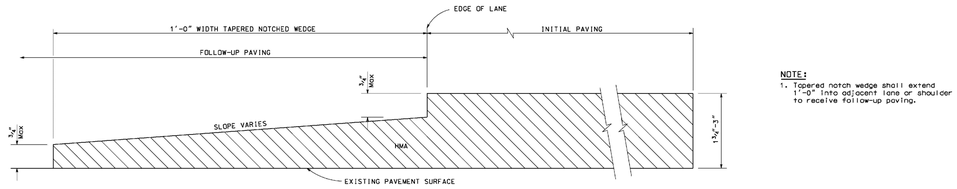
Quantities based on 5% cross slope.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

HOT MIX ASPHALT DIKES

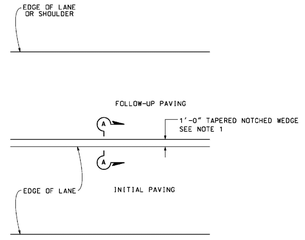
NO SCALE

A87B



NOTE:
1. Tapered notch wedge shall extend 1'-0" into adjacent lane or shoulder to receive follow-up paving.

SECTION A-A
LONGITUDINAL TAPERED NOTCHED WEDGE JOINT



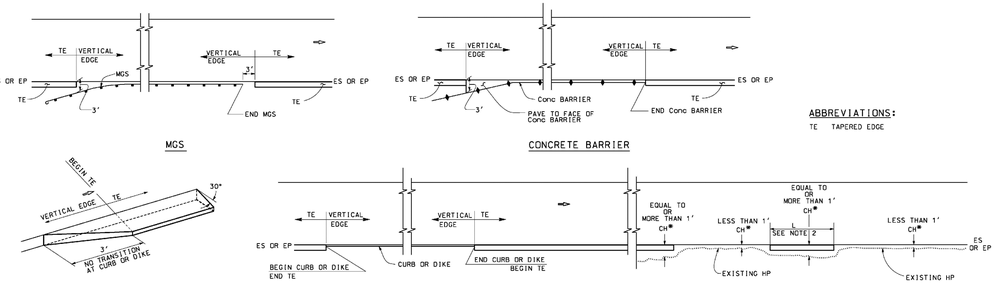
PLAN
DIVIDED MULTILANE HIGHWAY

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

HOT MIX ASPHALT PAVING (LONGITUDINAL TAPERED NOTCHED WEDGE JOINT)

NO SCALE

P70



MGS

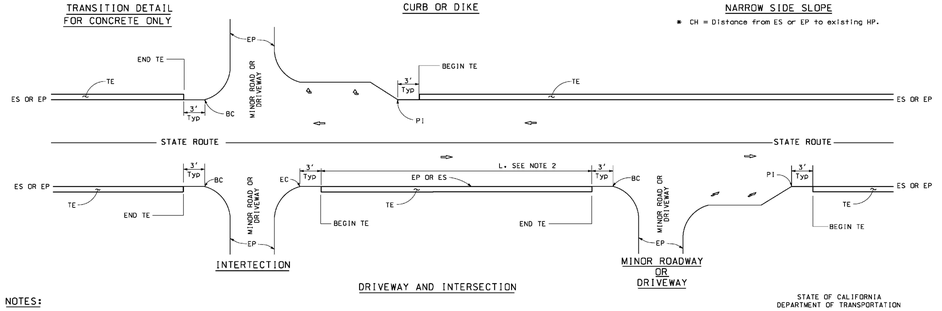
CONCRETE BARRIER

ABBREVIATIONS:
TE TAPERED EDGE

TRANSITION DETAIL
FOR CONCRETE ONLY

CURB OR DIKE

NARROW SIDE SLOPE
* CH = Distance from ES or EP to existing HP.



NOTES:
1. For details not shown, see Standard Plans P75 and P76.
2. Tapered edge is optional when L is less than 30'.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

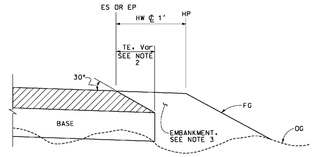
PAVEMENT EDGE TREATMENTS

NO SCALE

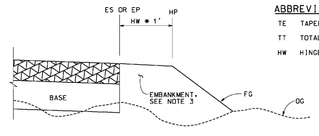
P74

LEGEND:
- HMA PAVEMENT
- HMA OR CONCRETE PAVEMENT
- CONCRETE PAVEMENT

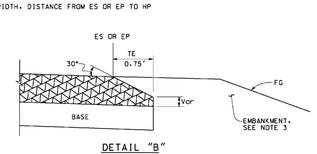
ABBREVIATIONS:
- TE TAPERED EDGE
- TT TOTAL THICKNESS OF TE
- HW HINGE WIDTH. DISTANCE FROM ES OR EP TO HP



CASE K
Tapered Edge - Fill Section. HW ≤ 1'

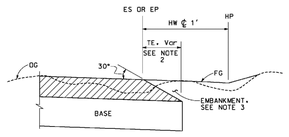


CASE L
Vertical Edge - Fill Section. HW ≤ 1'

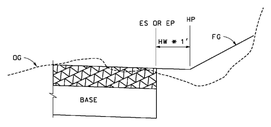


DETAIL "B"
For HMA pavement thickness more than 0.43' or concrete pavement

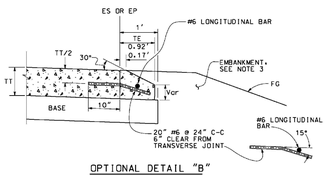
FILL SECTION



CASE M
Tapered Edge - Cut Section. HW ≤ 1'



CASE N
Vertical Edge - Cut Section. HW ≤ 1'



OPTIONAL DETAIL "B"
For concrete pavement
See Note 4

CUT SECTION

NOTES:
1. For limits of tapered edge and vertical edge treatments, see Standard Plan P74.
2. Details shown for HMA pavement thickness less than 0.43'. See Detail "B" for HMA pavement thickness more than 0.43' or concrete pavement.
3. For locations and limits of embankment see project plans.
4. Tapered edge transverse joint must match pavement transverse joint. End of #6 longitudinal bar must be 2" ±1/4" clear from transverse joint.
5. Tapered edge is not needed in the area of MGS, barrier, right turn lane and acceleration lane. See Standard Plan P74.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

PAVEMENT EDGE TREATMENTS– NEW CONSTRUCTION

NO SCALE

P76

NOT FOR CONSTRUCTION

75% DESIGN

HALEY & ALDRICH, INC.
785 Ygnacio Valley Road
Walnut Creek, CA 94595
Tel: 925.935.9771
www.haleyaldrich.com

PROJECT NO.: 0207545-007

REVISION	DATE	DESIGNED BY: H&A (ZG)	SLIP-OUT REPAIR AND BANK STABILIZATION	SCALE: AS SHOWN
		DRAWN BY: H&A (KV)	1780 HIGGINS CANYON ROAD	DATE: MAY-2024
		CHECKED BY: H&A (SA)	**CALTRANS STANDARD DETAILS II**	FILE NO.: E5082

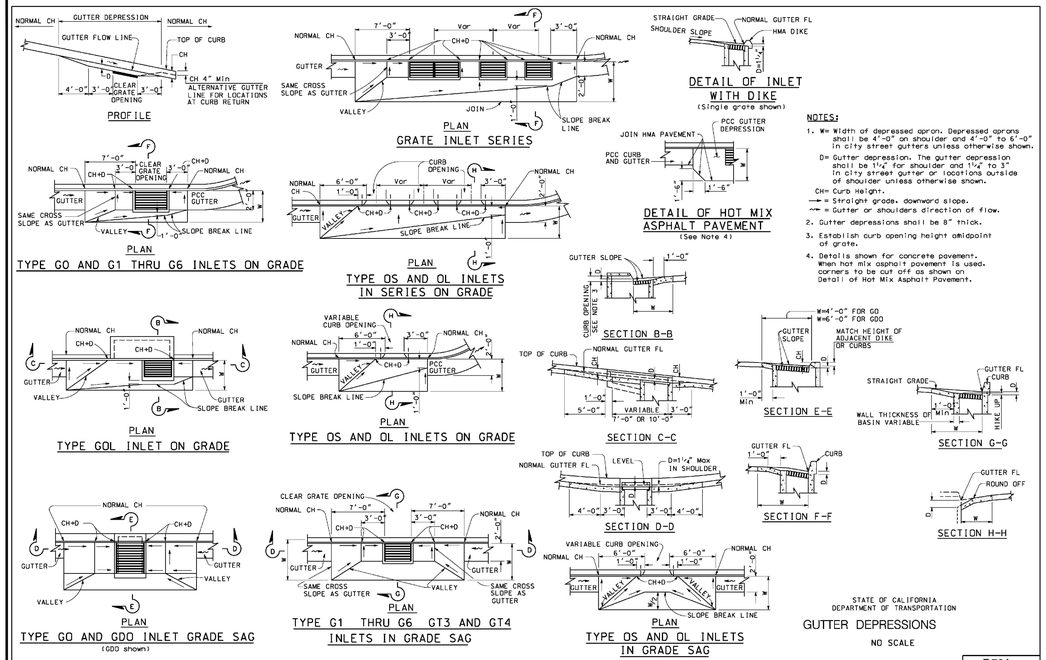
ANN MADER STILLMAN,
DIRECTOR OF PUBLIC WORKS
COUNTY SAN MATEO

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

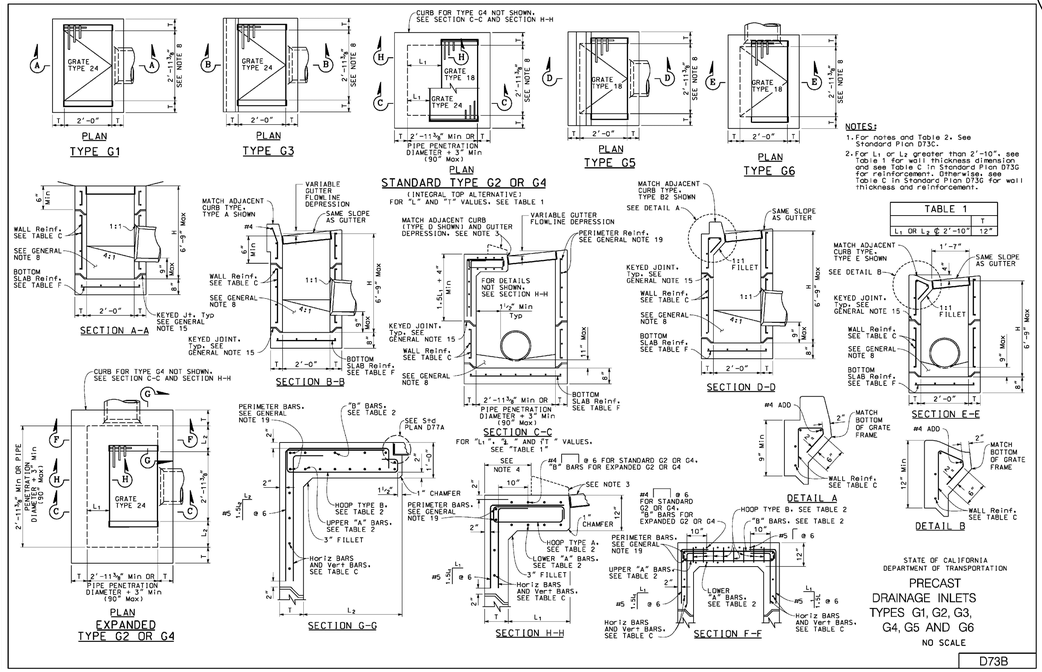
FOR REDUCED PLANS
ORIGINAL SCALE IS IN INCHES 0 1 2 3 4

C-406
SHEET 25 OF 26

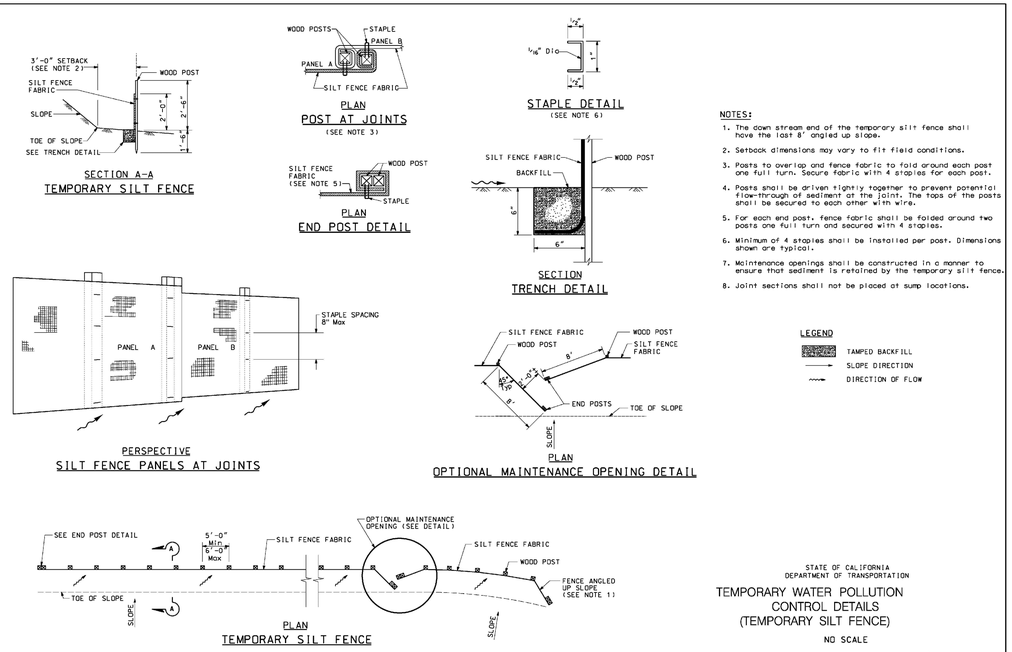
\\haleyaldrich\share\rgranite\2023\0207545-SanMateoCo-1780HigginsCynRdRetWall\CAD\207545-001_C-406s.dwg 11-13-24 09:22:32 AM jrcruz
Layout: C-406



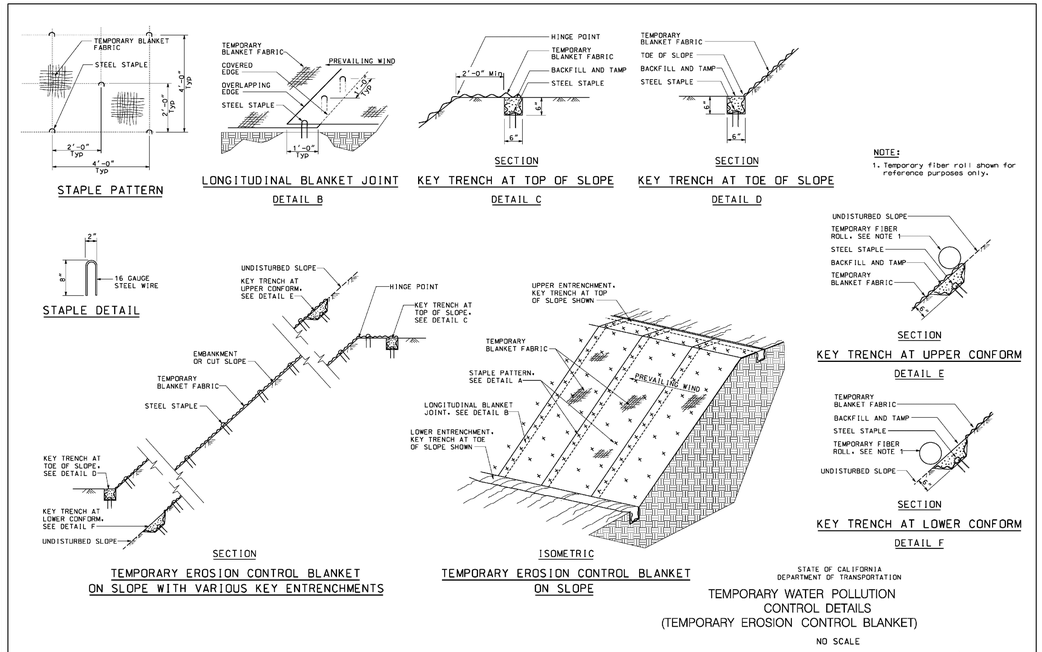
D78A



D73B



T51



T54

APPROVED:

DATE:

ANN MADER STILLMAN,
DIRECTOR OF PUBLIC WORKS
R. C. E. # 47882 / EXPIRES 12-31-2025

REGISTERED PROFESSIONAL ENGINEER
ANN MADER STILLMAN
C 47882
EXPIRES 12/31/25
CIVIL
STATE OF CALIFORNIA

NOT FOR CONSTRUCTION

75% DESIGN

HALEY ALDRICH

HALEY & ALDRICH, INC.
785 Ygnacio Valley Road
Walnut Creek, CA 94595
Tel: 925.935.9771
www.haleyaldrich.com

PROJECT NO.: 0207545-007

COUNTY OF SAN MATEO PUBLIC WORKS

REVISION	DATE	DESIGNED BY: H&A (ZG)	SLIP-OUT REPAIR AND BANK STABILIZATION	SCALE: AS SHOWN
		DRAWN BY: H&A (KV)	1780 HIGGINS CANYON ROAD	DATE: MAY-2024
		CHECKED BY: H&A (SA)	**CALTRANS STANDARD DETAILS III**	FILE NO.: E5082
		ANN MADER STILLMAN, DIRECTOR OF PUBLIC WORKS COUNTY SAN MATEO	555 COUNTY CENTER, 5th FLOOR REDWOOD CITY, CALIFORNIA 94063	

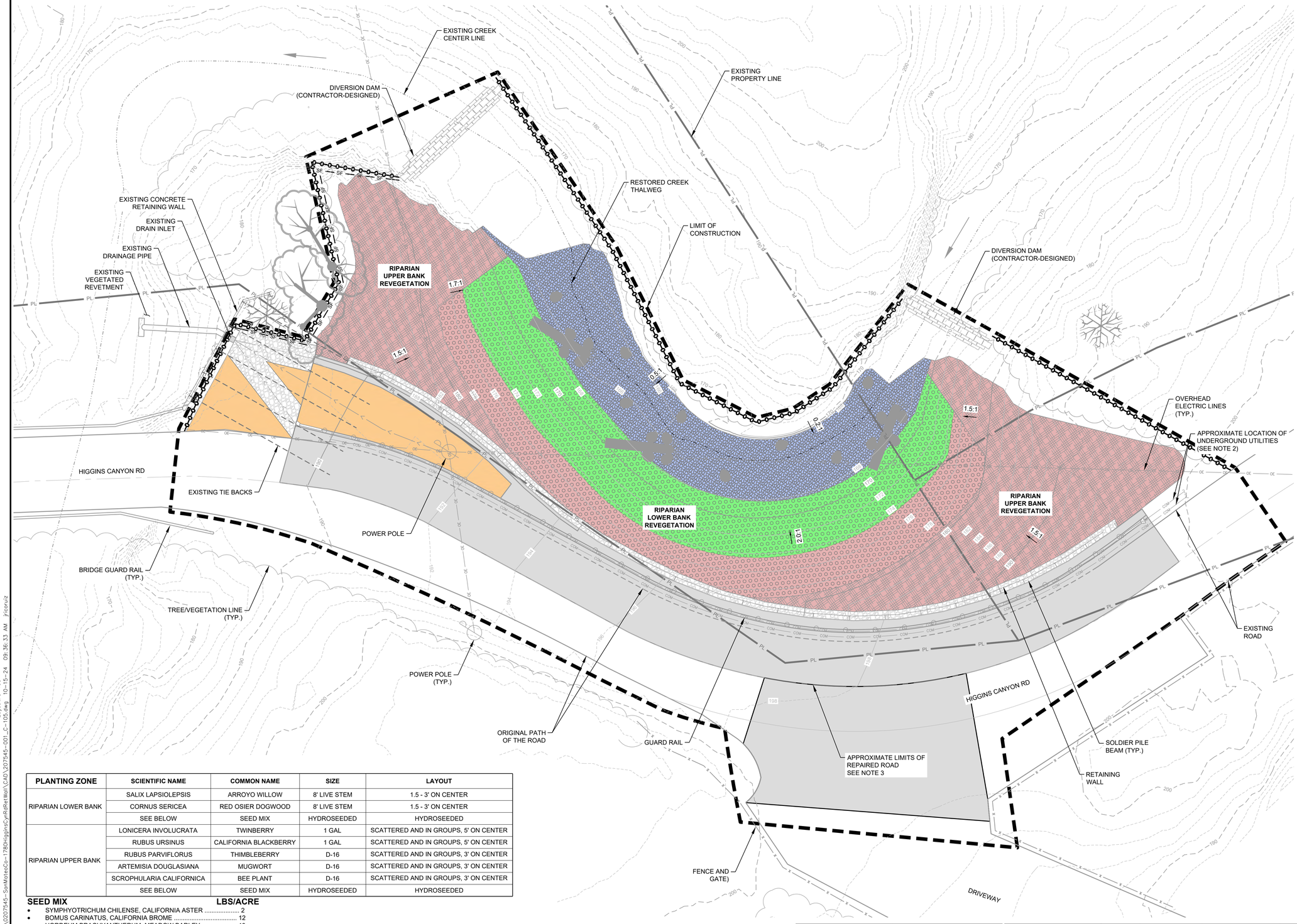
FOR REDUCED PLANS ORIGINAL SCALE IS IN INCHES 0 1 2 3 4

C-407
SHEET 26 OF 26

\\haleyaldrich\share\granite\2023\0207545-SanMateoCo-1780HigginsCynRdRetWall\CAD\0207545-001_C-400s.dwg 11-13-24 09:22:37 AM jrarauz
Layout: C-407

APPENDIX A2

Revised Design Plans (October 2024)



APPROVED:

DATE: _____

ANN MADER STILLMAN,
DIRECTOR OF PUBLIC WORKS
R. C. E. # 47882 / EXPIRES 12-31-2025

REGISTERED PROFESSIONAL ENGINEER
ANN MADER STILLMAN
C 47882
EXPIRES 12/31/25
CIVIL
STATE OF CALIFORNIA

LEGEND

- EXISTING PROPERTY LINE
- EXISTING CONTOUR MAJOR
- EXISTING CONTOUR MINOR
- EXISTING OVERHEAD ELECTRIC
- EXISTING UNKNOWN UNDERGROUND UTILITIES
- EXISTING CREEK CENTERLINE
- EXISTING ROADWAY
- EXISTING SLIPPED ROADWAY
- EXISTING TREE/VEGETATION LINE
- PROPOSED LIMITS OF CONSTRUCTION
- PROPOSED CREEK CENTERLINE
- PROPOSED TREE/VEGETATION LINE
- PROPOSED EXCLUSION FENCING
- PROPOSED SILT FENCE
- PROPOSED CONTOUR MAJOR
- PROPOSED CONTOUR MINOR
- PROPOSED ASPHALT (NOTE 3)
- PROPOSED GUARDRAIL
- PROPOSED ENGINEERED CREEK BED
- PROPOSED VEGETATED BOULDER REVETMENT
- PROPOSED VEGETATED SOIL LIFTS
- PROPOSED WALL BASE AND ROAD SHOULDER
- ENGINEERED CREEK BED MATERIAL
- RIPARIAN LOWER BANKS REVEGETATION
- RIPARIAN UPPER BANKS REVEGETATION
- REVEGETATION

NOTES

1. FOR SURVEY NOTES REFER TO SHEET G-103.
2. LOCATIONS OF UNDERGROUND UTILITIES ARE APPROXIMATE. CONTRACTOR SHALL FIELD VERIFY EXACT LOCATIONS PRIOR TO START OF ANY EARTH WORK AND REPLACE PRIOR TO INSTALLING THE GUARDRAIL.
3. LIMITS OF ASPHALT SHOWN AT THE ENDS OF NEW WORK ALONG HIGGINS CANYON ROAD ARE APPROXIMATE. THE ACTUAL LIMIT OF PAVING WILL BE FIELD DETERMINED BASED ON THE QUALITY AND COMPETENCE OF THE EXISTING PAVEMENT TO BE TIED INTO.

PLANTING ZONE	SCIENTIFIC NAME	COMMON NAME	SIZE	LAYOUT
RIPARIAN LOWER BANK	SALIX LAPSIOLEPSIS	ARROYO WILLOW	8' LIVE STEM	1.5 - 3' ON CENTER
	CORNUS SERICEA	RED OSIER DOGWOOD	8' LIVE STEM	1.5 - 3' ON CENTER
	SEE BELOW	SEED MIX	HYDROSEEDED	HYDROSEEDED
RIPARIAN UPPER BANK	LONICERA INVOLUCRATA	TWINBERRY	1 GAL	SCATTERED AND IN GROUPS, 5' ON CENTER
	RUBUS URSINUS	CALIFORNIA BLACKBERRY	1 GAL	SCATTERED AND IN GROUPS, 5' ON CENTER
	RUBUS PARVIFLORUS	THIMBLEBERRY	D-16	SCATTERED AND IN GROUPS, 3' ON CENTER
	ARTEMISIA DOUGLASIANA	MUGWORT	D-16	SCATTERED AND IN GROUPS, 3' ON CENTER
	SCROPHULARIA CALIFORNICA	BEE PLANT	D-16	SCATTERED AND IN GROUPS, 3' ON CENTER
	SEE BELOW	SEED MIX	HYDROSEEDED	HYDROSEEDED

SEED MIX **LBS/ACRE**

- SYMPHYOTRICHUM CHILENSE, CALIFORNIA ASTER 2
- BOMUS CARINATUS, CALIFORNIA BROME 12
- HORDEUM BRACHYANTHERUM, MEADOW BARLEY 10
- FESTUCA RUBRA "MOLATE", MOLATE RED FESCUE 8
- LEYMUS TRITICOIDES, CREEPING WILDRYE 8

PLANTING NOTES

1. APPLY HYRDOSEED MIX TO ALL DISTURBED AREAS ABOVE THE OHW AND WITHOUT DURABLE COVER (ASPHALT OR GRAVEL).
2. PLANTING PALETTE SHALL BE AS INDICATED OR USING APPROVED EQUAL BASED ON AVAILABILITY.

0 10 20 30 40
SCALE IN FEET

NOT FOR CONSTRUCTION

75% DESIGN

HALEY & ALDRICH, INC.
785 Ygnacio Valley Road
Walnut Creek, CA 94595
Tel: 925.935.9771
www.haleyaldrich.com

PROJECT NO.: 0207545-007

REVISION	DATE	DESIGNED BY: H&A (ZG)	SLIP-OUT REPAIR AND BANK STABILIZATION 1780 HIGGINS CANYON ROAD ############	SCALE: AS SHOWN
		DRAWN BY: H&A (KV)		DATE: ~~MM/DD/YY~~ 2024
		CHECKED BY: H&A (SA)		FILE NO.: E5082
			ANN MADER STILLMAN, DIRECTOR OF PUBLIC WORKS COUNTY SAN MATEO	555 COUNTY CENTER, 5th FLOOR REDWOOD CITY, CALIFORNIA 94063

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

SHEET ## OF 26

\\haleyaldrich\share\granite\2023\0207545-SanMateoCo-1780HigginsCynRdRetWall\CAD\207545-001_C-105.dwg 10-15-24 09:36:33 AM jrcoruz
Layout: C-105

APPENDIX B

County of San Mateo Routine Maintenance Program Manual

Best Management Practices

Table 9-1. Maintenance Program Best Management Practices

BMP Number	BMP Title	BMP Description
General Avoidance and Minimization Measures		
GEN-1	Staging and Access	▪ Staging, access, and parking areas will be located outside of sensitive habitats to the extent feasible. ▪ Staging areas will be located 30 feet from the top of bank (or as far as feasibly possible) or on the outboard side of levees. ▪ Vegetation removal shall be limited to the minimum amount necessary to provide access.
GEN-2	Minimize Area of Disturbance and Site Maintenance	▪ Areas of disturbance will be limited to the smallest footprint necessary and a single access pathway, where feasible. For maintenance activities near waterways or other sensitive habitat, the designated work area shall be clearly identified in the field using highly visible material, and work will not be conducted outside this area. ▪ Keep excavated soil and materials on the site where they will not collect into the street or get transported to storm drains or nearby water bodies by rainfall or runoff in order to avoid deleterious effects to fish, wildlife, and beneficial uses. ▪ Transfer excavated materials to dump trucks on the site, not in the street.
GEN-3	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. ▪ When in-channel work is required, where available use existing ingress or egress points or perform work from the top of the stream banks.
GEN-4	Salvage/Reuse of Plant and Woody Material	▪ Large wood or weed-free topsoil displaced by project activities may be stockpiled for use during site restoration. Native vegetation displaced by project activities will be stockpiled if it would be useful during site restoration. ▪ Stockpiled material shall not be placed over riparian or wetland vegetation. Stockpiled material shall not be placed in areas where it could enter the stream, riparian or wetland areas. ▪ To the extent feasible, all other woody material that is not re-usable should be disposed at a composting facility.
GEN-5	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.
GEN-6	Hazardous Materials Storage/ Disposal	▪ 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 watertight containers, store in appropriate secondary containment, and cover them at the end of every workday or during wet weather or when rain is forecast. ▪ Follow manufacturer's application instructions for hazardous materials and be careful not to use more than necessary. Do not apply chemicals outdoors when rain is forecast within 24 hours. ▪ Arrange for appropriate disposal of all hazardous wastes.

BMP Number	BMP Title	BMP Description
GEN-7	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. On-site monitor should insect beneath all vehicles that have been parked more than 15 minutes before they leave the work area. 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. If water must be used, the Contractor shall collect the water and spilled fluids and dispose of it as hazardous waste. • Clean up spills on dirt areas by digging up and properly disposing of contaminated soil. • Small spills (less than 18 inches in diameter) including small quantities of oil, gasoline, paint or other materials should be controlled by the first responder (maintenance staff) and do not necessarily require an emergency response team. Medium spills (greater than 18 inches but less than 6 feet in diameter) are typically controlled by the first responder (maintenance staff) but police or fire department HAZMAT teams may be called based on conditions. Report significant spills (larger than 6 feet in diameter and any "running" spill) immediately. You are required by law to report all significant releases of hazardous materials, including oil. To report a spill, contact the San Mateo County Environmental Health Services Division, or other emergency office (e.g., local fire or police department) as warranted, immediately and document the spill using the spill documentation form . Alternatively, 1) dial 911, the local emergency response number, 2) the National Response Center at (800) 424-8802; or 2) call the Governor's Office of Emergency Services Warning Center, (800) 852-7550 (24 hours). As appropriate, contact other agencies including California Occupational Safety and Health Administration or the Regional Water Quality Control Board. All chemical spills shall be reported as soon as possible to the emergency site contact.
GEN-8	Waste Management	Cover waste disposal containers securely at the end of every workday 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. ▪ Ensure that portable toilets have a secondary containment plan (e.g., a containment pan). ▪ 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.
GEN-9	Vehicle 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. ▪ Conduct vehicle and equipment cleaning at County corporation yards and ensure that rinse water does not run into gutters, streets, storm drains, or surface waters.

BMP Number	BMP Title	BMP Description
		▪ If refueling or vehicle maintenance must be done on-site, work in a bermed area (e.g., sandbags, gravel bags, compost socks, or other barrier material) at least 150 feet away from creek channels, away from storm drains and over a drip pan big enough to collect fluids. ▪ Refuel vehicles at least 150 feet away from the active stream channel. ▪ Keep an ample supply of spill clean-up materials near fueling, vehicle maintenance and hazardous materials/hazardous waste storage areas. Inventory clean-up materials monthly and restock as needed. ▪ Post proper fueling and spill clean-up instructions at fueling areas. Never leave the area while equipment is being filled. ▪ Recycle or dispose of fluids as hazardous waste. ▪ Do not clean vehicle or equipment on-site using soaps, solvents, degreasers, steam cleaning equipment, etc. ▪ Perform vehicle and mobile equipment steam cleaning, pressure washing or degreasing only over a containment designed to collect any generated wash water. Collect wash water and discharge to sewer via an oil water separator. Do not pour wash water down storm drains or sewers connected to septic systems.
GEN -10	Equipment Maintenance & Fueling	▪ A separate area should be designated for equipment maintenance and fueling, away from any slopes, watercourses, or drainage facilities. ▪ 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, gravel bags, or absorbent booms should be employed to contain any leaks or spills. ▪ Equipment should be inspected daily for leaks or damage and promptly repaired. ▪ Fueling and maintenance of vehicles should take place at least 65 feet away from waterways. ▪ In the event of a spill, follow procedures outlined in BMP GEN-7.
GEN-11	Paving and Asphalt Work	▪ Avoid paving and seal coating in wet weather or when rain is in the forecast, to prevent materials that have not cured from contacting stormwater runoff. ▪ Cover storm drain inlets and manholes when applying seal coat, tack coat, slurry seal or fog seal; and when saw cutting asphalt or concrete. ▪ Collect and recycle or appropriate dispose of excess abrasive gravel or sand. Do not sweep this material into gutters. ▪ Do not use water to wash down fresh asphalt concrete pavement. ▪ Use filter fabric, catch basin inlet filters, or gravel bags to keep slurry out of the storm drain system. ▪ Shovel, absorb or vacuum saw-cut slurry and dispose of all waste as soon as work is complete in one location or at the end of the workday. ▪ If sawcut slurry enters a catch basin, clean it up immediately.
GEN-12	Concrete, Grout and Mortar Application	▪ Store concrete, grout, and mortar away from storm drains or waterways, and on pallets under cover to protect them from rain, runoff and wind. ▪ Wash out concrete equipment/trucks offsite or in a designated washout area, where the water will flow into a temporary waste pit, and in a manner that will prevent leaching into the underlying soil or onto surrounding areas. Let concrete harden and dispose of as garbage.

BMP Number	BMP Title	BMP Description
		▪ When washing exposed aggregate, prevent wash water from entering storm drains. Block any inlets and vacuum gutters, hose wash water onto dirt areas, or drain onto a bermed surface to be pumped and disposed of properly.
GEN-13	Exclude Concrete from Channel	▪ For maintenance activities that involve concrete pouring, the County shall ensure that poured concrete be excluded from the wetted channel for a period of 30 days after it is poured. During that time, the poured concrete shall be kept moist, and runoff from the concrete shall not be allowed to enter a stream. Containment structures should be installed to control the placement of wet concrete and to prevent it from entering the channel outside of those structures. ▪ Commercial sealants may be applied to the poured concrete surface where difficulty in excluding water flow for a long period may occur. If sealant is used, water shall be excluded from the site until the sealant is dry. ▪ No dry concrete shall be placed on the banks or in a location where it could be carried into the channel by wind or runoff.
GEN-14	Concrete Washout Facilities	▪ Concrete washout facilities should be established for maintenance activities that require on-site preparation and use of Portland cement concrete, asphalt concrete or cement mortar, establish concrete washout facilities. These facilities capture wash water, concrete and aggregate flushed from concrete mixers, chutes, etc. Concrete washouts may be contained settling basins dug into the ground, raised and contained structures, trailers, etc. They are also applicable for projects that require equipment washouts. ▪ An appropriate area for the washout must be identified at least 50 feet away from watercourses and storm drains in case of accidental breaching. The storage capacity of the basin must be sized correctly for the job. <u>Construction Guidelines:</u> ▪ The location of the concrete washout should be clearly labeled and all employees should be educated about proper concrete disposal. ▪ Avoid mixing excess amounts of fresh concrete or cement mortar on-site. ▪ Wash out concrete mixers only in designated washout areas where the water will flow into temporary sealed basins or onto stockpiles of aggregate base or sand. Use as little water as possible to reduce hardening and evaporation time of waste products. ▪ Construct a basin large enough to contain all liquid and waste concrete materials generated during washout procedures. A minimum basin size is 9 feet x 9 feet and 2 feet deep. Plastic liner materials shall be a minimum of 60-mil polyethylene sheeting free of holes and defects. ▪ Recycle washout by pumping back into mixers for reuse when possible. <u>BMP Maintenance:</u> ▪ The concrete washout should be checked frequently to ensure proper use and effectiveness. ▪ At 75 percent capacity, the washout must be cleaned or new facilities must be constructed and ready for use. <u>BMP Removal:</u> ▪ The hardened concrete and materials related to the washout must be broken up, removed, and disposed of in accordance to local regulations. ▪ Area disturbed by the concrete washout must be repaired.

BMP Number	BMP Title	BMP Description
GEN-15	Painting and Paint Removal	▪ Never clean brushes or rise paint containers into a street, gutter, storm drain, or stream. ▪ For water-based paints, paint out brushes to the extent possible, and rinse into a drain that goes to the sanitary sewer. Never pour paint down a storm drain. ▪ For oil-based paints, paint out brushes to the extent possible and clean with thinner or solvent in a proper container. Filter and reuse thinners and solvents. Dispose of excess liquids as hazardous waste. ▪ Paint chips and dust from non-hazardous dry stripping and sand blasting may be swept up or collected in plastic drop cloths and disposed of as trash. ▪ Chemical paint stripping residue and chips and dust from marine paints or paints containing lead, mercury, or tributyltin must be disposed of as hazardous waste. Lead based paint removal requires a state-certified contractor.
GEN-16	Timing of Work	▪ In general, routine maintenance and construction activities that take place in sensitive habitat and/or in channels below ordinary high water will be conducted during the dry season (June 15 through October 15). Maintenance activities that are in upland areas and that would not affect streams may occur during low rainfall years at times when there is no predicted rainfall (chance of precipitation is less than 30 percent chance of rain). Activities that are subject to permit requirements will be conducted during the period authorized by the permits.
GEN-17	Maintain Traffic Flow	▪ To the extent feasible, work shall be staged and conducted in a manner that maintains two-way traffic flow on roadways in the vicinity of the work site. ▪ Heavy equipment and haul traffic shall be prohibited in residential areas to the greatest extent feasible. When no other route to and from the site is available, heavy equipment and haul traffic through residential areas shall be restricted to the hours of 8 a.m. to 5:30 p.m., Monday through Friday. ▪ If heavy equipment or hauling is required beyond the hours above, the County or their contractor would provide notice to adjacent property owners 48 hours in advance of such activities.
GEN-18	Traffic Control and Public Safety	▪ In the event that work activities require the temporary closure of any traffic lanes, the County shall implement measures to guide traffic (such as signage and flaggers), safeguard construction workers, provide safe passage of vehicles, and minimize traffic impacts through the duration of work activities. The County also shall notify local emergency service providers regarding any planned lane closures. ▪ For any other work within or near the roadway that could pose a hazard to the public, the County shall install/implement appropriate measures, such as fences, barriers, flagging, guards, and/or signs, to give adequate warning and provide protection from the potentially dangerous condition. ▪ For work activities along or near roadways with sidewalks and bike lanes, the County shall implement measures to ensure the safe passage of pedestrians and bicyclists around the work site. ▪ Where work is proposed at a recreational park or trail, warning signs will be posted several feet beyond the limits of work. Signs will also be posted if trails will be temporarily closed. ▪ Public transit access and routes will be maintained in the vicinity of the work site. If public transit will be affected by temporary road closures and require detours, affected transit authorities will be consulted and kept informed of project activities.

BMP Number	BMP Title	BMP Description
GEN-19	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.
GEN-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.
GEN-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.
GEN-22	Site Stabilization	Earthwork will be completed as quickly as possible, and where practical, site restoration will occur immediately following maintenance. If site restoration involves planting, such activities may commence in late fall or early winter during the onset of rainy season. Bare soil surfaces resulting from maintenance and/or construction activities shall be covered with suitable erosion controls (seed or plant vegetation, 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 October through April). ▪ No later than 7 days following the disturbance during the dry season (approximately May through September).Every effort shall be made to immediately cover bare soil surfaces resulting from maintenance and/or construction activities prior to storms. Revegetation activities will include only local plant materials native to the San Francisco Peninsula region.
GEN-23	Fire Prevention	1. All earthmoving and portable equipment with internal combustion engines will be equipped with spark arrestors. 2. During the high fire danger period (April 1–December 1), work crews will: ▪ Have appropriate fire suppression equipment available at the work site. ▪ Keep flammable materials, including flammable vegetation slash, at least 10 feet away from any equipment that could produce a spark, fire, or flame.

BMP Number	BMP Title	BMP Description
		▪ Not use portable tools powered by gasoline-fueled internal combustion engines within 25 feet of any flammable materials unless a round-point shovel or fire extinguisher is within immediate reach of the work crew (no more 25 feet away from the work area).
GEN-24	Investigation of Utility Line Locations	An evaluation of the locations of utility lines that could be affected by maintenance activities will be conducted annually as part of the preparation of the Annual Notification. Utilities will be avoided as much as possible. For maintenance areas with the potential for effects on utility services, the following measures will be implemented: 1. Utility excavation or encroachment permits will be required from the appropriate agencies. These permits include measures to minimize utility disruption. The County and its contractors will comply with permit conditions. Such conditions will be included in construction contract specifications. 2. Utility locations will be verified through a field survey (potholing) and use of the Underground Service Alert services. 3. Detailed specifications will be prepared as part of the design plans to include procedures for the excavation, support, and/or fill of areas around utility cables and pipelines. All affected utility services will be notified of the County's maintenance plans and schedule. Arrangements will be made with these entities regarding protection, relocation, or temporary disconnection of services. 4. Residents and businesses in the project area will be notified of planned utility service disruption 2 to 4 days in advance, in conformance with state standards. 5. Disconnected cables and lines will be reconnected promptly.
GEN-25	Retention of Tree Stumps / Rootwads	▪ Objects embedded/anchored in the bank, such as tree stumps, shall not be removed if removal could result in release of sediment into the channel. Stumps and rootwads that potentially serve as basking sites or that encourage pool formation should be left in place whenever possible. Protruding objects that could capture additional debris and result in obstruction of the channel (e.g. the branches and trunk of a downed tree) may be trimmed. If an embedded object must be removed to prevent a debris jam, turbidity control practices shall be used, and the bank shall be reseeded, re-vegetated and/or mulched following removal.
GEN-26	Decontamination of Project Equipment and Vehicles	▪ Equipment, boots and waders used for in-water maintenance activities will be decontaminated prior to entering and exiting the maintenance site and/or between each use in different water bodies to avoid the introduction and transfer of organisms between water bodies. Methods to be employed may include: drying, using a hot water soak, or freezing, as appropriate to the type of gear or equipment. The County shall begin the decontamination process by thoroughly scrubbing equipment, paying close attention to small crevices such as boot laces, seams, net corners, etc., with a stiff-bristled brush to remove all organisms. To decontaminate by drying, the County shall allow equipment to dry thoroughly (i.e., until there is a complete absence of water), preferably in the sun, for a minimum of 48 hours. To decontaminate using a hot water soak, the County shall immerse equipment in 140°F or hotter water and soak for a minimum of 5 minutes. To decontaminate by freezing, the County shall place equipment in a freezer 32°F or colder for a minimum of 8 hours. Repeat decontamination is required only if the equipment/clothing is removed from the site, used within a different waterbody, and returned to the project site.

BMP Number	BMP Title	BMP Description
		▪ Vehicles, watercraft, and other maintenance equipment used for in-water maintenance activities that are too large to immerse in a hot water bath shall be decontaminated by pressure washing with hot water (minimum of 140°F at the point of contact or 155°F at the nozzle or by using other effective techniques). Watercraft engines and all areas that could contain standing water (e.g., live wells, bilges, etc.) shall be flushed for a minimum of 10 minutes. Following the hot water wash, vehicles, watercraft and equipment shall be dried as thoroughly as possible. ▪ A bleach solution shall be used to decontaminate vehicles, watercraft and other maintenance gear and equipment at a designated location where runoff can be contained and not allowed to enter streams or other sensitive habitat areas.
GEN-27	Vegetation and Tree Removal	▪ The disturbance or removal of vegetation shall not exceed the minimum necessary to complete maintenance activities. The use of bulldozers, backhoes, or other heavy equipment to remove vegetation along stream banks shall be avoided wherever feasible. ▪ The County may remove up to two non-hazardous trees greater than 12 inches in diameter per year from natural channels below ordinary high water if the trees are restricting the capacity of the channel, causing erosion or flooding, or limiting access to perform maintenance work. Trees will be cut at ground level and the root mass left in place to maintain bank stability. No non-hazardous trees greater than 36 inches in diameter will be removed under this program. This measure does not apply to trees considered a hazard as defined by the International Society of Arboriculture, which may include dead or dying trees, dead parts of live trees, or unstable live trees (due to structural defects or other factors) that are within striking distance of people or property (a target) that have the potential to cause death, injury, or substantial property damage. ▪ Removed vegetation shall be placed directly into a disposal vehicle and removed from the site, and shall not be permitted to remain onsite overnight. However, if removed vegetation will be used onsite for erosion control or slash and will not be moved or disturbed, it may be stockpiled onsite for longer than an overnight. Stockpiled vegetation shall not be piled on the ground unless it is later transferred, piece by piece, under the direct supervision of the biological monitor or qualified biologist.
GEN-28	Herbicide Application	▪ Herbicide application shall only be conducted when the climate is dry and when wind speeds do not exceed 7 miles per hour. Herbicides shall not be used in or adjacent to any fish-bearing stream, lake, pond or other water bodies supporting suitable habitat for California red-legged frog or other listed species.
Erosion Control Measures		
EC-1	Brush Layering	Brush layering is a technique used to stabilize shallow slope failures or rebuild fill slopes with live brush cuttings (usually willows or other types of branches) with soil backfill or soil lifts. Live brush layers act as horizontal drains and improve slope stability by providing tensile strength and natural revegetation. Brush layering may include the use of fabric soil wraps, large vegetated boulder revetments, or other structural toe support. Synthetic geogrids can only be used with prior agency approval. For a more detailed description of this BMP, refer to Appendix A.
EC-2	Brush Packing	Brush packing is a biotechnical gully and slump repair technique. Brush packing utilizes alternating layers of live branch cuttings (from rootable plant species) and soil to repair large rills, gullies, and slumps. The brush packing technique is more

BMP Number	BMP Title	BMP Description
		appropriate for the repair of gullies on slopes, and it can be implemented with hand labor. For a more detailed description of this BMP, refer to Appendix A.
EC-3	Live Staking	Live staking involves the insertion of live, vegetative cuttings into the ground in a manner that allows the cutting (stake) to take root and grow. This BMP is used to reduce the potential for soil to become water borne, to reduce water velocity and erosive forces, and to aid in habitat protection. Poles used in willow walls and vegetated boulder revetments may be a structural application. Sprigs may be used in individual planting spots along a streambank. For a more detailed description of this BMP, refer to Appendix A.
EC-4	Live Pole Drain	Live pole drains are a biotechnical technique intended to drain excess moisture away from an unstable site. Plants (typically willows) are used to construct bundles which will sprout and grow, with the moisture continuing to drain from the lower end. The bundles are placed in shallow trenches in a manner that they intersect and collect excessive slope moisture. See Appendix A for additional description about this BMP.
EC-5	Wattles/ Fascines	Wattles and fascines are live branch cuttings, usually willows, bound together into long, tubular bundles used to stabilize slopes and stream banks. Both wattles and live fascines are true biotechnical practices. The live branches and live stakes provide the biological element while the stems, rope ties and wedge-shaped wooden stakes all combine to provide the structural elements. Fascines differ from wattles in that the branch cuttings all point in the same direction in fascines, where they may point in either direction in wattles. Wattles are typically aligned on contour, where fascines are angled slightly upslope and thus tend to produce more vigorous growth. For a more detailed description of this BMP, refer to Appendix A.
EC-6	Hand Seeding	Hand seeding is broadcasting grass seed on disturbed or bare soil areas by hand or a hand seeding device. This BMP is used to reduce the potential for soil to become water or air borne, reduce erosion after vegetation establishment, provide for vegetative buffers and aid in habitat protection. Seeding with appropriate seed mixes also helps discourage colonization by non-native and invasive plant species. For a more detailed description of this BMP, refer to Appendix A.
EC-7	Hydroseeding	Hydroseeding is broadcasting grass seed, tackifier, wood fiber mulch and water on disturbed areas using a hydroseeding machine. This BMP is used to reduce the potential for soil becoming water or air borne, to reduce erosion after vegetation is established, provide vegetative buffers and to aid in habitat protection. Seeding with appropriate seed mixes will also help discourage colonization by non-native and invasive plant species. Hydroseeding may be used after soil disturbance is completed at construction/maintenance sites and/or on bare slopes. For a more detailed description of this BMP, refer to Appendix A.
EC-8	Mulching	Mulching is the application of rice or sterile straw, wood chips, leaf litter, redwood duff, or other suitable materials on the soil surface applied manually or by machine. This BMP is used to reduce the potential for soil becoming water or air borne, and to encourage vegetation establishment. This BMP is used to protect the soil surface and to protect newly seeded areas. For a more detailed description of this BMP, refer to Appendix A.
EC-9	Vegetative Buffer	A vegetative buffer is a strip of vegetation adjacent to sensitive areas, ditches, pavement and water bodies. This BMP prevents soil from becoming water borne and may help restore shallow slope failures by trapping soil and debris. For a more detailed description of this BMP, refer to Appendix A.
EC-10	Erosion Control Blankets & Mats	Erosion control blankets and mats are installed to protect the prepared soil surface of a steep slope. This BMP may be used at maintenance sites to provide stabilization/protection on steep slopes or stream banks. Erosion control blankets and mats

BMP Number	BMP Title	BMP Description
		are available in a variety of materials including jute, excelsior, blanket material, straw, wood fiber blanket, coconut fiber blanket, coconut fiber mesh, and straw coconut fiber blanket. Material selection should be based on the size of area, slope, surface conditions, revegetation plans, and channel velocity. Coir fabric/netting is a geo-textile product made from coconut fibers loosely woven into a fabric usually packaged in roll form. This fabric can be used to provide a reduction in water velocity/erosive forces and/or habitat protection and topsoil stabilization. Erosion control blankets and mats may be used in combination with seeding and/or vegetation. For a more detailed description of this BMP, refer to Appendix A.
EC-11	Surface Roughening	Surface roughening is a technique for roughening a bare soil surface with furrows running across the slope, stair stepping, or tracking with construction equipment. Surface roughening is intended to aid the establishment of vegetative cover from seed, to reduce runoff velocity and increase infiltration, and to reduce erosion and provide for sediment trapping. This BMP is typically applied on slopes steeper than 3:1. For a more detailed description of this BMP, refer to Appendix A.
EC-12	Rolling Dip	Rolling dips are ridges or ridge-and-channels constructed diagonally across a sloping road or utility right-of-way that is subject to erosion to limit the accumulation of erosive volumes of water on roads by diverting surface runoff at designated intervals. Rolling dips are appropriate to use on low and moderate grades and on both high or low traffic roads. For a more detailed description of this BMP, refer to Appendix A.
EC-13	Slope or Bank Stabilization	Where biotechnical methods are unsuitable for stabilizing streambanks due to site specific conditions such as steep slopes or limited right-of-way width, hardened engineered solutions such as rock slope protection, solider pile walls, retaining walls, or slope soil nailing may be utilized along a failed portion of slope to provide a buttress against additional failure. To the extent feasible, this BMP should be combined with biotechnical solutions through installation of vegetated rock slope protection. Refer to Appendix A for a more detailed description of this BMP.
EC-14	Energy Dissipator	An energy dissipator is a structure designed to control erosion at the outlet of a channel or conduit by reducing the velocity of flow and dissipating the energy. This BMP is recommended at the outlet of any new or replacement drainage culvert, which are points of high erosion potential. Energy dissipators are effective in absorbing the impact of flow and reducing the velocity to non-erosive levels. For a more detailed description of this BMP, refer to Appendix A.
Sediment/Water Quality Control Measures		
SC-1	Gravel Bags	Gravel bags can be used to keep water away from work areas and unstable slopes or for constructing cofferdams and clean water bypasses. This BMP is also typically used at construction or maintenance sites to protect storm drain outlets, gutters, ditches, and drainage courses. For a more detailed description of this BMP, refer to Appendix A.
SC-2	Silt Fence	A silt fence is a temporary sediment barrier consisting of fabric stretched across and attached to supporting posts and entrenched into soil. This BMP is generally used for perimeter protection (around construction/maintenance sites, stockpile areas). It may also be installed perpendicular to the flow direction to slow or stop water and to allow perimeter filtration, settling of soil particles, and to reduce water velocity. For a more detailed description of this BMP, refer to Appendix A.
SC-3	Straw Log, Straw Roll, Coir Log	Straw rolls/logs or coir logs may be used for temporary soil stockpile protection; protection of storm drains, gutters, and drainage courses; temporary check dams; bank or slope stabilization; and streambank toe protection. Alternatives to straw rolls/logs and coir logs include compostable filter socks/berms comprised of natural fibers and other bio-based materials. For a more detailed description of this BMP, refer to Appendix A.

BMP Number	BMP Title	BMP Description
SC-4	Inlet Protection	Storm drain inlets can be protected through installation of temporary barriers such as silt fences, gravel bags, and other proprietary barriers like geotextile inserts, biofilter bags, or compost socks. These barriers are intended to prevent and reduce the sediment discharged into storm drains by ponding runoff and allowing sediment to settle out. For a more detailed description of this BMP, refer to Appendix A.
SC-5	Stormwater Separation Systems	Stormwater separation systems are engineered devices installed in storm drain facilities to remove solids, grease and other pollutants. These may be installed where deep structures allow for their placement and maintenance, or where sufficient quantities of pollutant materials require regular removal in order for the storm drains to operate correctly. For a more detailed description of this BMP, refer to Appendix A.
SC-6	Diversion Berm	A diversion berm is a temporary ridge of compacted soil or aggregate base material, or contiguous bag berm constructed at the top or base of a disturbed slope. It may also consist of asphalt concrete or "cutback" at the top of a disturbed slope. This BMP is intended to direct stormwater runoff away from an unstable slope. For a more detailed description of this BMP, refer to Appendix A.
SC-7	Silt Curtain	The County shall install silt curtains or other appropriate silt filtering devices around excavation sites to prevent heavily silted water from impacting areas around the work site. The silt curtain or silt filtering device shall be maintained throughout all phases of excavation.
SC-8	Turbidity Monitoring	During in-water maintenance activities, the County will monitor turbidity levels up and downstream of the maintenance work area prior to conducting maintenance. The County will maintain a log of turbidity data and ensure that activities do not result in increases in turbidity of the stream of more than 20 percent of upstream sampling locations, as measured visually or by nephelometric turbidity units (NTU). Work will be halted if turbidity/siltation levels exceed 20 percent of upstream sampling levels and CDFW will be contacted for further guidance to ensure activities do not harm aquatic life.
Dewatering Measure		
DW-1	Channel Dewatering	• When in-water construction is unavoidable, streamflow shall be diverted around work areas by either installing cofferdams and/or clean water bypass systems. A cofferdam is a temporary structure built into a waterway to enclose a construction area and reduce sediment pollution from construction work in or adjacent to water. A clean water bypass is typically used for short-term diversion of small amounts of water over short distances to enable dewatering of a maintenance site. Depending on site conditions, these systems may be either gravity driven or require use of a pump to divert water around a construction area. For a more detailed description of this BMP, refer to Appendix A. • No dewatering will be conducted at sites with recent document occurrences of coho salmon within the past 5 years.
Sediment Testing and Disposal Measure		
ST-1	Testing and Disposal of Sediment	Depending on the location of the sediment removal site and upstream and adjacent land uses, the County will test the sediment prior to removal to determine suitability for disposal or reuse based on its chemical qualities. The test results and proposed disposal or reuse locations will be submitted to the RWQCB for review and approval. Samples will be analyzed according to the Beneficial Reuse of Dredged Materials: Sediment Screening and Testing Guidelines (RWQCB 2000), as appropriate for the proposed disposal or reuse site. The results will be compared against federal and state environmental screening levels (ESLs) for protection of human health, groundwater quality, and terrestrial receptors. If hazardous levels of

BMP Number	BMP Title	BMP Description
		contaminants (as defined by federal and state regulations) are present, the material will be taken to a permitted hazardous waste facility.

Sources: San Mateo Countywide Water Pollution Prevention Program, 2014; County of San Mateo, 2004 and 2013.

Table 9-2. Cultural Resources Best Management Practices

BMP Number	BMP Title	BMP Description
CUL-1	Review Cultural Resources Sensitivity Map Data and County Baseline Maps to Determine if the Work Area Has Been Subject to a Previous Cultural Resource Study	During the early phases of Annual Work Plan development, the County will review the Cultural Sensitivity Map Data and County Baseline Maps (Appendix I) for all locations where ground-disturbing activities are proposed where excavation would be required beyond the facility's as-built design or otherwise reach previously undisturbed soils beyond existing engineered depths or extent. If the foregoing conditions are not applicable to the maintenance activity being performed, only BMPs CUL-4 and CUL-5 will be required. Based on the location of projects, and whether or not excavation or ground disturbance will occur beyond existing engineered depths or extent, BMPs CUL-2 through CUL-4 shall be implemented as follows: ▪ High Sensitivity: BMPs CUL-2, CUL-3, and CUL-4 ▪ Moderate Sensitivity: BMP CUL-2 and CUL-3 ▪ Low Sensitivity: BMPs CUL-2 through CUL-4 not required ▪ Unknown Sensitivity: BMP CUL-2 and CUL-3 ▪ BMPs CUL-5 and CUL-6 are applicable to all ground-disturbing activities in natural channels or native soils, regardless of the sensitivity level of the work area.
CUL-2	Record Search and Field Inventory for Highly or Moderately Sensitive Areas (Sensitivity Ratings 3-5), and Areas of Unknown Sensitivity	▪ The County will retain a qualified cultural resources specialist to conduct a review and evaluation of locations that involve soil disturbance/excavation in natural channels or native soils identified as Highly to Moderately Sensitive to determine the potential for these activities to affect significant cultural resources. ▪ The initial evaluation will be based on a review of archival information provided by the Northwest Information Center (NWIC) of the California Historical Resources Information System in regard to the project area based on a 0.25-mile search radius. This initial archival review will be completed by the professional archaeologist who will be able to view confidential site location data and literature to arrive at a preliminary sensitivity determination. ▪ It is recommended that the County conduct a review of the Sacred Lands Inventory of the Native American Heritage Commission (NAHC) and due diligence outreach with individuals identified by the NAHC and/or local historical societies or groups. This outreach would involve sending a letter with a request for pertinent information about cultural resources within the project area and to identify any concerns. This outreach is in addition to notification under PRC 21080.3.1 (i.e., CUL-3), and may be appropriate for projects that would not otherwise require Assembly Bill 52 notification. Such outreach is also encouraged under Section 106 implementing regulations at 36 CFR 800.4(a)(3) for identification of historic properties. ▪ The qualified archaeologist will conduct field inventory of the project area to determine the presence/absence of surface cultural materials. The results, along with any mitigation and/or management recommendations, will be presented to the County in an appropriate report format that includes any necessary maps, figures, and correspondence with interested parties. The report will also include a summary of the records search and archival research data, and pertinent geoarchaeological overviews and studies, and regional research designs, as appropriate. ▪ A summary table indicating appropriate management actions (e.g., monitoring during construction, presence/absence testing for subsurface resources, and data recovery) will be developed for each project work area reviewed.

BMP Number	BMP Title	BMP Description
		▪ The maintenance activities will be implemented to avoid significant impacts to cultural resources, if possible. **EXCEPTIONS**: After the NWIC record search and NAHC sacred lands search have been conducted, the qualified archaeologist may determine that a field review is not necessary under the following circumstances: ▪ Locales that have previously been subject to cultural resource studies where no previously identified cultural resources or historical resources were documented. ▪ Locales that have previously been subject to cultural resources studies, but identified cultural resources have been determined by a qualified archaeologist/resource specialist as not eligible for listing in the California Register of Historical Resources (CRHR) or the National Register of Historic Places (NRHP). ▪ A short report would be required to document the decision not to conduct a field study.
CUL-3	Consult with Native American Tribes	▪ The County, as the lead CEQA agency, has notified Native American tribes about the Maintenance Program according to PRC 21080.3.1 (also referred to as Assembly Bill 52); *only Native American tribes that have previously requested notification from the County pursuant to PRC 21080.3.1(b) require notification*. For tribes that request consultation under PRC 21080.3.1(b)(2), the County will consult with those tribes pursuant to PRC 21080.3.2 for projects in areas of high, moderate, and unknown sensitivity.
CUL-4	Construction Monitoring	▪ The County will retain a qualified archaeologist to be present on-site during ground-disturbing activities within areas identified as highly sensitive for cultural areas, unless the qualified archaeologist determines otherwise after the field inventory conducted under CUL-2. Similarly, after conducting the field study under CUL-2, the qualified archaeologist may determine that areas originally identified as moderately sensitive for cultural resources warrant monitoring during construction. The reasons for conducting monitoring in areas initially considered of moderate sensitivity would be discussed in the inventory report. ▪ The qualified archaeologist will have the authority to stop work if cultural resources are discovered. ▪ If any cultural resources are discovered during construction monitoring, BMP CUL-6 would be implemented as appropriate.
CUL-5	Conduct Pre-Maintenance Educational Training	At the beginning of each maintenance season, and in concert with implementing BMP BIO-1, as well as before conducting activities subject to BMP CUL-2 through CUL-4, all maintenance personnel will participate in an educational training session conducted by a qualified cultural resources specialist. This training will include instruction on how to identify historic and prehistoric resources that may be encountered, and will describe the appropriate protocol to be followed if resources are discovered during maintenance work.
CUL-6	Address Discovery of Cultural Remains or Historic or Paleontological Artifacts Appropriately	Unanticipated discoveries of cultural and paleontological resources may occur during maintenance construction activities. Examples of cultural remains are obsidian and chert flaked-stone tools (e.g., projectile points, knives, scrapers) or significant areas of tool-making debris; culturally darkened soil (“midden”) containing heat-affected rocks, artifacts, or shellfish remains; stone milling equipment (e.g., mortars, pestles, handstones, or milling slabs); and battered stone tools, such as hammerstones and pitted stones. Historic-period artifacts may include stone, concrete, or adobe footings and walls; filled wells or privies; and deposits of metal, glass, and/or ceramic refuse. Paleontological artifacts are fossilized remains of plants and animals. Work will be restricted or stopped in areas where remains or artifacts are found until proper protocols are met.

		Protocol for treatment of prehistoric or historic cultural resources: 1. Work at the location of the find will halt immediately within 50 feet of the find. A "no work" zone will be established utilizing appropriate flagging to delineate the boundary of this zone, which will measure at least 50 feet in all directions from the find. 2. The County will retain the services of a consulting archaeologist, who will visit the discovery site as soon as practicable and perform minor hand excavation to describe the archaeological or paleontological resources present and assess the amount of disturbance. 3. The consulting archaeologist will provide to the County and USACE, at a minimum, written and digital-photographic documentation of all observed materials, utilizing the CRHR and NRHP guidelines for evaluating archaeological resources. Based on the assessment, the County and USACE will identify the CEQA and Section 106 cultural resources compliance procedures to be implemented. 4. If the consulting archaeologist determines that the find appears not to meet the CRHR or NRHP criteria of significance, and a USACE archaeologist concurs with the consulting archaeologist's conclusions, construction may continue while monitored by the consulting archaeologist. The authorized maintenance work will resume at the discovery site only after the County has retained a consulting archaeologist to monitor and the Maintenance Manager has received notification from USACE allowing work to continue. 5. If the find appears significant, avoidance of additional impacts is the preferred alternative. The consulting archaeologist will determine if adverse impacts to the resources can be avoided. 6. Where avoidance is not practical (e.g., maintenance activities cannot be deferred or must be completed to satisfy the Maintenance Program objective), the County will develop an action plan (also known as a data recovery plan) and submit it to USACE within 48 hours of determining that maintenance activities cannot be deferred. The action plan will be submitted by email to the appropriate archeological/cultural resources contact at the USACE. The action plan is equivalent to a data recovery plan. It will be prepared in accordance with the current professional standards and state guidelines for reporting the results of the work, and will describe the services of a Native American consultant and a proposal for curation of cultural materials recovered from a non-grave context. 7. The recovery effort will be documented in a report prepared by the consulting archaeologist in accordance with current archaeological standards. Any non-grave artifacts will be placed with an appropriate repository. 8. In the event of discovery of human remains (or if a find consists of bones suspected to be human), the field crew supervisor will take immediate steps to secure and protect such remains from vandalism during periods when work crews are absent.) 9. The maintenance crew supervisor will immediately notify the San Mateo County Coroner and provide any information that identifies the remains as Native American. If the remains are determined to be those of a prehistoric Native American or a Native American from the ethnographic period, the Coroner will contact NAHC within 24 hours of being notified about the remains. NAHC will designate and notify a Most Likely Descendant (MLD) within 24 hours. The MLD will have 24 hours to consult and provide recommendations for the treatment or disposition, with proper dignity, of the human remains and grave goods. 10. Preservation in situ is the preferred option for human remains. Human remains will be preserved in situ if continuation of the maintenance work, as determined by the consulting archaeologist and MLD, will not cause further damage to the remains. The remains and artifacts will be documented, the find location carefully backfilled (with protective geo-fabric if desirable), and the information recorded in County Maintenance Program files.

BMP Number	BMP Title	BMP Description
		11. If human remains or cultural items are exposed during maintenance that cannot be protected from further damage, they will be exhumed by the consulting archaeologist at the discretion of the MLD and reburied, with the concurrence of the MLD, in a place mutually agreed upon by all parties. <u>Protocol for treatment of paleontological resources:</u> 1. Work at the location of the find will halt immediately within 50 feet of the find. A "no work" zone will be established utilizing appropriate flagging to delineate the boundary of this zone, which will measure at least 50 feet in all directions from the find. 2. The County shall retain the services of a consulting paleontologist. The consulting paleontologist will meet the Society for Vertebrate Paleontology's criteria for a qualified professional paleontologist (Society of Vertebrate Paleontology 2010). 3. The consulting paleontologist shall visit the discovery site as soon as practicable and perform minor hand-excavation to describe the paleontological resources present and assess the amount of disturbance. The consulting paleontologist will follow the Society for Vertebrate Paleontology's guidelines (2010) for treatment of the artifact. Treatment may include preparation and recovery of fossil materials for an appropriate museum or university collection, and may include preparation of a report describing the finds. The County will be responsible for ensuring that the consulting paleontologist's recommendations for treatment are implemented.

Table 9-3. Biological Resources Best Management Practices

BMP Number	BMP Title	BMP Description
BIO-1	Environmental Awareness Training	Prior to commencing maintenance activities in a given year, all participating maintenance personnel will attend a worker environmental awareness training program. The training will include a brief review of special-status species, sensitive habitats, and other sensitive resources that may exist in the project area, including field identification, habitat requirements, and the legal status and protection of each relevant species, as well as locations of sensitive biological resources. The training will include materials concerning the following topics: sensitive resources, resource avoidance, permit conditions, and possible consequences for violations of State or Federal environmental laws. The training will cover the maintenance activity's conservation measures, environmental permits, and regulatory compliance requirements, as well as the roles and authority of the monitors and biologist(s). It will include printed material and an oral training session by a qualified biologist.
BIO-2	Minimize Injury or Mortality of Fish and Amphibian Species during Dewatering	Prior to dewatering a construction site, all reasonable efforts shall be made to capture and relocate native fish and amphibian species if necessary to avoid direct mortality and minimize take. Streams that support a sensitive species (e.g., steelhead, California red-legged frog) will require a relocation effort led by a qualified biologist (see also BMPs BIO- 3 through BIO-5). The following measures are consistent with those defined as *reasonable and prudent* by NMFS for projects concerning several central California Evolutionarily Significant Units for coho salmon and steelhead trout. ▪ Fish relocation activities will be performed only by qualified fisheries biologists that have 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. ▪ Capture methods may include fish landing nets, dip nets, buckets and by hand. ▪ 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). Captured aquatic life shall be released immediately in the closest suitable body of water adjacent to the work site, taking into consideration 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. D. Avoid areas with large concentrations of potential predators in immediate vicinity. ▪ Minimize handling of salmonids. However, when handling is necessary, always wet hands or nets prior to touching fish.

BMP Number	BMP Title	BMP Description
		▪ Temporarily hold fish in cool, shaded, aerated water in a container with a lid or in a live–car (i.e., a net enclosure that can be placed in a pond to temporarily hold the fish). ▪ If fish are held in a container, 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 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. The biological monitor or qualified biologist shall check daily for stranded aquatic life as the water level in the dewatering area drops. ▪ If mortality during relocation exceeds the amount authorized by the applicable permits or, if no amount is specified, 5 percent, stop efforts and immediately contact the appropriate agencies (CDFW and NMFS).
BIO-3	California Red-legged Frog Protection Measures	If suitable habitat for California red-legged frog is determined to exist in or around the work area where maintenance activities are planned to occur, the County will implement applicable protection measures as follows: ▪ No more than twenty-four (24) hours prior to the date of initial ground disturbance or mowing, a pre-activity survey for the California red-legged frog will be conducted by a qualified biologist at the work site. The survey will consist of walking the work area limits to ascertain the possible presence of the species. The qualified 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 qualified 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 qualified biologist is given sufficient time to move the animals from the work site before ground disturbance is initiated. Only qualified biologists will capture, handle, and monitor the California red-legged frog. ▪ To minimize harassment, injury, death, and harm to individual California red-legged frogs, one of the following two measures will be implemented. 1. An approved, qualified biologist(s) will be on-site during all activities that may result in take of the California red-legged frog, as determined by the biologist taking into account all information gathered during the desktop audit of the site as well as the preconstruction survey. Qualified biologists must be approved by the USFWS.

BMP Number	BMP Title	BMP Description
		or 2. Prior to pre-activity surveys, personnel will enclose the work area with an exclusion fence with a minimum height above grade of 42 inches. The bottom of the fence will either be buried a minimum of six inches below ground or otherwise secured in a manner approved by the USFWS and will remain in place during all maintenance activities in order to prevent California red-legged frogs from entering the work area. Escape ramps, funnels, or other features that allow animals to exit the work area, but which will prohibit the entry of such animals, will be provided in the exclusion fencing. A qualified biologist will conduct a pre-activity survey of the fence installation area immediately prior to (i.e., the day of) the commencement of installation and will be on-hand to monitor fence installation. The exclusion fencing will be inspected daily by maintenance personnel and maintained for the duration of maintenance implementation. ▪ The qualified biologist(s) will be given the authority to freely communicate verbally, by telephone, electronic mail, or in writing at any time with maintenance personnel, any other person(s) at the work area, otherwise associated with the maintenance work, the USFWS, the CDFW, or their designated agents. The qualified 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 work activities if they determine any of the associated requirements are not being fulfilled. If the qualified 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 County will minimize adverse impacts to the California red-legged frog by limiting, to the maximum extent possible, the number of access routes, ground disturbance area, equipment staging, storage, parking, and stockpile areas. Prior to initiating maintenance work that involve ground-disturbing activities, 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 qualified biologist, and clearly identified with fencing. The fencing will be inspected by the qualified biologist and maintained daily until the last day that equipment is at the site. ▪ To the extent practicable, ground-disturbing activities will be avoided from October through April because that is the time period when California red-legged frogs are most likely to be moving through upland areas. When ground-disturbing activities must take place between November 1 and March 31, the County will ensure that daily monitoring by the qualified biologist is completed for the California red-legged frog. ▪ If egg masses are present and work cannot be postponed until after hatching, a buffer of vegetation at least 10 feet in diameter shall be left around any egg masses found. Staff will keep a record of any sites where egg masses are found and will conduct vegetation removal at these sites between June 15 and October 15. Staff shall avoid entering the channel to avoid dislodging egg masses. Activities shall be performed from the banks. ▪ To minimize harassment, injury, death, and harm in the form of temporary habitat disturbances, all maintenance-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. Maintenance-

BMP Number	BMP Title	BMP Description
		related vehicles will observe a 20-mile per hour speed limit within work areas, except on County roads, and State and Federal highways. Off-road traffic outside of designated and fenced work areas will be prohibited. ▪ When a California red-legged frog is encountered in the work area, all activities which have the potential to result in the harassment, injury, or death of the individual will be immediately halted. The qualified 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 the individual 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 qualified biologist outside the work area within the same riparian area or watershed. If relocation of the individual outside the work area 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 work 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 qualified 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 USFWS contact for this situation is the Coast Bay Foothills Division Chief of the Endangered Species Program by email and at telephone (916) 414-6600. ▪ A litter control program will be instituted at each activity 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 site at the end of each working day. ▪ The County will comply with all herbicide application requirements mandated by the USEPA and stipulated injunctions pertaining to California red-legged frog. For example, herbicides will be limited for controlling state-designated invasive species and noxious weeds, will not be used within 15 feet of aquatic breeding critical habitat or non-breeding aquatic critical habitat areas or within 15 feet of aquatic features within non-critical habitat sections subject to the 2006 Court-ordered injunction; precipitation is not occurring or forecast to occur within 24 hours; herbicide is limited to localized spot treatment using hand-held devices; and herbicide will be applied by a certified applicator or person working under the direct supervision of a certified applicator. ▪ For on-site storage of pipes, conduits and other materials that could provide shelter for California red-legged frogs, materials will be securely capped prior to storage or 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 maintenance activities will occur during rain events or within 24-hours following a rain event. Prior to maintenance activities resuming, a qualified biologist will inspect the work area and all

BMP Number	BMP Title	BMP Description
		equipment/materials for the presence of California red-legged frogs. The animals will be allowed to move away from the work site of their own volition or moved by the qualified biologist. ▪ To the maximum extent practicable, night-time construction activities will be minimized or avoided by the County. Because dusk and dawn are often the times when the California red-legged frog 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 30 minutes after sunrise. Except when necessary for driver or pedestrian safety, to the maximum extent practicable, artificial lighting at a work 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 qualified biologist, maintenance personnel, or County contractors. Materials utilizing fixed weaves (strands cannot move), polypropylene, polymer or other synthetic materials will not be used. ▪ 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 County 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 qualified 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 qualified 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 qualified biologist will remove and transport it to a safe location, or contact the USFWS for guidance.
BIO-4	California Tiger Salamander Protection Measures	In the limited area in which the California tiger salamander might occur (i.e., in the vicinity of Alpine Trail), the measures described for California red-legged frog above will be implemented for California tiger salamander as well. In addition, the CDFW will be included in any agency coordination, as well as the USFWS, for issues involving the salamander.
BIO-5	San Francisco Garter Snake Protection Measures	In areas within one mile of a documented occurrence of the San Francisco garter snake, onsite habitat shall be evaluated by a qualified biologist or biological monitor for the potential to support this species. If suitable habitat for San Francisco garter snake is determined to exist in or around the work area where ground disturbing activities or mowing are planned to occur, the following measures will be followed: ▪ To the extent feasible, maintenance activities should be conducted from April through October during the dry season when these semi-aquatic species are less likely to be found in a work area. ▪ Prior to implementation of maintenance work, the County will submit to the USFWS and CDFW for its review and approval the qualifications of proposed wildlife biologist(s) who will perform pre-activity surveys and on-site monitoring. ▪ To avoid harassment, injury, death, and harm to individual San Francisco garter snakes, immediately prior to (i.e., the day of) the initiation of maintenance activities that have potential for take of the San Francisco garter snake, a USFWS

BMP Number	BMP Title	BMP Description
		and CDFW-approved biologist will conduct daytime surveys throughout the project site. The approved biologist will be present during initial ground-disturbing activities (i.e., clearing and grubbing) within 250 ft of the work area to monitor for individual garter snakes. The biologist will also be present during any other maintenance activities that could potentially result in take, as determined by the biologist taking into account all information gathered during the desktop audit of the site as well as the preconstruction survey. If a San Francisco garter snake is observed within the maintenance work area, either during the pre-activity survey or at any time, activities that could potentially harm the individual will cease and the USFWS and CDFW will be contacted immediately. Work will not re-commence without written approval from CDFW. 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. ▪ For vegetation removal on berms or other sites with suitable San Francisco garter snake habitat, vegetation shall be cut down to 3 inches by hand tools (weedwhacker, etc.). Once the ground is visible, a visual survey for San Francisco garter snakes shall be conducted. If no sensitive species are found in the area, removal of vegetation may continue by mowing or mechanized equipment very slowly with a biological monitor walking in front of the equipment to observe. ▪ Maintenance-related vehicles will observe a 20 mile per hour speed limit while in the 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 maintenance 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 maintenance crew, if the biologist is not on-site) will watch the individual until it has moved out of the maintenance work area. ▪ A litter control program will be instituted at each activity 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 site at the end of each working day.
BIO-6	Measures to Protect the Foothill Yellow-legged Frog, California Giant Salamander, Santa Cruz Black Salamander, and Western Pond Turtle	In areas within one mile of documented foothill yellow-legged frog, California giant salamander, Santa Cruz black salamander, or western pond turtle occurrences, or where suitable habitat for one or more of these species is determined to exist in or around the work area where ground disturbing activities or mowing are planned to occur, the County will implement applicable protection measures as follows: ▪ The qualified biologist will conduct a special-status species survey on each morning of and within 48 hours prior to the scheduled work commencing. 1. If no foothill yellow-legged frog, California giant Salamander, Santa Cruz black salamander, or western pond turtle is found, the work may proceed. 2. If eggs or larvae of the foothill yellow-legged frog, California giant salamander, Santa Cruz black salamander, are found, the qualified biologist will establish a buffer around the location of the eggs/larvae and work may proceed outside of the buffer zone. No work will occur within the buffer zone. Work within the buffer zone will be rescheduled until the time that eggs have hatched and/or larvae have metamorphosed, or the Permittee shall contact CDFW to develop site appropriate avoidance and minimization measures.

BMP Number	BMP Title	BMP Description
		3. If an active western pond turtle nest is detected within the activity area, a 10-foot buffer zone around the nest will be established and maintained during the breeding and nesting season (April 1 – August 31). The buffer zone will remain in place until the young have left the nest, as determined by a qualified biologist. 4. If adult or non-larval juvenile foothill yellow-legged frogs, California giant salamanders, Santa Cruz black salamanders, or western pond turtles are found, one of the following two procedures will be implemented: a. If, in the opinion of the qualified biologist, capture and removal of the individual to a safe place outside of the work area is less likely to result in adverse effects than leaving the individual in place and rescheduling the work (e.g., if the species could potentially hide and be missed during a follow-up survey), the individual will be captured and relocated by a qualified biologist to suitable habitat at least 100 meters away and work may proceed. b. If, in the opinion of the qualified biologist, the individual is likely to leave the work area on its own, and work can be feasibly rescheduled, a buffer will be established around the location of the individual(s) and work may proceed outside of the buffer zone. No work will occur within the buffer zone until the turtle has left the work area. Work within the buffer zone will be rescheduled if necessary.
BIO-7	Check for Wildlife in Pipes/Construction Materials	For maintenance activities that involve pipes or culverts, the County will visually check all sections of pipe for the presence of wildlife sheltering within them prior to moving any pipe or culvert sections that have been stored on the site overnight, or the pipes will have the ends capped while stored on site so as to prevent wildlife from entering. After attachment of the pipe/culvert sections to one another, the exposed end(s) of the pipe/culvert will be capped at the end of each day during construction to prevent wildlife from entering and being trapped within the pipeline/culvert.
BIO-8	Minimize Impacts on Dusky-footed Woodrat Nests	If suitable habitat for San Francisco dusky-footed woodrat is determined to exist in the work area, the following measure will be followed: ▪ No more than two weeks prior to the beginning of ground disturbance or other routine maintenance activities that could disturb woodrat nests, a qualified biologist will survey the work areas scheduled for maintenance. If any dusky-footed woodrat nests are found, the nests shall be flagged and construction fencing or flagging that will not impede the movement of the SFDW shall be placed around the nest to create a 10-foot buffer (where feasible). If the nest is located adjacent to a road or trail, the nest shall be clearly flagged so equipment/truck drivers accessing sites can see the nest. If a dusky-footed woodrat nest is identified in a work area, the following measure will be implemented by the County. ▪ The County will avoid physical disturbance of the nest if feasible. Ideally, a minimum 10-foot buffer should be maintained between maintenance construction activities and each nest to avoid disturbance. In some situations, a smaller buffer may be allowed if in the opinion of a qualified biologist removing the nest would be a greater impact than that anticipated as a result of maintenance activities. ▪ If a dusky-footed woodrat nest cannot be avoided and the nest is located in urban or bayside areas where woodrat populations are small and isolated from larger populations, the County will consult with CDFW regarding the appropriate measures to minimize impacts.

BMP Number	BMP Title	BMP Description
		▪ If a dusky-footed woodrat nest cannot be avoided and the nest is located in more rural or natural areas and/or where woodrat populations are large and have connectivity to large populations, one of the following two relocation measures will be implemented by the County: 1. If the woodrat nest site and the proposed relocation area are connected by suitable dispersal habitat for the woodrat, as determined by a qualified biologist, the following relocation methodology will be used: Prior to the beginning of construction activities, a qualified biologist will disturb the woodrat nest to the degree that all woodrats leave the nest and seek refuge outside of the maintenance activity area. Relocations efforts will avoid the nesting season (February - July) to the maximum extent feasible. Disturbance of the woodrat nest will be initiated no earlier than one hour before dusk to minimize the exposure of woodrats to diurnal predators. Subsequently, the biologist will dismantle and relocate the nest material by hand. All material from dismantled nests will be placed in a pile, preferably against a log or tree trunk, in suitable habitat located at least 20 feet from, but otherwise as close as possible to, the original nest locations, to provide material for woodrats to construct new nests. During the deconstruction process, the biologist will attempt to assess if there are juveniles in the nest. If immobile juveniles are observed, the deconstruction process will 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 nest until the juveniles are mobile. The nest may be dismantled once the biologist has determined that adverse impacts on the juveniles would not occur. All disturbances to woodrat nests will be documented in a construction monitoring report and submitted to CDFW. 2. If a qualified biologist determines that the woodrat relocation area is separated from the nest site by major impediments, or a complete barrier, to woodrat movement, trapping for woodrats will be conducted prior to relocation of nest material. Prior to the start of nest relocation activities, artificial pine box shelters will be placed at each of the sites selected for relocation of nest materials. The dimensions of the artificial shelters will be approximately 8” long x 8” wide x 6” high. Each shelter will include two interior chambers connected by an opening. At the relocation sites, the artificial pine box shelters will provide basement structures for the relocated woodrat nest materials, allowing woodrats to enter, use, and modify the relocated nests. A qualified biologist will set two traps around each of the woodrat nests to be relocated. Traps will be set within one hour prior to sunset, and baited with a mixture of peanut butter, oats, and apples. Traps will also be equipped with cotton bedding and covered with cardboard. The traps will be checked the following morning, within one-and-a-half hours of sunrise. If a woodrat is captured it will be placed in a quiet area while its nest material is relocated; the animal will then be released at the relocated nest. If no woodrats are captured after the first night, the biologist will set the traps for one additional evening to increase the probability of capturing the animal and ensuring a safe relocation. If no woodrats are captured at a given house after two nights, it will be assumed that the house is not currently occupied. 3. Trapping will only be conducted outside the breeding season, which for woodrats is from February through the end of July. If a litter of young is found or suspected while dismantling a nest for relocation, the nest material will be replaced, any trapped woodrats will be returned to the nest, and the nest will be left alone for 2 to 3 weeks,

BMP Number	BMP Title	BMP Description
		after which time the nest would be rechecked to verify that the young are capable of independent survival, as determined by the lead woodrat biologist, before proceeding with nest dismantling.
BIO-9	Measures to Protect Nesting Migratory Birds	▪ To the extent possible, conduct vegetation removal activities prior to nesting bird season (February 1 through August 31). ▪ For maintenance activities or tree removal that are scheduled to occur between February 1 and August 31, a qualified biologist will survey the work area and a minimum of 300 feet surrounding the work area for raptor nests and 100 feet for nests of non-raptors. This survey will occur no more than three days prior to starting work. If a lapse in maintenance-related work of 7 days or longer occurs, another focused survey will be conducted before maintenance 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. A qualified biologist will identify an appropriate buffer based on a site specific-evaluation. Typical appropriate buffers are 300 feet for raptors, herons, and egrets (though larger for bald and golden eagles, as discussed in BIO-14); 100 feet for non-raptors nesting on trees, shrubs and structures, and 25 feet for ground-nesting non-raptors. ▪ The boundary of each buffer zone will be marked with fencing, flagging, or other easily identifiable marking if work will occur immediately outside the buffer zone. ▪ Install physical barriers to nesting where appropriate (e.g., install netting over entryways to cavities, bridge ledges, culverts) and check regularly for any trapped birds. Work will not commence within the buffer until fledglings are fully mobile and no longer reliant upon the nest or parental care for survival. ▪ No trees or shrubs shall be disturbed that contain active bird nests until all eggs have hatched, and young have fully fledged (are no longer being fed by the adults and have completely left the nest site). To avoid potential impacts to tree or shrub-nesting birds, any project-specific trimming or pruning of trees or shrubs shall be conducted during the time period of September 1 to February 14 unless a preconstruction nesting bird survey has been conducted by a qualified biologist. No habitat removal or modification shall occur within the Ecologically Sensitive Area fenced nest zone even if the nest continues to be active beyond the typical nesting season for the species, until the young have fully fledged and will no longer be adversely affected by the project. ▪ Within areas subject to CDFW regulation under Section 1600 of the Fish and Game Code, nesting bird protection measures required as conditions of the Streambed Alteration Agreement will be implemented.
BIO-10	Measures to Protect Nesting Marbled Murrelet	▪ During marbled murrelet breeding/nesting season (March 24 to September 15), if suitable marbled murrelet nesting trees are present within 300 feet of the project area or if a marbled murrelet nest is detected, Permittee shall consult with CDFW before proceeding. If habitat trees are present within ¼- mile of the project site but are greater than 300 feet from the work area, Permittee may proceed with the following conditions: o Work within the ¼-mile buffer shall be confined to the period of September 15 to October 15. o If activities cannot be performed during this window and would thus occur during the marbled murrelet breeding season (March 25 to September 15), seasonal disturbance minimization buffers as listed the USFWS document, *Estimation of the Effects of Auditory and Visual Disturbance to Northern Spotted Owls and Marbled Murrelets in Northwestern California* (2006) shall be followed. Permittee shall measure ambient noise and estimate construction activity noise to calculate seasonal buffer widths using that reference.

BMP Number	BMP Title	BMP Description
		o Alternatively, if protocol-level surveys are conducted and do not indicate that the habitat is occupied by marbled murrelet, seasonal and distance work restrictions may be lifted with written approval from CDFW. Protocol level survey procedures and information can be found at: http://www.pacificseabirdgroup.org/publications/PSG_TechPub2_MAMU_ISP.pdf
BIO-11	Non-native Aquatic Plant Removal	Any aquatic non-native plants found while performing maintenance activities will be disposed of properly and will not be placed back into the tributaries where work is being conducted or any other drainages, creeks, or streams.
BIO-12	Measures to Protect Special-Status Butterflies	If suitable habitat for Bay checkerspot, Mission blue, San Bruno elfin, or Callippe silverspot butterflies is determined to exist in or around the work area where ground disturbing activities are planned to occur, the County will implement applicable protection measures as follows: ▪ Areas supporting larval host plants for the Bay checkerspot, Mission blue, San Bruno elfin, or Callippe silverspot will be identified by a qualified biologist and protected from disturbance by establishing buffer zones around individual plants or populations. The size of the buffer will be determined by a qualified botanist; the actual distance will depend on the plant species potentially affected and the type of disturbance. If impacts on larval host plants of federally listed butterflies are unavoidable and are within occupied or potentially occupied habitats, then the County will stop work in the vicinity of the host plant(s) and consult with the USFWS. ▪ No herbicide will be applied to the buffer area, and to the extent feasible, maintenance personnel and equipment will not operate within such areas. If, based on a review of current CNDDB records or the latest information available from the Xerces Society (https://xerces.org/state-of-the-monarch-butterfly-overwintering-sites-in-california/) historically or currently occupied overwintering habitat for the monarch butterfly is determined to exist in or adjacent to the work area where ground disturbing activities are planned to occur, the County will implement applicable protection measures as follows: ▪ Areas supporting overwintering habitat for the monarch butterfly will be identified by a qualified biologist and maintenance activities during fall and winter months when monarch butterflies are present will be avoided to the extent practicable. ▪ Historically or currently occupied trees/groves will be protected from disturbance by the establishment of a 100-foot buffer zone around the tree/grove. The buffer will be measured from the outside edge of the dripline of the monarch grove. If maintenance activities within 100 feet of a historically or currently occupied tree/grove are unavoidable, the County will prepare and implement an impact minimization plan in consultation with the USFWS. ▪ No herbicides or pesticides will be applied to the buffer area, and to the extent feasible, maintenance personnel and equipment will not operate within such areas.
BIO-13	Measures to Protect the California Ridgway's Rail	If suitable breeding habitat for California Ridgway's rails is determined to exist in or around the work area where maintenance activities are planned to occur, the County will implement applicable protection measures as follows: ▪ If work will occur during the Ridgway's rail breeding season (February 1 through August 31), the County will conduct

BMP Number	BMP Title	BMP Description
		pre-activity surveys for the Ridgway's rail in the late winter and early spring of the year maintenance activities are scheduled to occur. Surveys will be conducted per the current USFWS protocol. ▪ If the surveys confirm there are no breeding rails within 700 feet of the project area, or the area where heavy equipment, ground disturbance, or vegetation removal would occur, work activities may proceed during the breeding season. ▪ If surveys identify the presence of breeding rails, no maintenance activities will occur within 700 feet of occupied nesting habitat during the breeding season (February 1 to August 31). For work occurring within 300 feet of potential nonbreeding habitat for California Ridgway's rails which provides habitat that occasional nonbreeding California Ridgway's rails may use for foraging or cover, or other identified suitable California Ridgway's rail habitat locations, the County will implement applicable protection measures as follows: ▪ Prior to the initiation of work each day, if suitable habitat occurs within the immediate work area, a qualified biologist will conduct a preconstruction survey of all suitable habitat that may be directly or indirectly impacted by the day's activities (work area, access routes, staging areas). Specific habitat areas are vegetated areas of cordgrass (*Spartina* spp.), marsh gumplant (*Grindelia* spp.), pickleweed (*Salicornia pacifica*), alkali heath, (*Frankenia* sp.), and other high marsh vegetation, brackish marsh reaches of creek with heavy accumulations of bulrush thatch (old stands), and high water refugia habitat that may include annual grasses, and shrubs immediately adjacent to channels. ▪ If during the initial daily survey or during work activities a Ridgway's rail is observed within or immediately adjacent to the work area (50 feet), initiation of work will be delayed until the Ridgway's rail leaves the work area. ▪ Mowing using heavy equipment (e.g., tractors, boom mowers, or rider mowers) will not be conducted in habitat areas or within 50 feet of habitat areas. If mowing with hand equipment is necessary within 50 feet of habitat areas, an on-site monitor will observe the area in front of the mower from a safe vantage point while it is in operation. If Ridgway's rails are detected within the area to be mown, the mowing will stop until the individual(s) have left the work area. ▪ If visual observation cannot confirm the Ridgway's rail(s) left the work area, then it is assumed that the individual(s) remains in the work area and the work will not resume until the area has been thoroughly surveyed (and absence confirmed) or the USFWS has been contacted for guidance.
BIO-14	Measures to Protect Bat Colonies	▪ If high-quality habitat for roosting bats (i.e., large trees with cavities of sufficient size to support roosting bats, or buildings providing suitable roost sites, as determined by a qualified bat biologist) is present within 100 feet of a maintenance site, a qualified bat biologist will conduct a survey to look for evidence of bat use within two weeks prior to the onset of work activities. If evidence of bat occupancy is observed, or if high-quality roost sites are present in areas where evidence of bat use might not be detectable (such as a tree cavity), an evening survey and/or nocturnal acoustic survey may be necessary to determine if a bat colony is present and to identify the specific location of the bat colony. ▪ If no active maternity colony or non-breeding bat roost is located, project work can continue as planned. ▪ If an active maternity colony or non-breeding bat roost is located, the project work will be redesigned to avoid disturbance of the roosts, if feasible.

BMP Number	BMP Title	BMP Description
		▪ If an active maternity colony is located, and the project cannot be redesigned to avoid removal or disturbance of the occupied tree or structure, disturbance will not take place during the maternity season (March 15 – July 31), and a disturbance-free buffer zone (determined by a qualified bat biologist) will be observed during this period. ▪ If an active non-breeding bat roost is located, and the project cannot be redesigned to avoid removal or disturbance of the occupied tree or structure, the individuals will be safely evicted between August 1 and October 15 or between February 15 and March 15 (as determined by a Memorandum of Understanding with CDFW). Bats may be evicted through exclusion after notifying CDFW. Trees with roosts that need to be removed will first be disturbed at dusk, just prior to removal that same evening, to allow bats to escape during the darker hours.
BIO-15	Nesting Bald Eagle and Golden Eagle Avoidance	In areas within 0.5 mile of known bald or golden eagle nesting areas, the following measures will be implemented: ▪ To the extent feasible, conduct vegetation removal activities prior to the nesting season (January 15 through August 1). ▪ For maintenance activities or tree removal that are scheduled to occur between January 15 and August 1, a qualified biologist will survey the work area and a minimum 0.5 mile surrounding the work area for eagle nests. This survey will occur no more than seven days prior to starting work. ▪ No maintenance activities will occur within a 0.5-mile viewshed buffer zone (areas that can be seen by an eagle on the nest), around any active eagle nest during the breeding season, unless a qualified biologist determines late in the season that nesting activity has been completed for the year. No breeding-season maintenance activities will occur within 0.25 mile of the nest site a, regardless of whether or not those activities can be seen from the nest, while nesting activity is occurring.
BIO-16	Avoid Special-Status Plant Species	For projects located in areas where special-status plants have been identified as potentially occurring (see Table 4-1), a qualified biologist will assess habitat suitability for the potential occurrence of special-status plant species within the work area. If determined to be warranted, a qualified botanist will conduct appropriately timed surveys for the focal plant species in accordance with CDFW's special-status plant survey methodology. If a special-status species is observed in or near the project site, the County will follow the measures below as well as any additional measures that might be contained in the forthcoming Biological Opinion issued by the USFWS for the Maintenance Program. ▪ If discovered, the population size and occupied area of special-status plant populations identified during the field survey, and with potential to be impacted, will be estimated. A "population" will be defined as the group of individuals of a species present within a 0.10-mile radius. In addition, the population will be photographed and flagged to maximize avoidance, as well as to estimate the percentage of the population affected. If feasible, the project shall be redesigned or modified to avoid direct and indirect impacts on special-status plant species. ▪ Special-status plants to be avoided will be protected from disturbance by installing environmentally sensitive area fencing (orange construction barrier fencing or a suitable alternative). Protective fencing will be installed under the direction of a qualified biologist as necessary to protect the plant and its habitat; where feasible, the environmentally sensitive area fencing will be installed at least 50 ft from the edge of the population. The location of the fencing will be shown on the maintenance design drawings and marked in the field with stakes and/or flagging. The design specifications will contain clear language that prohibits maintenance-relate activities, vehicle operation, material and equipment storage, and other surface disturbing activities within the fenced environmentally sensitive area. For non-ground disturbing vegetation management activities conducted using only hand-held equipment, the non-disturbance

BMP Number	BMP Title	BMP Description
		buffer may be reduced to a minimum of 3 feet and flagging of the population may be used in place of environmentally sensitive fencing. ▪ Vegetation management activities in sensitive plant areas will be conducted under the guidance of a qualified botanist. These activities will be timed following the blooming periods of potentially occurring listed species. ▪ If any impacts to individual state-listed plants are unavoidable, or if more than 5 percent of a population of a federally listed plant species or species with California Rare Plant Ranks of 1 or 2 would be impacted, then the County will stop work in the vicinity of the plant(s) and consult with the appropriate regulatory agencies. ▪ If impacts to state or federally listed plants are unavoidable and less than 5 percent of a population would be impacted, prior to any ground-disturbing activities the County will preserve the seedbank within the impact area by removing and retaining the topsoil prior to the implementation of maintenance activities. Following completion of the maintenance activity, the County will monitor the impact area for two years. Any non-native invasive plant species occurring within this area during the monitoring period will be removed under the supervision of a qualified biologist. ▪ If appropriately timed focused botanical surveys cannot be conducted prior to maintenance activities in areas identified by a qualified biologist as potentially supporting listed plants, then the County will assume presence of the plant species in question.
BIO-17	Sudden Oak Death Controls	▪ Before entering maintenance sites located in areas infested with *Phytophthora*, field workers will receive training that includes information on *Phytophthora* pathogens and how to prevent the spread of these and other soil-borne organisms by following approved phytosanitary procedures. ▪ The exterior and interior of all vehicles, construction equipment, and tools should be clean and free of debris, soil and mud (including mud on tires, treads, wheel wells and undercarriage) prior to arrival at a new job site, especially during the wet season. ▪ Work shoes should be kept clean by inspecting shoe soles and removing mud, debris and soil off treads before moving to a new job site. ▪ Do not collect or transport host plants from an infested or quarantined area. ▪ Vehicles should stay on established roads whenever possible. ▪ To minimize the potential for spreading potentially contaminated soil and time required for decontamination, if possible, avoid vehicle traffic and field work when soils are wet enough to stick readily to shoes, tools, equipment and tires. ▪ Delivered nursery plants that will be held before planting will be transferred to cleaned and sanitized raised benches and maintained in accordance with the "Guidelines to Minimize *Phytophthora* Pathogens for holding (non-production) nurseries at restoration sites, Section 3." ▪ A portion of purchased nursery plants will be tested for *Phytophthora* using the pear-baiting methodology in which pear baits are placed in soil samples, water samples and root samples of nursery purchased plants. Incubation temperatures with diurnal fluctuations from 21 degrees Celsius to 27 degrees Celsius are generally suitable for detecting *Phytophthora* species using pear baits. If dark lesions appear on pears, the sample likely has *Phytophthora* inoculum. For additional information for the pear-baiting methodology, see: phytosphere.com/BMPsnursery/test3_2bait.htm

BMP Number	BMP Title	BMP Description
		▪ Nursery plants will be transported on or in vehicles or equipment that have been cleaned before loading the stock. ▪ Nursery stock will not be placed on the soil or other potentially contaminated surfaces until they are placed at their specific planting sites. ▪ Minimize unnecessary movement of soil and plant material within a planting area, especially from higher to lower risk areas. ▪ On-site or off-site collection of plant materials, including seed and cuttings for direct planting, will be conducted in a phytosanitary manner. ▪ Only uncontaminated water or water that has been effectively treated to remove or kill *Phytophthora* should be used for rinsing or irrigating plant material.
BIO-18	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. ▪ Prior to implementation of Program activities at a given site, the proposed staging area, as well as any areas to be graded, will be surveyed for the presence of invasive weed species. Invasive weed species occurring within locations of construction clearing and grubbing shall be flagged for removal by the biological monitor or qualified biologist. Any invasive weeds with a Cal-IPC rating of "moderate" or "high" found within the survey area will be removed and disposed of in a sanitary landfill, incinerated off-site, or disposed in a high-temperature composting facility that can compost using methods known to kill weed seeds, taking care to prevent any seed dispersal during the process by bagging material or covering trucks transporting such material from the site. ▪ Suitable onsite disposal areas should be identified to prevent the spread of weed seeds. Invasive plant material should be rendered nonviable (partially decomposed, very slimy or brittle) when being treated onsite. Maintenance staff shall desiccate or decompose invasive plant material until it is nonviable. Depending on the type of plant, disposed plant material can be left out in the open as long as roots are not in contact with moist soil, or can be covered with a tarp to prevent material from blowing or washing away. Permittee shall monitor all sites where invasive plant material is disposed onsite and treat any newly emerged invasive plants. Invasive plant material removed during work activities shall be bagged and appropriately incinerated or disposed of in a landfill or permitted composting facility. ▪ No invasive plants shall be planted at maintenance work areas. Prohibited exotic plant species include those identified in the California Invasive Plant Council's Inventory Database, which is accessible at: https://www.cal-ipc.org/plants/inventory/.
BIO-19	Restore Channel Features	▪ Following completion of bank stabilization activities, any temporary modifications to the low-flow channels will be reversed so that the channel is contoured to facilitate fish passage at least as well following the activity as it did prior to the stabilization activity.
BIO-20	Avoidance of Mammal Pupping Sites	▪ Work within 250 feet of an active harbor seal or sea lion haul out will be conducted outside of the pupping season (i.e., June – February).
BIO-21	General Wildlife Protection Measures	▪ If any wildlife is encountered during project activities, said wildlife shall be allowed to leave the area unharmed and on their own volition, except in cases where relocation by a qualified biologist is permitted by conditions below.

BMP Number	BMP Title	BMP Description
BIO-22	Measures to Protect Nesting Western Snowy Plover	▪ To the extent feasible, maintenance activities within 600 feet of suitable snowy plover breeding habitat will occur outside the plover breeding season of March 1 through September 14. ▪ If maintenance activities are scheduled to occur within 600 feet of suitable snowy plover breeding habitat during the nesting season (March 1 through September 14), a pre-activity survey will be conducted by a qualified biologist within 7 days prior to the start of the activity to determine whether active nests are present. ▪ If an active snowy plover nest is detected within 600 feet of maintenance areas, the qualified biologist, in coordination with USFWS personnel, will determine an appropriate buffer that should remain free from new activities (i.e., those that were not ongoing when the nest was established). The buffer will be determined taking into account visual barriers (such as dunes) between the activities and the nest and the level and proximity of human activity around the nest when it was established. The buffer will remain in place until the nest is no longer active. ▪ If broods of unfledged snowy plover young are present, no maintenance activities will occur within 300 feet (or as otherwise determined by a qualified biologist in coordination with the USFWS) of a brood.
BIO-23	Burn Pile Measures	▪ The County would coordinate burn pile activities with CAL FIRE. ▪ Burning will only occur on days when danger of wildfire is low (e.g., it will not occur on windy days or in very hot, dry conditions). ▪ No burn piles will be located within 200 feet of known occurrences of special-status plants, suitable habitat for special-status butterflies and their hostplants, or high-quality aquatic or wetland habitat for the California red-legged frog, California tiger salamander, or San Francisco garter snake. ▪ Prior to the initiation of burning, the burn pile will be physically disturbed (e.g., with a stick or shovel) to encourage any animals taking refuge within the pile to move out of the pile.
BIO-24	Pathogen Control	▪ In order to minimize the spread of plant and animal pathogens, all equipment (including personal gear such as boots) will be cleaned of soil, seeds, and plant material prior to arriving on a maintenance site. All organic matter will be removed from nets, traps, boots, vehicle tires and all other surfaces that have come into contact with water or potentially contaminated sediments. ▪ Equipment, including maintenance equipment and field gear used to capture and relocate special-status species such as frogs, will be disinfected after exiting one aquatic habitat and before entering the next aquatic habitat, unless the waters are hydrologically connected to one another. Cleaning equipment in the immediate vicinity of aquatic habitats will be avoided (e.g., clean in an area at least 100 feet from aquatic features). ▪ Boots, nets, gloves, and any other equipment used to handle amphibians or aquatic organisms will be scrubbed with a bleach solution (0.5 to 1.0 cup per 1.0 gallon of water), Quat-128™ (1:60), or a 3 to 6 percent sodium hypochlorite solution and thoroughly rinsed clean with water between maintenance sites. Care will be taken so that all traces of the disinfectant are removed before entering the next aquatic habitat. ▪ When working at sites with known or suspected disease problems, disposable gloves will be worn and changed between handling each animal. Gloves will be wetted with water from the site or distilled water prior to handling any

BMP Number	BMP Title	BMP Description
		amphibians. Gloves will be removed by turning inside out with hands cleaned using a hand cleaner and water rinse to minimize cross-contamination.
BIO-25	Eelgrass Surveys at Coyote Point Marina	In the event that the County plans to conduct in-water maintenance activities to the north of the jetty forming the northern boundary of Coyote Point Marina (identified as "potential eel grass patch #1 in Appendix J), the County will retain a biologist to conduct an eelgrass survey in this area. Survey results would be provided to CDFW and other appropriate permitting agencies prior to commencing maintenance work in this area.

BMPs

BEST MANAGEMENT PRACTICES

BMP #	BMP Title
EC-1	Brush Layering
EC-2	Brush Packing
EC-3	Live Staking
EC-4	Live Pole Drain
EC-5	Wattles/Fascines
EC-6	Hand Seeding
EC-7	Hydroseeding
EC-8	Mulching
EC-9	Vegetative Buffer
EC-10	Erosion Control Blankets & Mats
EC-11	Surface Roughening
EC-12	Rolling Dip
EC-13	Slope or Bank Stabilization
EC-14	Energy Dissipator
SC-1	Sandbags and Gravel Bags
SC-2	Silt Fence
SC-3	Straw Log, Straw Roll, Coir Log
SC-4	Inlet Protection
SC-5	Stormwater Separation Systems
SC-6	Diversion Berm
DW-1	Channel Dewatering

BMP: EC-1

BRUSH LAYERING

DESCRIPTION

Brush layering is a technique used in stabilizing shallow slope failures or rebuilding fill slopes with live brush cuttings (usually willows or other types of branches with soil backfill or soil lifts. Live brush layers act as horizontal drains, improve slope stability by providing tensile strength and natural revegetation. Brush layering may include the use of fabric soil wraps, large vegetated boulder revetments, or other structural toe support. Examples of native species from San Mateo County that may potentially be used for brush layering are listed in **Table 1**.

Table 1. Native plant species for use in brush layering.

Scientific Name	**Common Name**
Salix lasiolepis	arroyo willow
Salix exigua	sandbar willow
Salix laevigata	red willow
Salix lasiandra	Pacific willow
Alnus rhombifolia	white alder
Alnus rubra	red alder
Populus fremontii	Fremont cottonwood
Populus trichocarpa	black cottonwood

APPLICATIONS

This technique is used for repairing steep slopes, slumps or stream banks above stream-forming flow conditions. It's useful in restoring eroded stream banks on outside bends where laying back the bank is not feasible and can be placed on slopes up to 1:1 or steeper with additional geotechnical analysis. Brush layering can help dry wet sites with seeps through transpiration. The willow brush helps reduce near bank stream velocities.

Brush layering involves relatively simple construction. Among the ground stabilizing techniques, the brushlayer has an immediate impact, its protective and stabilizing effect extending into lower soil horizons. At extreme sites where erosion, deposition, and rockfall are particular hazards, brush layers and the original vegetation that develops with them gradually eliminate these problems. Fast establishment of a stable soil-root complex is possible. Relatively short and spreading branches of the scrub willows growing in mountainous regions can be used. Simultaneous brush layering construction during fill operations is possible. It is one of the best techniques for revegetating and stabilizing streambanks and slopes. Living and non-living brush layers along

streambanks also provide valuable fish habitat.

LIMITATIONS

- Not suitable for the stabilization of deep, organic topsoil layers.
- Live materials should be harvested and constructed during the dormancy stage of plant growth.
- Drainage areas should be relatively small (generally less than 2,000 acres). If used on larger stream systems, additional toe protection and analysis will be required.
- Stream system should not be degrading (downcutting) or the structure can be undermined.
- The system must be built during low flow conditions. May need to divert water around the site and/or dewater during construction.
- Live cuttings should be taken no earlier than the end of August and kept moist until the rainy season.
- Willows require nearly full sun conditions to be vigorous. Not to be used in heavy shade. Check to see if willows are growing in the area to confirm if this technique can be used.
- In-stream construction requires permits from regulatory agencies.

CONSTRUCTION GUIDELINES

1. Choose a technique such as key trenching, rock toe, retaining wall, root wads, coir logs, or buried toe rock to secure the toe of the slope. Boulder toe protection should be installed if toe scour is a concern. Toe depth should be several feet below the thalweg of the streambed. Width of lifts will vary by site; however, a minimum width of 4 feet should be used for adequate fabric and brush layer depth.

2. Beginning at the bankfull elevation, place 8 to 12 live branch cuttings per linear foot on top of the rock filled fabric lift with growing tips at right angles to the streamflow. Live willow cuttings should be 4 feet in length or longer. Place a few inches of select fill around willow between fabric lifts to ensure good soil contact with willow. Water in willow.

3. Cover this layer of cuttings with fabric leaving an overhang. Place a 12 to 24-inch layer of soil suitable for plant growth (in compacted 6” lifts) on top of the fabric. Wrap the overhanging portion of fabric over the compacted soil to encapsulate the soil in a wrap. Pull and tighten fabric toward slope and stake in place. The thickness of lifts will vary by soil type, stream shear stress, and velocity. Generally, 12-inch thick lifts are more stable than thicker lifts but are more expensive to build. Lifts typically range from 12-inch to 30-inch with 18-inch lifts being most common.

4. Continue this process with alternating layers of cuttings and compacted lifts wrapped in fabric until the bank is restored to its original height or meets desired grade.

5. Several fabric options can be used for creating the wraps. Coir twine mats (outside) with a high tensile strength can be used in conjunction with coir erosion control blanket (inside) with a dense weave to prevent soil migration through the blanket. At sites where capital improvements are in jeopardy or higher shear stresses and velocities are calculated, synthetic geotextile materials (geogrids) may only be used with prior agency approval. Willow roots will grow through the geogrid layers creating a dense matrix of willow roots bonding the structure into a single mass.

BMP MAINTENANCE

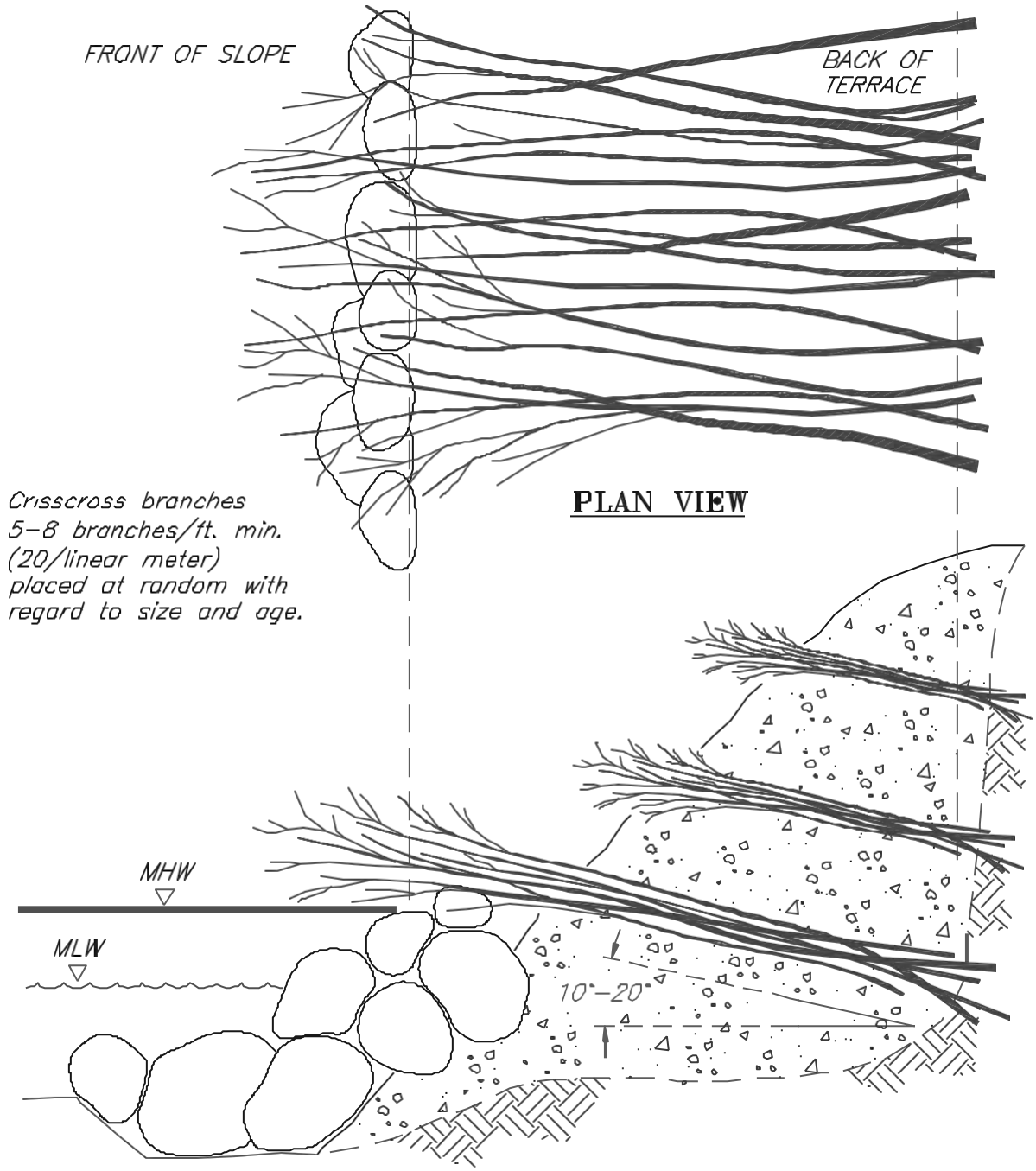
- Keep soil and live cuttings moist by overhead irrigation until the rainy season begins.
- Keep livestock away from the live cuttings. If possible, protect from deer for the first year after installing the live cuttings.
- No maintenance of brushlayers should be required if materials are placed at appropriate depths.
- Fill slopes should be periodically inspected and any failures corrected immediately.

MATERIALS

Materials include branches and cuttings of deciduous woody plants capable of producing adventitious roots, most appropriately willow. Live brushlayer materials can be stored in containers under shade until installation. For best results, soak willow for at least 24 hours, or up to 30 days. Willows may be bundled and soaked in a stream near the project site.

BMP REMOVAL

- Not required.



NOTES:

1. Tilt branches down into the slope 10°–20° min.
2. Brushlayering may be constructed with non-compacted or compacted backfill without damage to the brush layer.
3. Branches irrespective of length, should protrude 8–18in. (0.20–0.50 meters) beyond the face of the slope.

BRUSHLAYERING WITH ROCK TOE PROTECTION

© 1999 JOHN McCULLAH

FILE: BRLAY-RT

BMP: EC-3

LIVE STAKING

DESCRIPTION

Live staking involves the insertion of live, vegetative cuttings into the ground in a manner that allows the cutting (stake) to take root and grow. This BMP is used to reduce the potential for soil to become water borne, to reduce water velocity and erosive forces, and to aid in habitat protection. Poles used in willow walls and vegetated boulder revetments may be a structural application. Sprigs may be used in individual planting spots along a streambank.

Applications

This BMP may be used to repair small slips and slumps, to reinforce or enhance stream banks, and to anchor and enhance the effectiveness of wattles, fascines, straw logs and other erosion control materials. It may also be used in conjunction with approved biostabilization installations such as vegetated boulder revetments.

LIMITATIONS

Do not use this BMP under the following conditions:

- where vegetation growth will interfere with maintenance or facility access.
- where vegetation growth will create safety issues.
- for immediate soil stabilization results.

CONSTRUCTION GUIDELINES

1) Live staking must be implemented during the dormancy period of chosen plant species, late fall to winter (October through January is ideal in Northern Coastal California). If native willows or cottonwood are not found in the vicinity, live staking may not be a good option.
2) Hardwood cuttings are generally divided into three categories: Sprigs (or stakes) that are 0.75 to 1.5 inches in diameter and 36 to 48 inches long; Poles that are 1.5 to 3 inches in diameter and 5 to 8 feet long; and Branch Cuttings or Weavers which are no thinner than ½ inch and 6 to 12 feet long depending on the application (wattles, layering, willow wall revetments).
3) Don’t allow stakes to dry out. Soak all cuttings in water for a minimum of 24 hours. Soaking significantly increases the survival rate of the cuttings; however, they must be planted the same day they are removed from water.
4) Use an iron stake or bar to make a pilot hole in firm soil. Plant the stakes butt-ends into the ground, with the leaf bud scars or emerging buds always pointing up. Be careful not to damage the buds, strip the bark or split the stake during

installation. Plant stakes at random in the most suitable places at a rate of 2-5 cuttings/square yard. Do not plant the stakes in rows or at regular intervals.

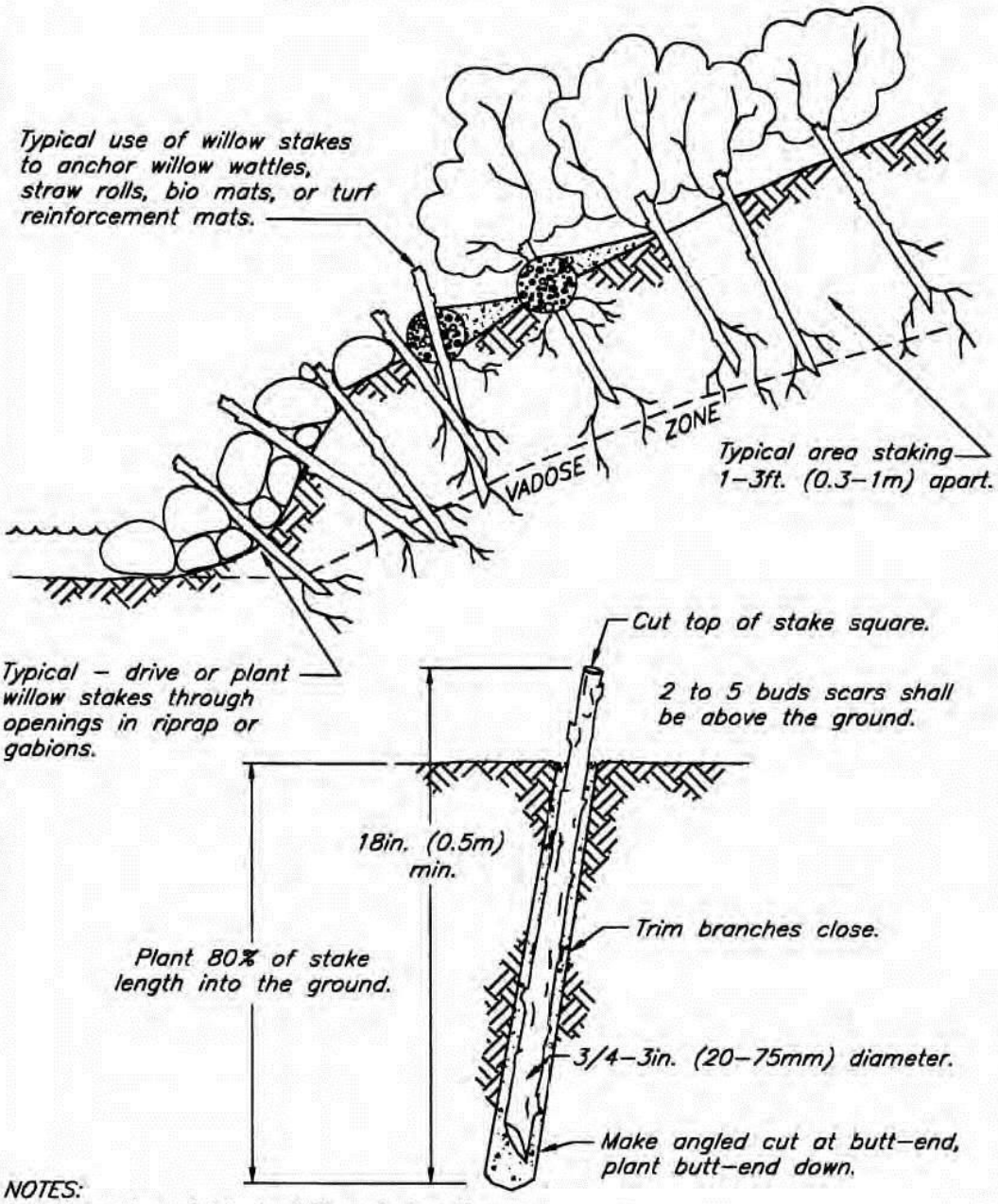
5) Set the stake as deep as possible into the soil, preferably with 80 percent of its length into the soil and in contact with mid-summer moist soils. The stake should protrude only to a maximum of one-quarter its length above the ground level to prevent it from drying. Stakes should be cut so that cutting extends above competing herbaceous vegetation. At least 2 buds and/or bud scars shall be above the ground after planting. It is essential to have good contact between the stake and soil for roots to sprout. Tamp the soil around the cutting. Do not fertilize.

BMP MAINTENANCE

- Periodic inspection, repair and maintenance will be done in accordance with permit requirements. If no permits are required, vegetation will be monitored for the first two years or until the vegetation is established.
- Staked area may need to be watered during summer months.

BMP REMOVAL

- BMP removal is not necessary.



NOTES:

1. Harvest and plant stakes during the dormant season.
2. Use healthy, straight and live wood at least 1 year old.
3. Make clean cuts and do not damage stakes or split ends during installation, use a pilot bar in firm soils.
4. Soak cuttings for 24 hours (min.) prior to installation.
5. Tamp the soil around the stake.

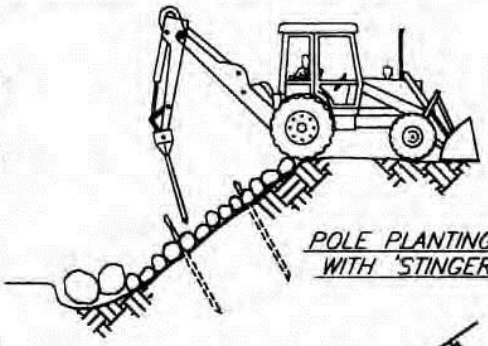
LIVE STAKING AND JOINT PLANTING

© 2000 JOHN McCULLAH

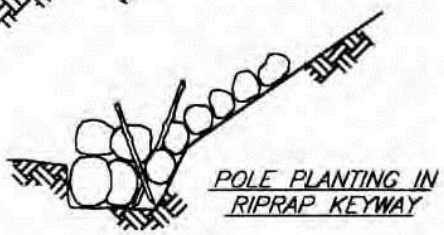
FILE: LVSTJTPL

CONSTRUCTION TECHNIQUES

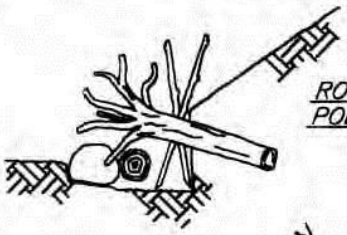
Plant poles deeply during construction of biotechnical streambank work.



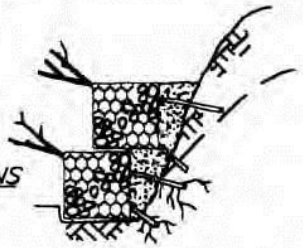
POLE PLANTING WITH 'STINGER'



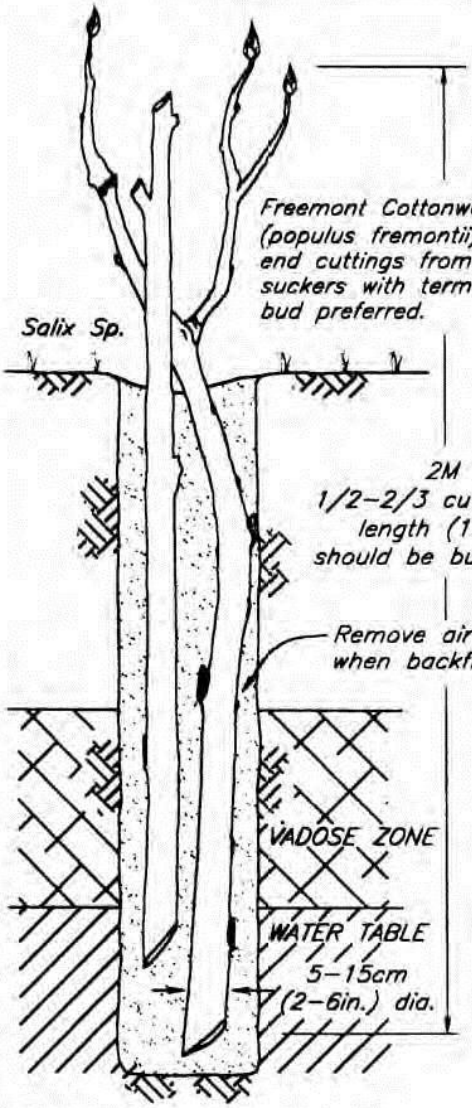
POLE PLANTING IN RIPRAP KEYWAY



ROOTWAD WITH POLE PLANTING



VEGETATED GABIONS WITH POLES



NOTES:

1. *Pole cuttings of willow or cottonwood are longer and have a larger diameter than branch cuttings or live stakes.*
2. *Larger diameter cuttings have a greater supply of stored energy (stored photosynthesis) than smaller diameter cuttings.*
3. *Pole cuttings are better suited for highly erodible areas and sites with fluctuating water levels.*
4. *The pole cuttings should extend through the vadose zone and into the permanent water table. At least 1/2 to 2/3 of the pole should be below the ground, at least 1.0m (3 ft.), and long enough to emerge above adjacent vegetation.*
5. *"Muddying" – filling the hole with water and then soil to make a mud slurry can remove air pockets.*

POLE PLANTING

© 2000 JOHN McCULLAH

POLEPLNT

BMP: EC-5

WATTLES/FASCINES

DESCRIPTION

Wattles and fascines are live branch cuttings, usually willows, bound together into long, tubular bundles used to stabilize slopes and stream banks. Both wattles and live fascines are true biotechnical practices. The live branches and live stakes provide the biological element while the stems, rope ties and wedge shaped wooden stakes all combine to provide the structural elements. Fascines differ from wattles in that the branch cuttings all point in the same direction in fascines, where they may point in either direction in wattles. Wattles are typically aligned on contour, where fascines are angled slightly upslope and thus tend to produce more vigorous growth.

APPLICATIONS

Wattles/fascines may be used for long slopes, road fills, road cuts, gullies or slumped areas, eroded slopes or eroding stream banks. May be used to repair small earth slips and slumps or to protect slopes from shallow slides 1-2 feet deep. Wattles/fascines may be used to stabilize entire cut or fill slopes or localized gully areas of slopes, or may be installed on newly built slopes or as a remedial action on existing slopes. This technique is useful on slopes requiring other planting materials such as woody vegetation, transplants and grasses. Wattles/fascines enhance conditions for natural invasion and the establishment of other plants from the surrounding plant community.

LIMITATIONS

- Always perform plant material harvest and installation during the dormant season, late fall through early spring.
- Where increased infiltration may cause slope failures, use fascines instead of wattles to ensure positive drainage.

CONSTRUCTION GUIDELINES

1) Pre-soak wattles/fascines for 24 hours, or installed on the same day they are harvested and prepared. Wattles/fascines must be stored in the shade and under cover, preferably in water. Use site reconnaissance to identify species and site conditions on adjacent sites and compare their conditions to the construction site. Planting will be more successful as the soil, site conditions, and species selected match stable and vegetated nearby sites.

2) Tie cuttings together to form bundles, tapered at each end, 6-30 feet in length, depending on site conditions or limitations in handling. The completed bundles should be 6-12 inches in diameter. Stagger the cuttings in the bundles so that the tips are evenly distributed throughout the length of the bundle.
3) Compress and tightly tie wattle/fascine bundles with rope or twine of sufficient strength and durability. Bundles shall be tied 12-15 inches apart.
4) General Installation Guidelines:

Slope (H:V)	Slope Length Between Wattles/Fascines (feet)
1:1 to 1.5:1	3-4
1.5:1 to 2:1	4-5
2:1 to 2.5:1	5-6
2.5:1 to 4:1	6-8
3.5:1 to 4:1	8-12
4.5:1 to 5:1	10-20

5) Perform any slope repairs prior to wattle/fascine installation.
6) Beginning at the base of the slope, dig a trench on contour. The trench shall be shallow, about ½ the diameter of the wattle. The trench width will vary from 12-18 inches depending on the slope angle. Place the wattles immediately after trenching to reduce desiccation of the exposed soil. Wattles shall be staked firmly in place with one row of construction stakes on the downhill side of the wattling, not more than 3 feet apart. The second row of stakes shall be placed through the wattles, near the ties, at not more than 5 feet apart. Overlap the tapered ends of adjacent wattles so the overall wattle thickness of the wattle is uniform. Two stakes shall be used at each bundle overlap such that a stake may be driven between the last two ties of each wattle.
7) Live stakes, if specified, are generally installed on the downslope side of the bundle. Drive the live stakes below and against the bundle between the previously installed construction stakes. Backfill wattles with soil from the slope or trench above. The backfill shall be worked into the wattle interstices and compacted behind and below the bundle by walking on and working from its wattling terrace.
8) Repeat the proceeding steps to the top of the slope. Place moist soil along the sides of the live bundle. The top of the bundle should be slightly visible when the installation is completed. Plant the slope as specified.

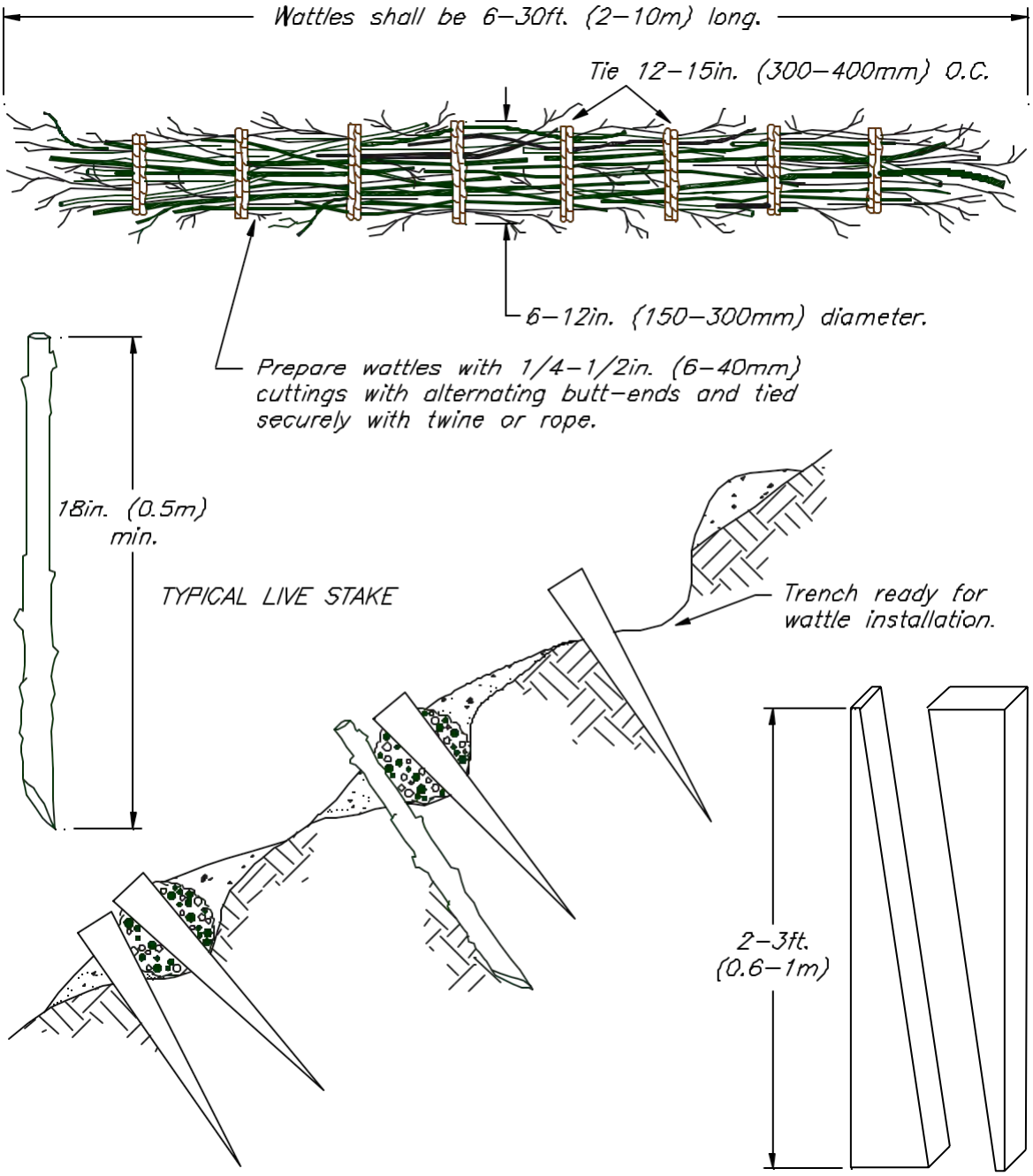
9) Seed and mulch slope, if specified. Shallow slopes, generally 3:1 or flatter may be seeded and mulched by hand. Steeper slopes can have seed applied hydraulically and the mulch should be anchored with tackifier or other approved methods.

BMP MAINTENANCE

- Regular inspection and maintenance of wattle installations should be conducted, particularly during the first year.
- Staked area may need to be watered during summer months.
- Rills and gullies around or under wattles shall be repaired immediately.

BMP REMOVAL

- BMP removal is not necessary.



NOTES:

1. Harvest and install wattles during dormant season or favorable conditions
2. Install wattles on slope contours.
3. All work proceeds from the bottom of the slope to the top.
4. Fill or partially cover wattle with soil from slope or trench above.
5 Compact and work soil into completed wattles.

WATTLE

© 2000 JOHN McCULLAH

FILE: WATTLE2

BMP: EC-6

HAND SEEDING

DESCRIPTION

Hand seeding is broadcasting grass seed on disturbed or bare soil areas by hand or a hand seeding device. This BMP is used to reduce the potential for soil to become water or air borne, reduce erosion after vegetation establishment, provide for vegetative buffers and aid in habitat protection. Seeding with appropriate seed mixes also helps discourage colonization by non-native and invasive plant species.

APPLICATIONS

Hand seeding is encouraged whenever possible to aid in controlling erosion on construction or maintenance sites. Seeding shall be applied to areas intended to be left dormant for a year or more, such as soil berms.

LIMITATIONS

- After hand seeding, mulch the area and/or install erosion control blankets or mats.
- Schedule seeding to fit the germination timing for the specific grasses to be used. Typically, this is October and November for cool season California grasses. If seed is applied earlier, increase the seed and mulch quantities.

CONSTRUCTION GUIDELINES

1) Select seed mixes appropriate to the season and site conditions. Permit conditions and/or sensitive locations may require special seed mixes. Avoid the use of tall growing flashy fuel types or types with known allelopathy such as annual rye grass. When possible, consider use of native perennials. However, in some instances, sterile species such as a wheat grass hybrid or barley may be appropriate to ensure the site is restored in a timely manner.
2) Grade as needed and feasible to permit the use of equipment for seedbed preparation.
3) Grade and scarify the site as needed and feasible to permit good seed to soil contact. See BMP Surface Roughening and Soil Tracking. Commercial fertilizers are seldom recommended as they can leach into the stream and the high nitrogen promotes broadleaf weed growth over native perennial growth. In areas where there is no longer topsoil, consider amending the soil with mycorrhizal inoculants and/or mature screened compost.
4) Install needed erosion control practices, such as sediment basins, diversion dikes and channels, prior to seeding. Divert concentrated flows away from seeded areas.

5) Surface roughening: If the area has been recently loosened or disturbed, no further roughening is required. When the area is compacted, crusted or hardened the soil shall be loosened with raking or harrowing.
6) Spread seed uniformly and according to manufacturer's recommendations.
7) Straw mulch, erosion control blankets or mulch and tackifiers/soil binders should be applied over the seeded areas.

BMP MAINTENANCE

- Inspect during seed establishment period. Re-see, due to mortality, as necessary. Areas which fail to establish cover adequate to prevent sheet and rill erosion will be reseeded as soon as such areas are identified. Spot seeding can be done on small areas to fill in bare spots where grass did not grow properly.

BMP REMOVAL

BMP removal should not be necessary.

BMP: EC-7

HYDROSEEDING

DESCRIPTION

Hydroseeding is broadcasting grass seed, tackifier, wood fiber mulch and water on disturbed areas using a hydroseeding machine. This BMP is used to reduce the potential for soil becoming water or air borne, to reduce erosion after vegetation is established, provide vegetative buffers and to aid in habitat protection. Seeding with appropriate seed mixes will also help discourage colonization by non-native and invasive plant species.

APPLICATIONS

Hydroseeding may be used after soil disturbance is completed at construction sites and/or on bare slopes.

LIMITATIONS

- Hydroseeding should not be used on streambanks or in areas subject to scour.
- Schedule seeding to fit the germination timing for the specific grasses to be used. Typically, this is October and November for cool season California grasses. If seed is applied earlier, increase the seed and mulch quantities.

CONSTRUCTION GUIDELINES

- Select seed mixes appropriate to the season and site conditions. Permit conditions and/or sensitive locations may require special seed mixes. Avoid the use of tall growing flashy fuel types or types with known allelopathy[1] such as annual rye grass. Consider native perennials whenever possible. Commercial fertilizers are seldom recommended as they can leach into the stream, and the high nitrogen promotes broadleaf weed growth over native perennial growth. In areas where there is no longer topsoil, consider amending the soil with mycorrhizal inoculants and/or mature screened compost.
- Install needed erosion control practices, such as sediment basins, diversion dikes and channels, prior to hydroseeding. Divert concentrated flows away from hydroseeded areas.
- Surface roughening: If the area has been recently loosened or disturbed, no further roughening is required. When the area is compacted, crusted or hardened the soil shall be loosened with raking or harrowing.
- Spread hydroseed mix uniformly and according to manufacturer's recommendations.

[1] If a plant type is allelopathic, it exudes chemicals into the surrounding soil that discourage or inhibit other plant types from growing. Eucalyptus is a commonly known allelopathic species.

- Cover hydroseeded areas with other methods as needed.

BMP MAINTENANCE

- Inspect during seed establishment period. Re-seed, due to mortality, as necessary. Areas that fail to establish cover adequate to prevent sheet and rill erosion will be reseeded as soon as such areas are identified. Spot seeding can be done on small areas to fill in bare spots where grass did not grow properly.

BMP REMOVAL

- BMP removal should not be necessary.

BMP: EC-8

MULCHING

DESCRIPTION

Mulching is the application of rice or sterile straw, wood chips, leaf litter, redwood duff, or other suitable materials on the soil surface applied manually or by machine. This BMP is used to reduce the potential for soil becoming water or air borne, and to encourage vegetation establishment.

APPLICATIONS

This BMP may be used to provide protection to the soil surface and to protect newly seeded areas. This BMP may be used in combination with plantings.

LIMITATIONS

- Mulch may not adhere well to slopes steeper than 2:1.
- Mulch should not be placed in water bodies or in ditches where water flow is continuous.

CONSTRUCTION GUIDELINES

- Mulch should be applied so that the soil is covered enough to allow seeds to protect against erosion, but still allow seeds to germinate.
- Native mulches (redwood duff, leaf litter, etc.) are preferred in sensitive areas.
- In areas subject to runoff or wind erosion, mulch shall be secured into the soil by mechanical or manual crimping, anchoring with branches, or other appropriate methods.

BMP MAINTENANCE

- Periodic inspection should be conducted, and mulch reapplied in areas where missing.

BMP REMOVAL

- BMP removal is not necessary.

BMP: EC-9

VEGETATIVE BUFFER

DESCRIPTION

A vegetative buffer is a strip of vegetation adjacent to sensitive areas, ditches, pavement and water bodies. This BMP prevents soil from becoming water borne, and may help restore shallow slope failures by trapping soil and debris.

APPLICATIONS

This BMP may be used adjacent to ditches and/or sensitive areas and water bodies, parallel to roadways, parking lots, etc. It may be used in combination with other BMPs.

LIMITATIONS

This BMP should not be used:

- if it creates a potential public safety hazard.

CONSTRUCTION GUIDELINES

1) Existing vegetation shall be preserved as a buffer to the greatest extent possible.
2) Use live staking, brush layering, wattles/fascines and/or seeding methods to restore vegetative buffers after disturbances.

BMP MAINTENANCE

- Mow, trim or selectively harvest the vegetative buffer in accordance with applicable permits and/or approved vegetation management plans.
- Revegetate as necessary.

BMP REMOVAL

- BMP removal is not necessary.

BMP: EC-10

EROSION CONTROL BLANKETS & MATS

DESCRIPTION

Erosion control blankets and mats are installed to protect the prepared soil surface of a steep slope. This BMP may be used at maintenance sites to provide stabilization on steep slopes or stream banks. Erosion control blankets and mats are available in a variety of biodegradable materials including jute (natural fiber that is made into a yarn and loosely woven into a biodegradable mesh), excelsior (curled wood fiber) blanket material, straw, wood fiber blanket, coconut fiber blanket, coconut fiber mesh, and straw coconut fiber blanket. Coir fabric/netting is a geo-textile product made from coconut fibers loosely woven into a fabric usually packaged in roll form. This fabric can be used to provide a reduction in water velocity/erosive forces and/or habitat protection and topsoil stabilization.

APPLICATIONS

This BMP may be used in areas to provide stabilization/protection to the soil surface of steep slopes or stream banks. It can be used in combination with vegetation and/or seeding to reinforce soil in high flow/high velocity waters and on slopes as steep as 1:1. It may be used as bank stabilization before vegetation efforts have occurred.

Erosion control blankets are used on steep slopes to temporarily stabilize and protect disturbed soil from raindrop impact and surface erosion, to increase infiltration, decrease compaction and soil crusting, and to conserve soil moisture. Erosion control blankets also protect seeds from predators, reduce desiccation and evaporation by insulating the soil and seed environment.

Some types of erosion control blankets and turf reinforcement mats are specifically designed to stabilize channelized flow areas.

LIMITATIONS

This BMP should not be used:

- In the streambed.
- When short-term biodegradability is desired.
- In areas subject to scour from high flows (e.g. streambanks) unless designed by an engineer.
- Permits shall be obtained prior to any streambank or shoreline installation.

Blankets and mats manufactured with plastic netting shall be avoided.

CONSTRUCTION GUIDELINES

- When used near watercourses or streams, coir fabrics/nettings must be used in accordance with permit requirements.
- Proper soil preparation is essential to ensure complete contact of the protection matting with the soil. Prepare the soil on the slope prior to laying out the erosion control blanket or mat.
- Grade and shape area of installation.
- Remove all rocks, clods, vegetative or other obstructions so that the installed blankets, or mats will have direct contact with the soil.
- Prepare seedbed by loosening 2-3 inches of topsoil above final grade.
- Seed area before blanket installation for erosion control and re-vegetation. Seeding after mat installation is often specified for turf reinforcement application. When seeding prior to blanket installation, all areas disturbed during blanket installation should be re-seeded. Where soil filling is specified for turf reinforcement mats, seed the matting and entire disturbed area after installation and prior to filing the mat with soil.
- Fertilize and seed in accordance with seeding specifications or other types of landscaping plans. The protective matting can be laid over areas where grass has been planted and the seedlings have emerged. Where vines or other ground covers are to be planted, lay the protective matting first and then plant through matting according to design of planting.
- Check slots should be installed as specified by the manufacturer.
- Before laying the matting, all check slots should be installed and the seedbed should be friable, made free from clods, rocks, and roots. The surface should be compacted and finished according to the requirements of the manufacturer's recommendations.
- Use mechanical or manual lay down equipment capable of handling full rolls of fabric and laying the fabric smoothly without wrinkles or folds. Equipment should meet fabric manufacturer's recommendations or standards.
- Install mats or blankets in accordance with the manufacturer's recommendations. In general, begin at the top of the slope and anchor blanket/fabric in a 6 inch by 6 inch wide trench and backfill the trench. Unroll the blanket/fabric down slope in the direction of water flow. Overlap the edges of adjacent rolls 2-3 inches and stable every 3 feet. If splicing is needed, place blankets end over end (shingle style) with 6 inches of overlap. Staple through the overlapped area, approximately 12 inches apart.
- If coir fabric is used, lay loosely on the surface so fabric makes contact with the ground and conforms to the ground surface's topography (do not stretch for extra coverage). Overlap fabric edges at least 12 inches. The fabric should be trenched in at least 12 inches deep at the top and bottom ends of the installation to prevent undercutting. If used in conjunction with hand seeding or hydroseeding, place seeding first and cover with fabric.
- U-shaped wire staples, metal geotextile stake pins, or triangular wooden stakes can be used to anchor mats to the ground surface. Wire staples should be a minimum of 11 gauge. Metal stake pins should be 3/16 inch diameter steel with a

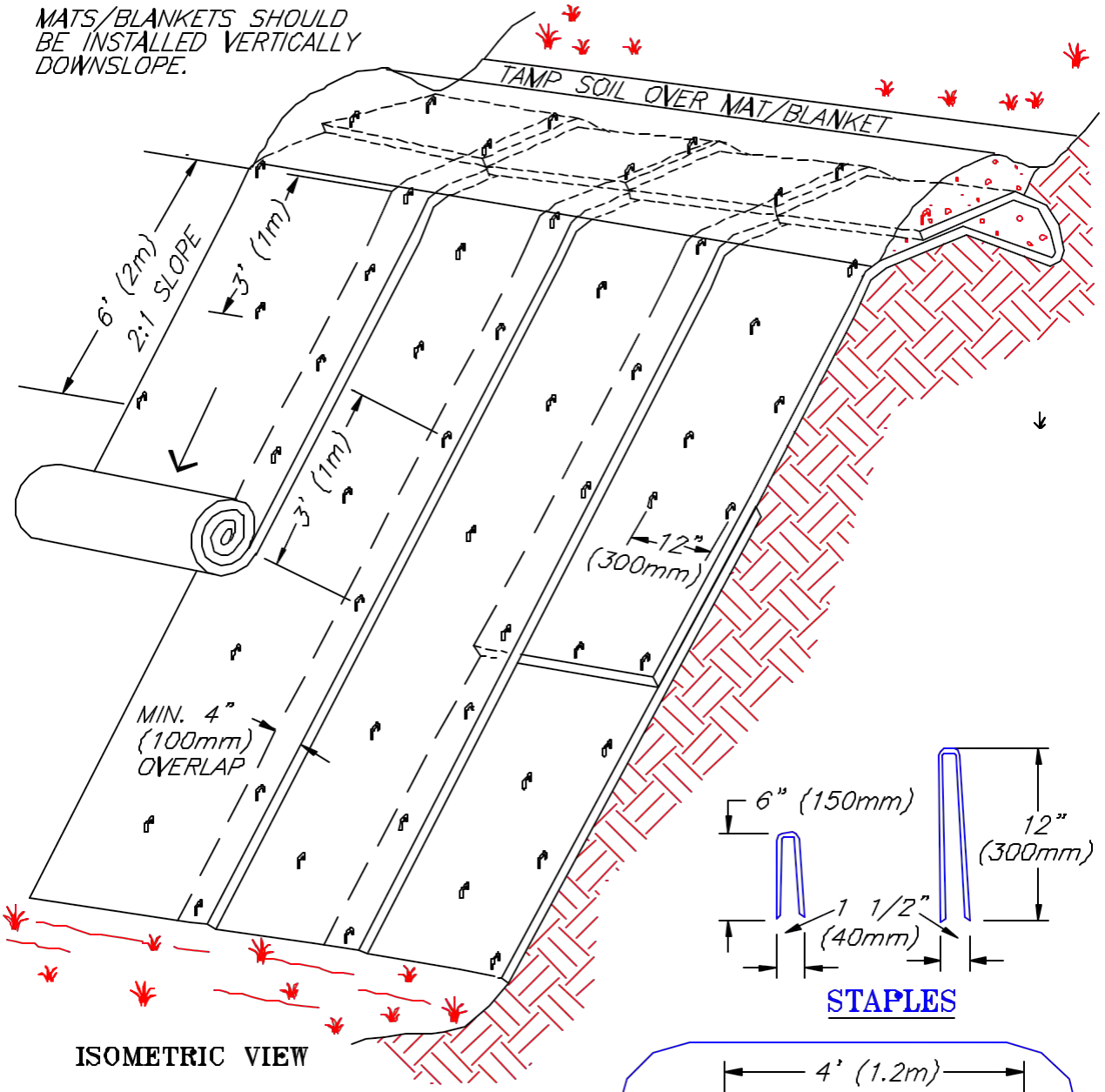
1 1/2 inch steel washer at the head of the pin. Wire staples and metal stakes should be driven flush to the soil surface. All anchors should be 6-8 inches long and have sufficient ground penetration to resist pullout. Longer anchors may be required for loose soils. For coir netting, live staking may be done after the fabric is placed by piercing the fabric.

BMP MAINTENANCE

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

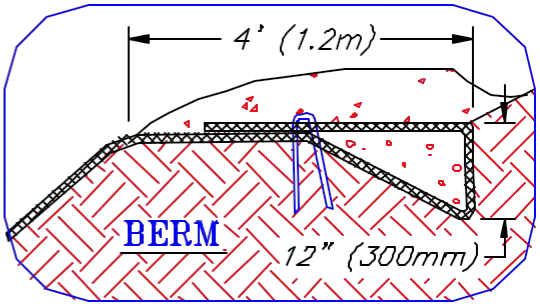
BMP REMOVAL

- BMP removal is not necessary.



ISOMETRIC VIEW

STAPLES



NOT TO SCALE

TYPICAL SLOPE SOIL STABILIZATION

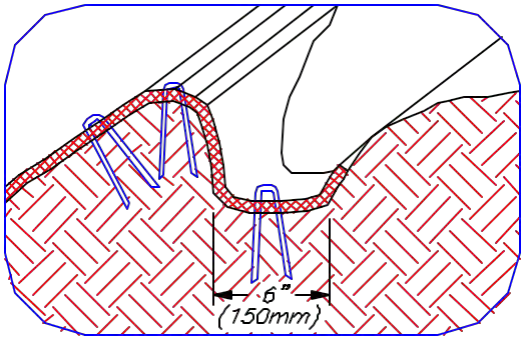
NOTES:

1. SLOPE SURFACE SHALL BE FREE OF ROCKS, CLODS, STICKS AND GRASS. MATS/BLANKETS SHALL HAVE GOOD SOIL CONTACT.
2. APPLY PERMANENT SEEDING BEFORE PLACING BLANKETS.
3. LAY BLANKETS LOOSELY AND STAKE OR STAPLE TO MAINTAIN DIRECT CONTACT WITH THE SOIL. DO NOT STRETCH.

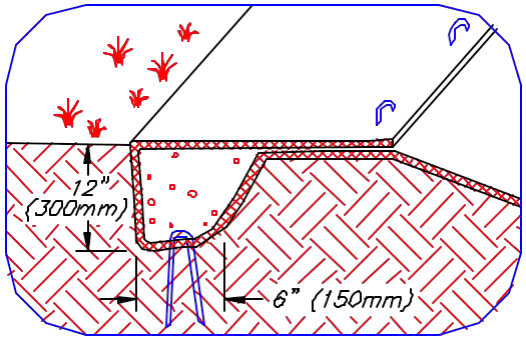
EROSION BLANKETS & TURF REINFORCEMENT MATS SLOPE INSTALLATION

© 1994 JOHN McCULLAH

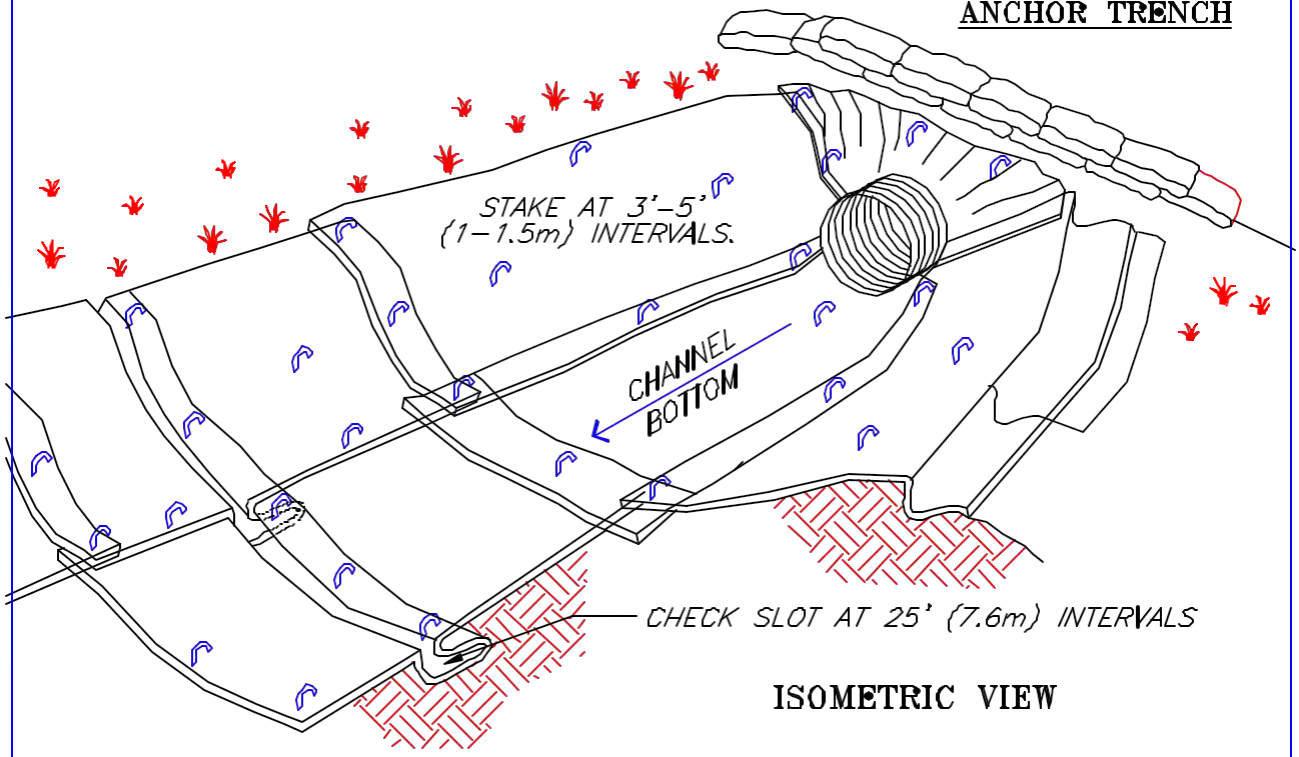
FILE. BLNKTSLP



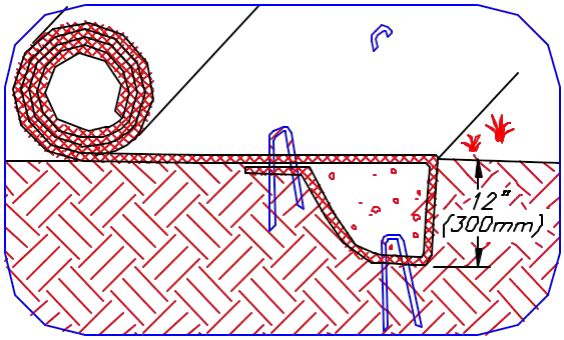
LONGITUDINAL ANCHOR TRENCH



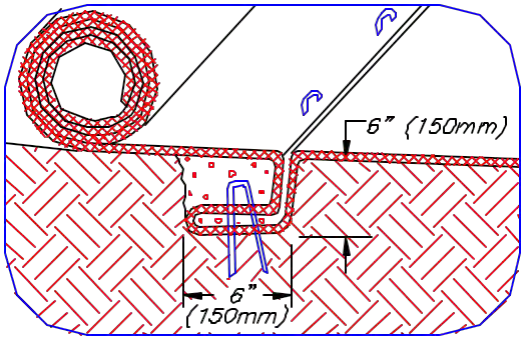
TERMINAL SLOPE AND CHANNEL ANCHOR TRENCH



ISOMETRIC VIEW



INITIAL CHANNEL ANCHOR TRENCH



INTERMITTENT CHECK SLOT

NOTES:

1. CHECK SLOTS TO BE CONSTRUCTED PER MANUFACTURERS SPECIFICATIONS.
2. STAKING OR STAPLING LAYOUT PER MANUFACTURERS SPECIFICATIONS.

EROSION BLANKETS & TURF REINFORCEMENT MATS CHANNEL INSTALLATION

© 1994 JOHN McCULLAH

FILE: BLNKTCHA

BMP: EC-13

SLOPE OR BANK STABILIZATION

DESCRIPTION

The County strives to implement biotechnical methods to stabilize streambanks. Biotechnical stabilization methods utilize native materials such as large woody debris, willows, and other vegetation, to stabilize streambanks. Refer to BMPs EC-1 (Brush Layering), EC-2 (Brush Packing), and EC-4 (Wattles and Fascines) for description of biotechnical methods.

Where biotechnical methods are unsuitable (i.e., in locations with very steep slopes or limited right-of-way width), and where engineered retaining structures are necessary, hardened engineered solutions such as rock slope protection, solider pile walls, retaining walls, or slope soil nailing may be utilized along a failed portion of slope to provide a buttress for against additional failure. To the extent possible, the County shall aim to combine these hardened solutions with biotechnical methods and incorporate habitat features at the base of the structure. Such design approaches may include structural fixes such as solider pile retaining walls with concrete or wood laggings installed above the ordinary high water mark with vegetated rock slope protection or slope soil nailing fronted by a vegetated boulder revetments or habitat features at the toe of the slope. These hardscape solutions are utilized to stabilize steep slopes with seepage problems and/or unstable soils that need armoring to prevent sloughing, as well as along narrow, steep roadways where the right-of-way width is limited.

Vegetated boulder revetments involve placing logs, rootwads, and boulders in selective areas in and on streambanks. This method is effective in higher velocity streams, and trap sediment between components support restoration of slope vegetation and distribute flow velocities.

LIMITATIONS

- Streambank and road embankment stabilization methods shall only be implemented after identifying potential impacts to upstream and downstream banks, structures and facilities.
- Do not use hardscape engineered solutions (e.g., riprap, concrete, shot-crete, soil nailing) as a stand-alone method of streambank stabilization.
- Obtain permits from appropriate agencies before placing any fill below the mean high water line of any water body, or in other sensitive areas. For example, placing rock in pools at the bottom of culverts is a regulated activity.

DESIGN AND CONSTRUCTION GUIDELINES

- For vegetated boulder revetments, the construction guidelines will vary based on existing site conditions, size and shape of woody materials, forces exerted by moving water, etc.
- For bank stabilization methods using hardened materials, consult with a qualified engineer to determine the appropriate size of boulders and hardscape protection needed, the appropriate placement techniques, and the potential application of biotechnical stabilization treatments in conjunction with the hardscape protection. The selected engineer shall conduct a shear stress evaluation to confirm the appropriate sizing of rock to be used.
- Attempt to limit hardscape protection methods below the ordinary high water mark.
- Anchor hardscape walls horizontally and vertically to the slope.
- Incorporate plantings, designed to allow tree growth, into hardscape designs; and key into the bank as appropriate.
- For rock slope protection treatments, angular rock should be used and sized to ensure a thickness of at least 2 courses over the slope failure. Filter or geotextile fabric, which allows water to flow through the material while blocking sediment, silt and other aggregates, may be placed on the slope prior to the rock. If filter/geotextile fabric is used, the edges should be buried to a depth of six inches (6”). Filter or geotextile fabric may not be necessary along portions of the slope where vegetation is incorporated.
- Carefully place rock to avoid damaging the filter fabric.
    - Stone 4-6” may be carefully dumped onto filter fabric from a height not to exceed 12”.
    - Stone 8-12” must be placed by hand onto filter fabric, or the filter fabric may be covered with 4” of gravel and the 8-12” rock may be dumped from a height not to exceed 16”.
    - Stone greater than 12” shall only be dumped onto filter fabric protected with a layer of gravel with a thickness equal to one half the D_{50} (median) rock size, and the dump height limited to twice the depth of the gravel protection layer thickness (CASQA 2015).
- Where vegetation can be incorporated into bank stabilization projects, perform live staking or pole planting during rock placement as appropriate.
- Place rock to its full thickness in one operation.
- The toe of the rock slope should be keyed to a stable foundation at its base.
- Schedule topsoil and revegetation finish work at an appropriate time or year.

BMP MAINTENANCE

- Where biotechnical streambank stabilization methods are implemented, monitor finished streambanks to ensure stability and vegetative growth. Consult as necessary for adjustments and/or modifications to streambank stabilization installations.
- During construction of hardscape methods, inspect daily during the work week.

- Schedule additional inspections of bank stabilization sites during storm events.
- Immediately repair any gaps, holes, scour, or underlying filter fabric observed where hardened solutions have been implemented. Replace dislodged stones immediately.

BMP REMOVAL

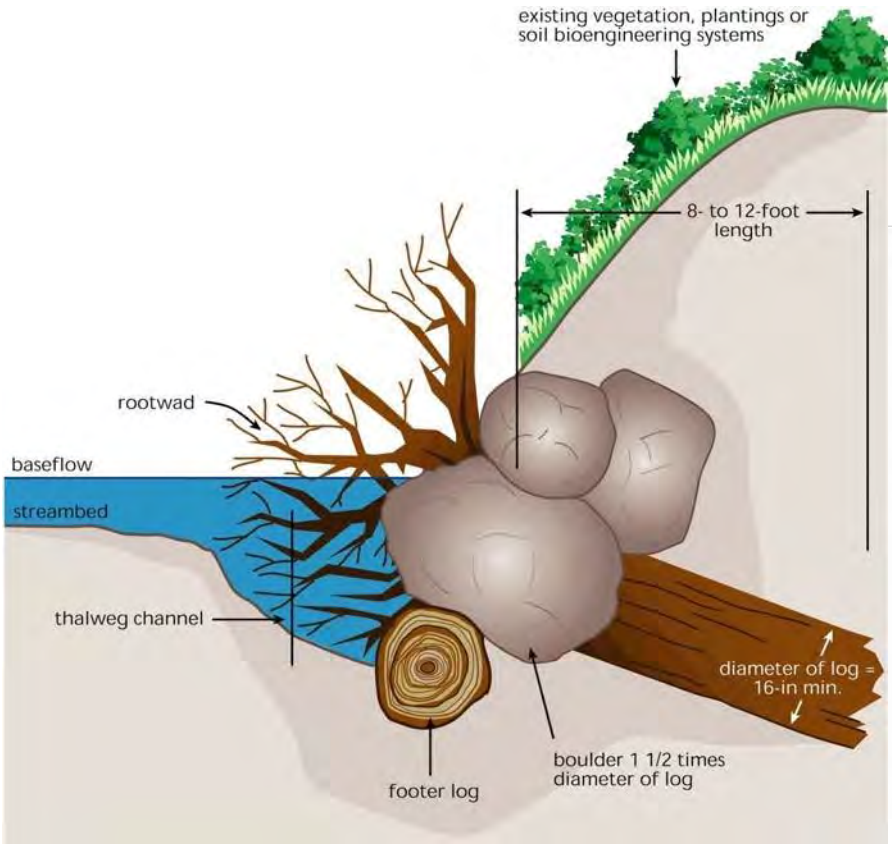
BMP removal should not be necessary.

ADDITIONAL RESOURCES

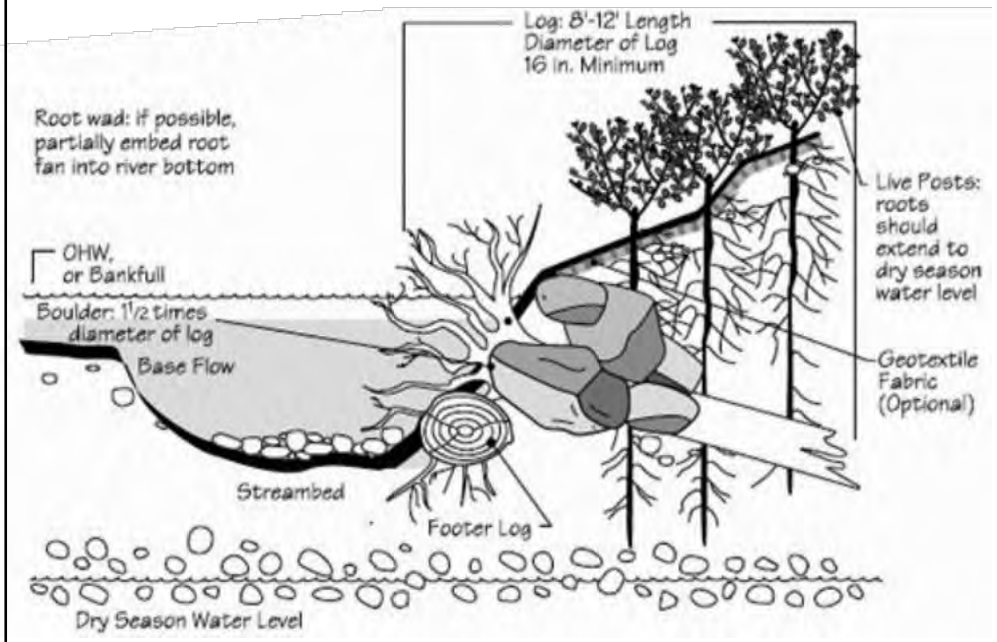
Bio Draw 1.0, Compendium of Biotechnical Soil Stabilization Solutions, Salix Applied Earthcare, 2000.

California Stormwater BMP Handbook. Construction. January 2011.

Guidelines for Bank Stabilization Projects in the Riverine Environments of King County, King County, Washington, Department of Public Works, June 1993.



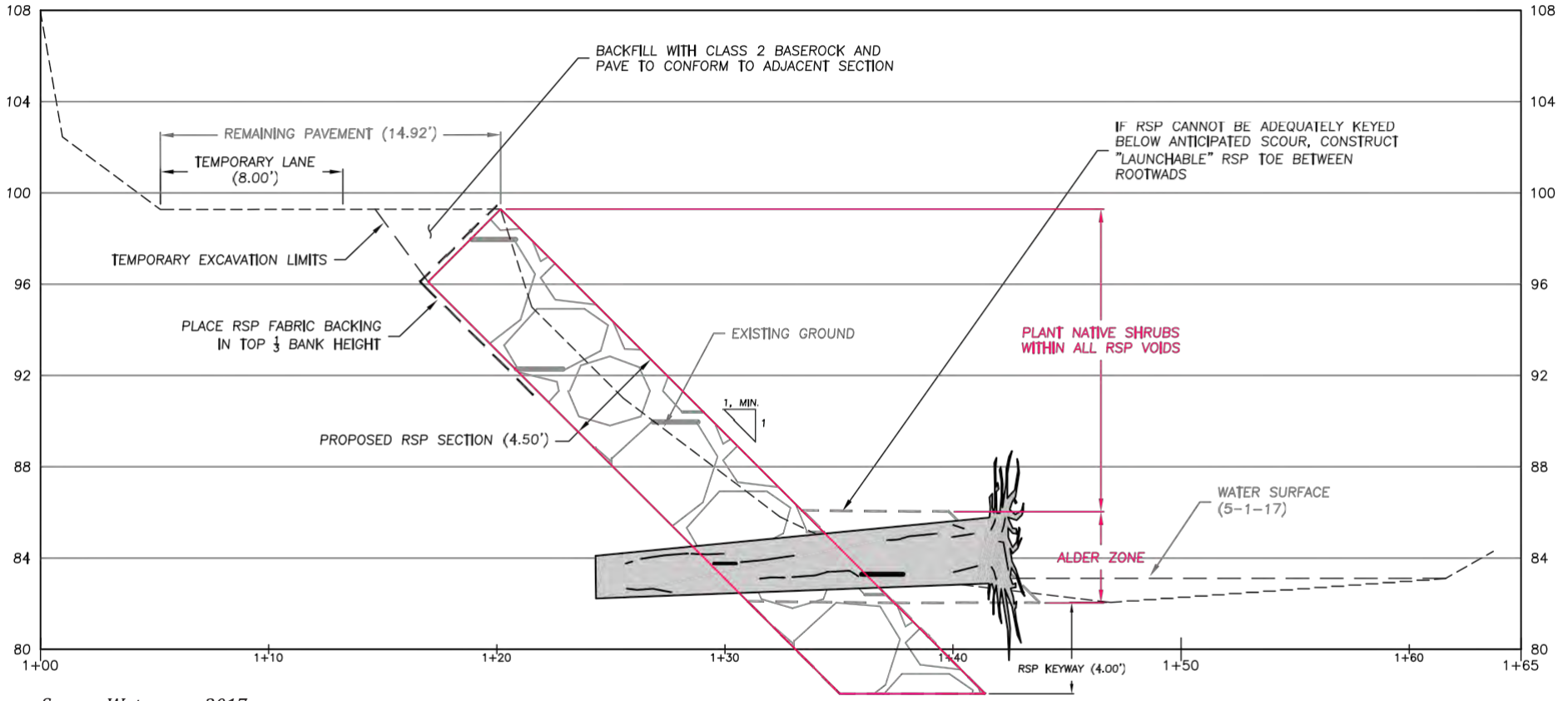
Source: LCSMC and USDA-NRCC 2002



Source: Indiana General Assembly 2012

Horizon WATER and ENVIRONMENT

Example Profile Views of Log, Rootwad and Boulder Revetment Designs
(1 of 3)



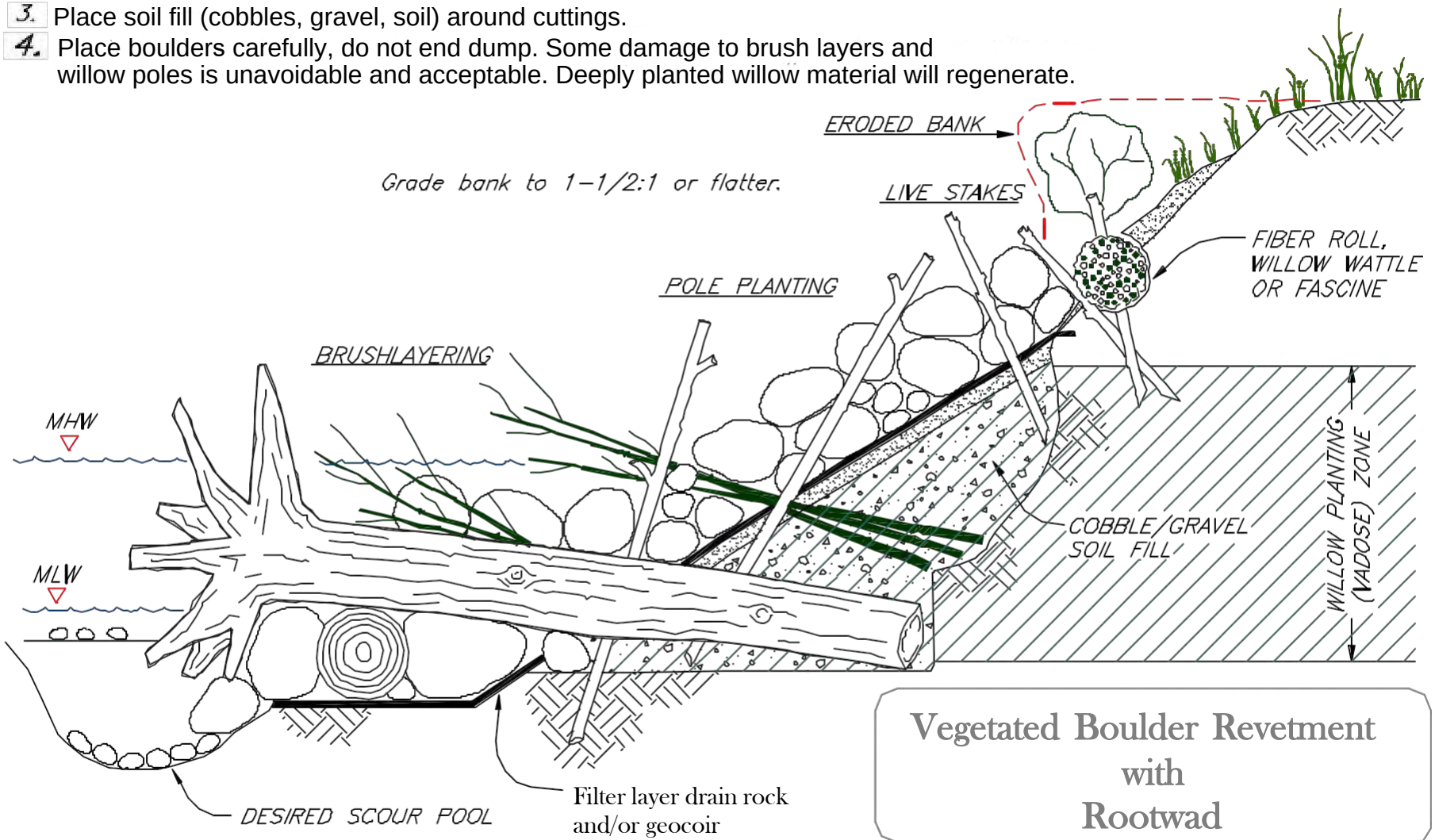
Source: Waterways 2017

Horizon WATER and ENVIRONMENT

Example Profile Views of Log, Rootwad and Boulder Revetment Designs (2 of 3)

NOTES:

1. Willow pole planting and brushlayering shall be installed during bank grading and boulder placement to ensure good contact with 'native ground' and soil fill.
2. Willow poles and brush layers shall extend down into expected soil moisture zones (vadose).
3. Place soil fill (cobbles, gravel, soil) around cuttings.
4. Place boulders carefully, do not end dump. Some damage to brush layers and willow poles is unavoidable and acceptable. Deeply planted willow material will regenerate.

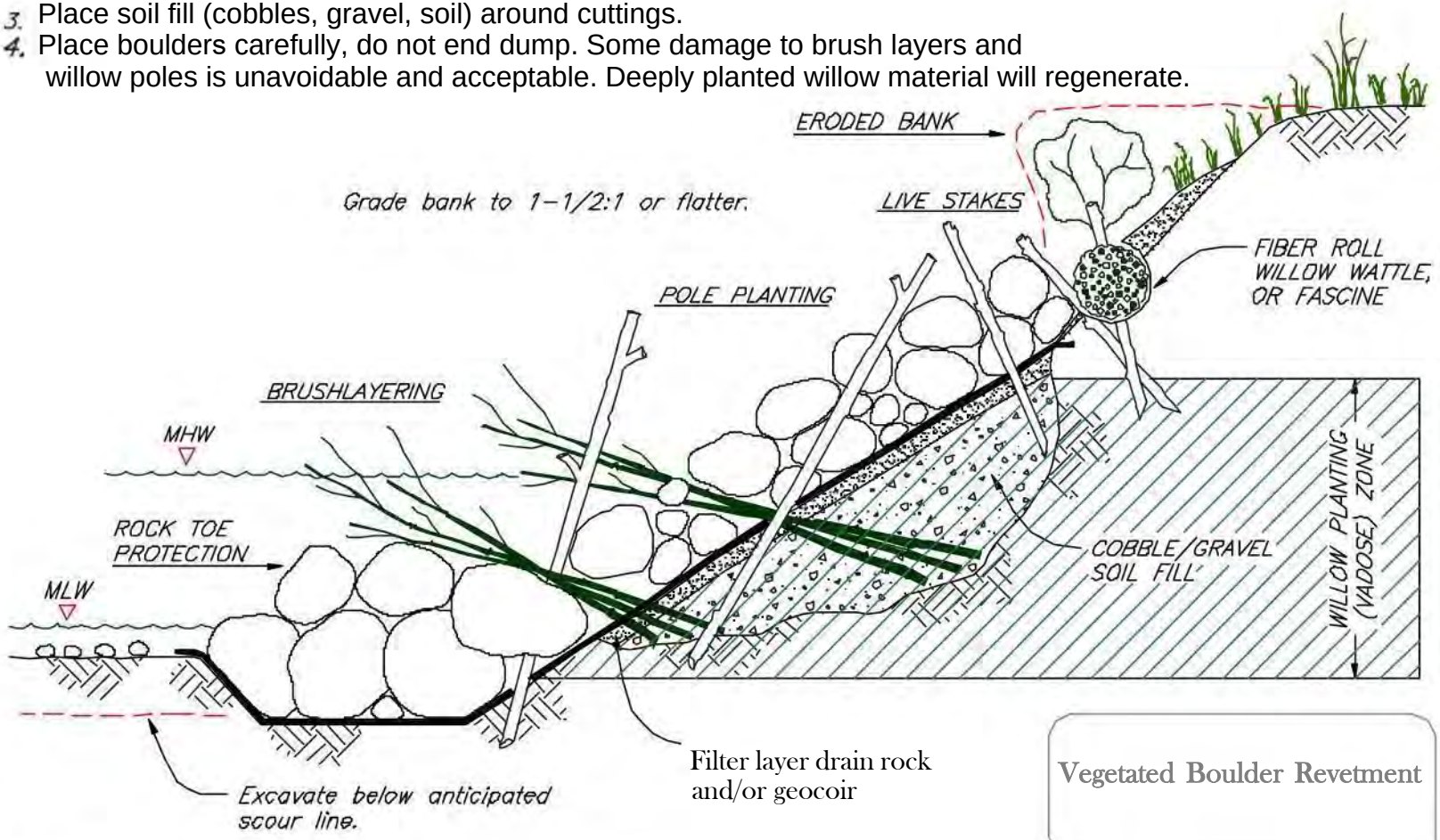


Vegetated Boulder Revetment with Rootwad

Source: John McCullah 1999

NOTES:

1. Willow pole planting and brushlayering shall be installed during bank grading and boulder placement to ensure good contact with 'native ground' and soil fill.
2. Willow poles and brush layers shall extend down into expected soil moisture zones (vadose).
3. Place soil fill (cobbles, gravel, soil) around cuttings.
4. Place boulders carefully, do not end dump. Some damage to brush layers and willow poles is unavoidable and acceptable. Deeply planted willow material will regenerate.

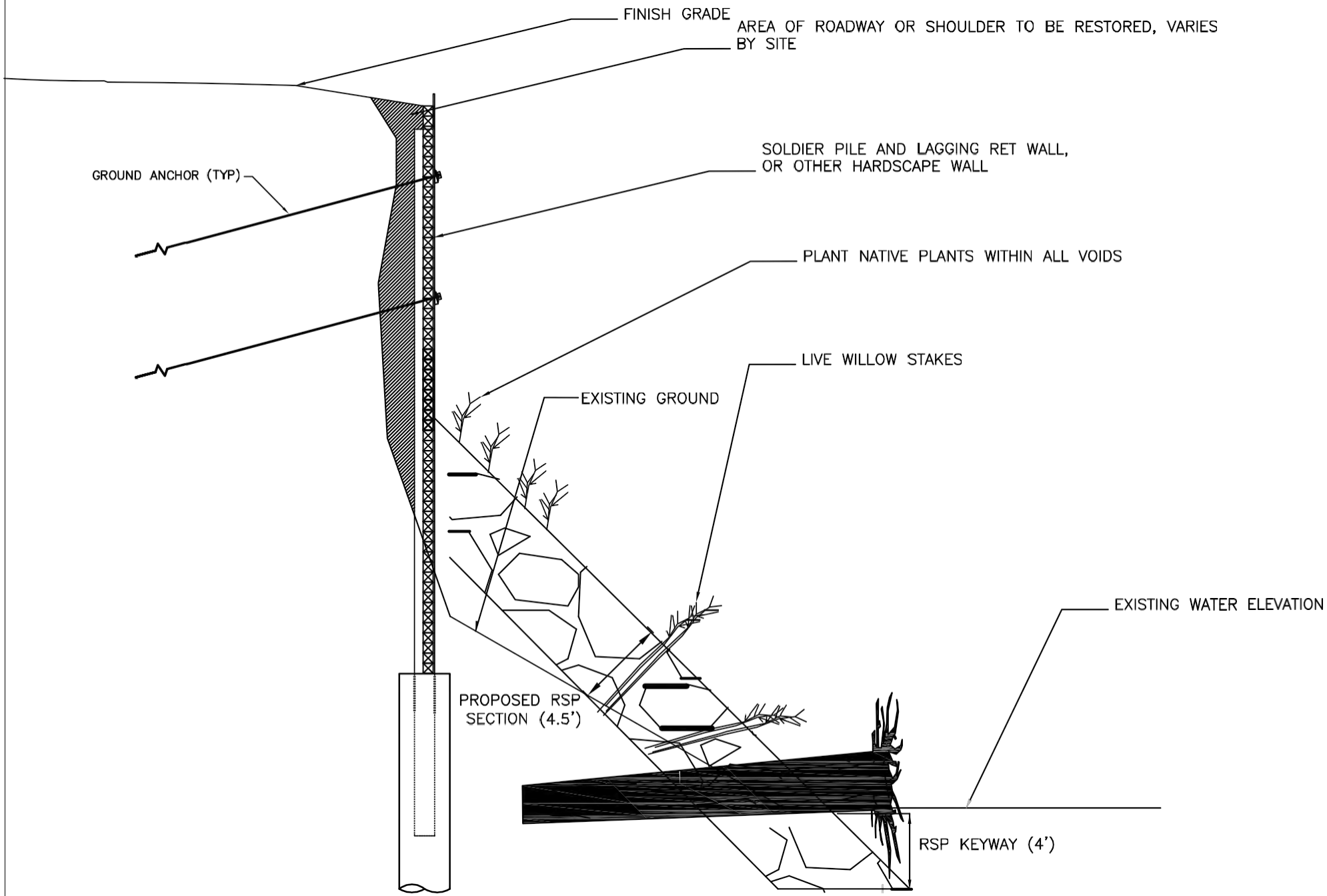


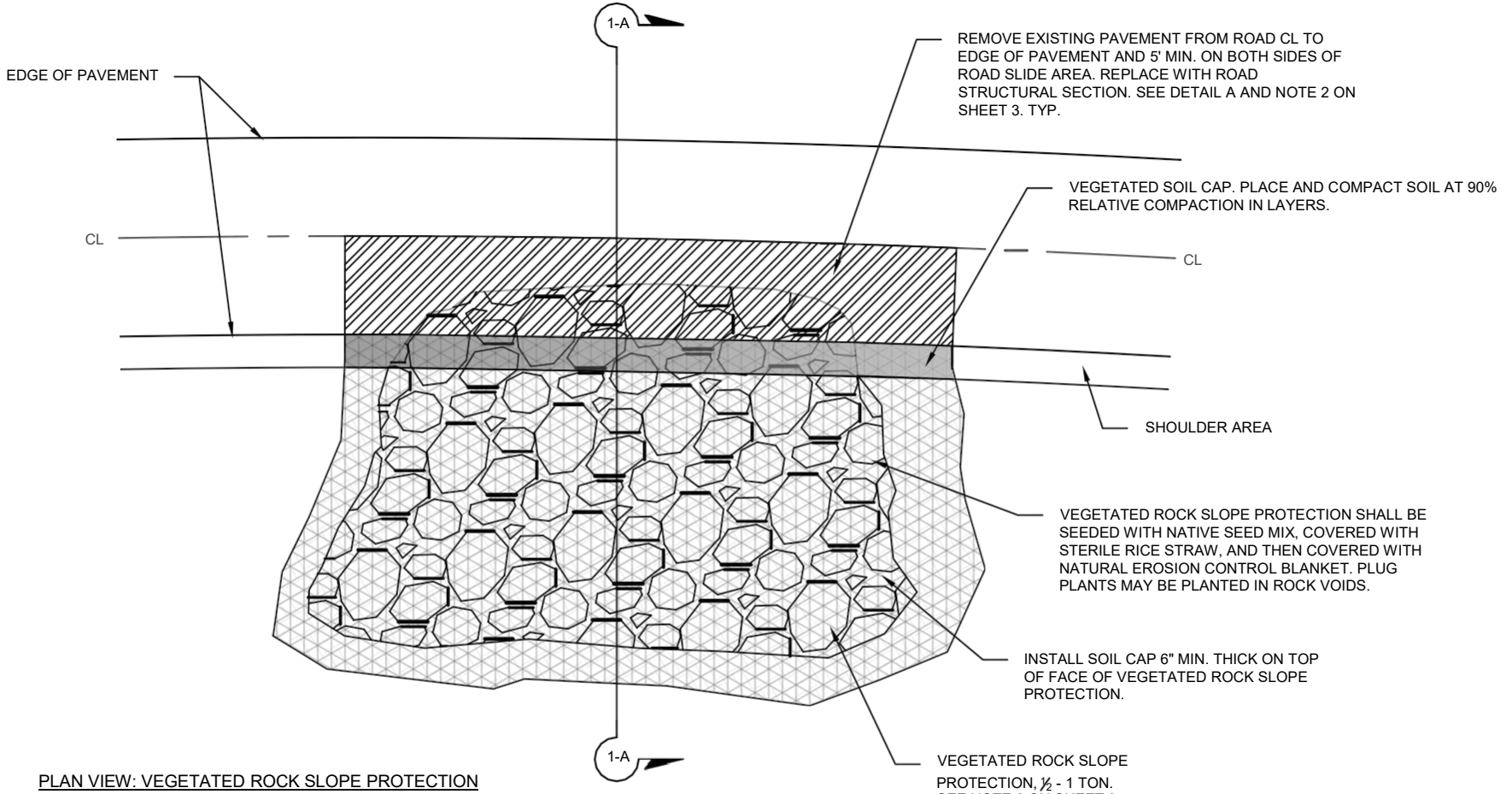
Vegetated Boulder Revetment

© 1999 JOHN McCULLAH

VGRIPRAP

RETAINING WALL WITH VEGETATED REVETMENT





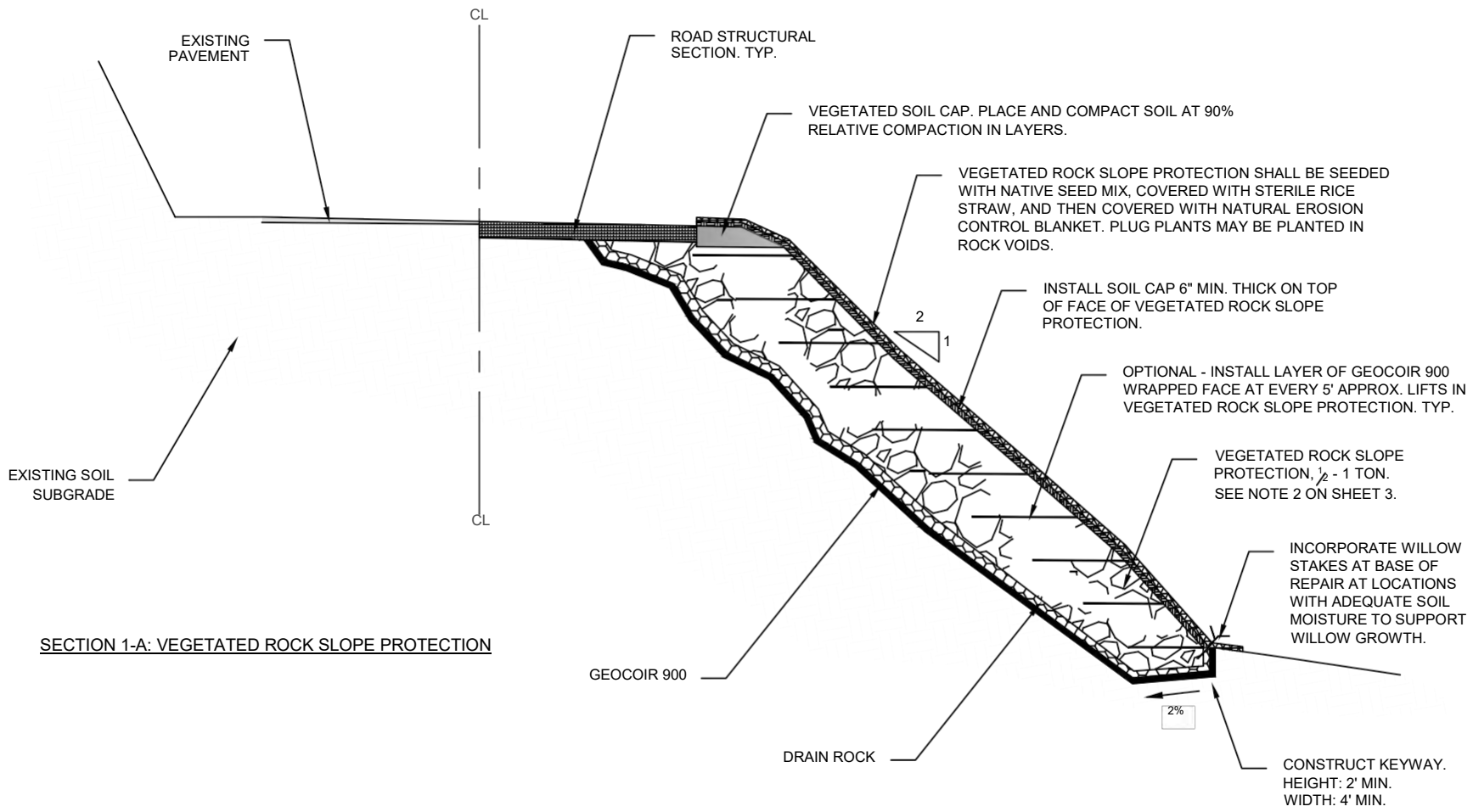
PLAN VIEW: VEGETATED ROCK SLOPE PROTECTION

FILENAME: F:\USERS\DESIGN\C3D\RMP EXHIBITS\DWG\RMP EXHIBITS.DWG

DESIGNED BY: JC	VEGETATED ROCK SLOPE PROTECTION - SHEET 1	SCALE: NONE
CHECKED BY: AL/JC	COUNTY OF SAN MATEO	DATE: 04-14-2023
DRAWN BY: ADG	ROUTINE MAINTENANCE PROGRAM	FILE NO: NONE

ANN M. STILLMAN, DIRECTOR OF PUBLIC WORKS
COUNTY OF SAN MATEO

555 COUNTY CENTER, 5TH FLOOR
REDWOOD CITY, CALIFORNIA 94063-1665



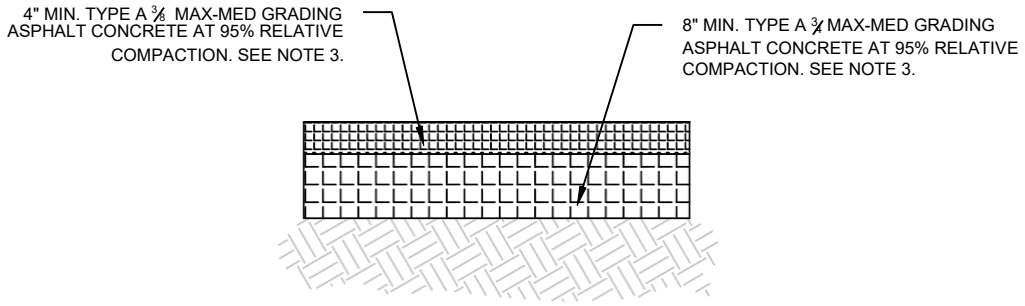
SECTION 1-A: VEGETATED ROCK SLOPE PROTECTION

FILENAME: F:\USERS\DESIGN\C3D\RMP EXHIBITS\DWG\RMP EXHIBITS.DWG

DESIGNED BY: JC	VEGETATED ROCK SLOPE PROTECTION - SHEET 2	SCALE: NONE
CHECKED BY: AL/JC	COUNTY OF SAN MATEO	DATE: 04-14-2023
DRAWN BY: ADG	ROUTINE MAINTENANCE PROGRAM	FILE NO: NONE

ANN M. STILLMAN, DIRECTOR OF PUBLIC WORKS
COUNTY OF SAN MATEO

555 COUNTY CENTER, 5TH FLOOR
REDWOOD CITY, CALIFORNIA 94063-1665



DETAIL A:
ROAD STRUCTURAL SECTION

NOTES:

1. DRAIN ROCK SHALL BE USED TO FILL VOIDS OF ROCK SLOPE PROTECTION BEFORE PLACEMENT OF SOIL.
2. ROAD STRUCTURAL SECTION SHALL CONFORM TO EXISTING PAVEMENT AND EXISTING CROSS SLOPE.
3. LAYING AND COMPACTING OF ASPHALT CONCRETE SHOULD BE DONE IN 3"-4" MAX LIFTS.

ABBREVIATIONS:

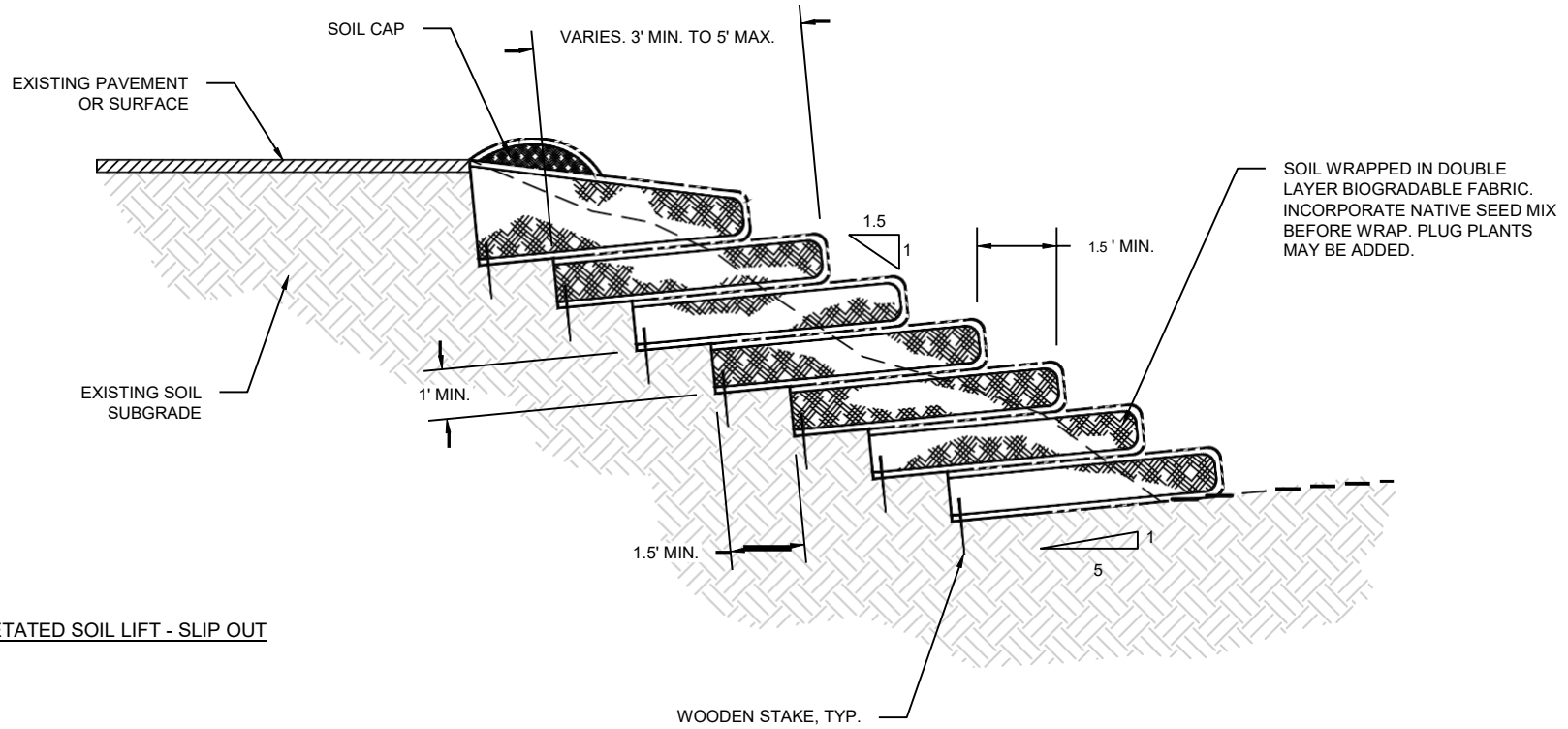
CL	CENTERLINE
MAX	MAXIMUM
MIN	MINIMUM
TYP	TYPICAL

FILENAME: F:\USERS\DESIGN\C3D\RMP EXHIBITS\DWG\RMP EXHIBITS.DWG

DESIGNED BY: JC	VEGETATED ROCK SLOPE PROTECTION - SHEET 3	SCALE: NONE
CHECKED BY: AL/JC	COUNTY OF SAN MATEO	DATE: 04-14-2023
DRAWN BY: ADG	ROUTINE MAINTENANCE PROGRAM	FILE NO: NONE

ANN M. STILLMAN, DIRECTOR OF PUBLIC WORKS
COUNTY OF SAN MATEO

555 COUNTY CENTER, 5TH FLOOR
REDWOOD CITY, CALIFORNIA 94063–1665



VEGETATED SOIL LIFT - SLIP OUT

ABBREVIATIONS:

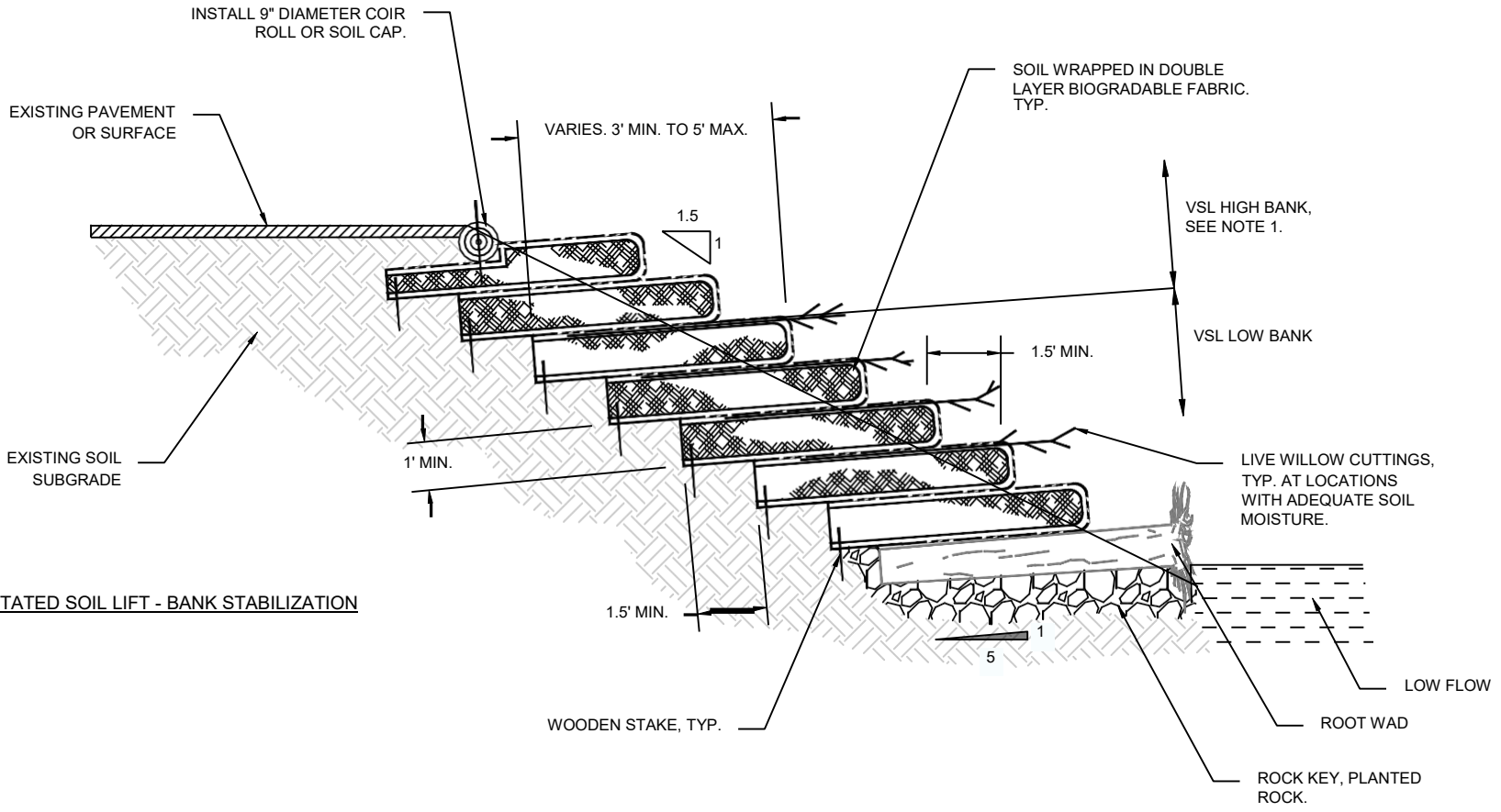
MAX	MAXIMUM
MIN	MINIMUM
TYP	TYPICAL
VSL	VEGETATED SOIL LIFT

FILENAME: F:\USERS\DESIGN\C3D\RMP EXHIBITS\DWG\RMP EXHIBITS.DWG

DESIGNED BY: JC	VEGETATED SOIL LIFT - SLIP OUT	SCALE: NONE
CHECKED BY: AL/JC	COUNTY OF SAN MATEO	DATE: 04-14-2023
DRAWN BY: ADG	ROUTINE MAINTENANCE PROGRAM	FILE NO: NONE

ANN M. STILLMAN, DIRECTOR OF PUBLIC WORKS
COUNTY OF SAN MATEO

555 COUNTY CENTER, 5TH FLOOR
REDWOOD CITY, CALIFORNIA 94063–1665



VEGETATED SOIL LIFT - BANK STABILIZATION

NOTES:

1. INCORPORATE NATIVE SEED MIX BEFORE WRAP ON LAYERS AT VSL HIGH BANK.

ABBREVIATIONS:

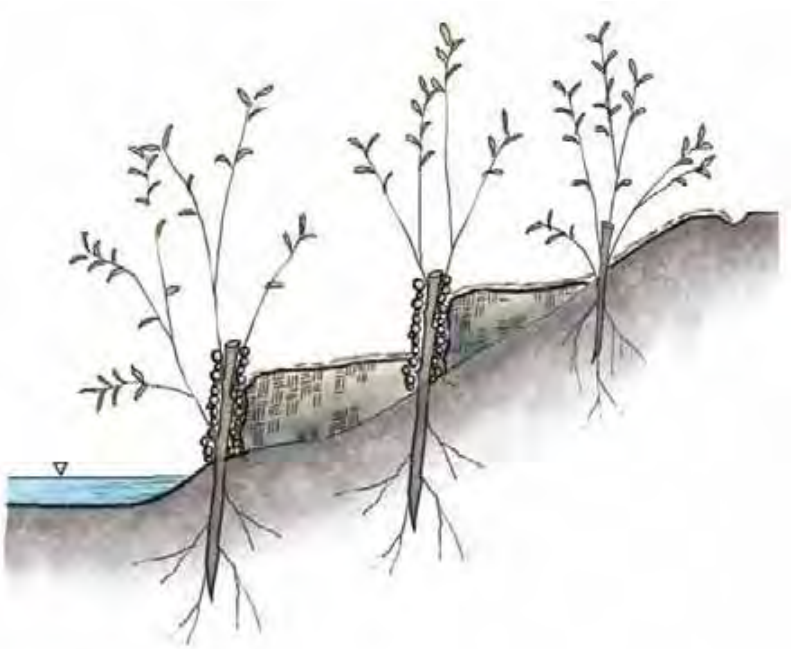
MAX	MAXIMUM
MIN	MINIMUM
TYP	TYPICAL
VSL	VEGETATED SOIL LIFT

FILENAME: F:\USERS\DESIGN\C3D\RMP EXHIBITS\DWG\RMP EXHIBITS.DWG

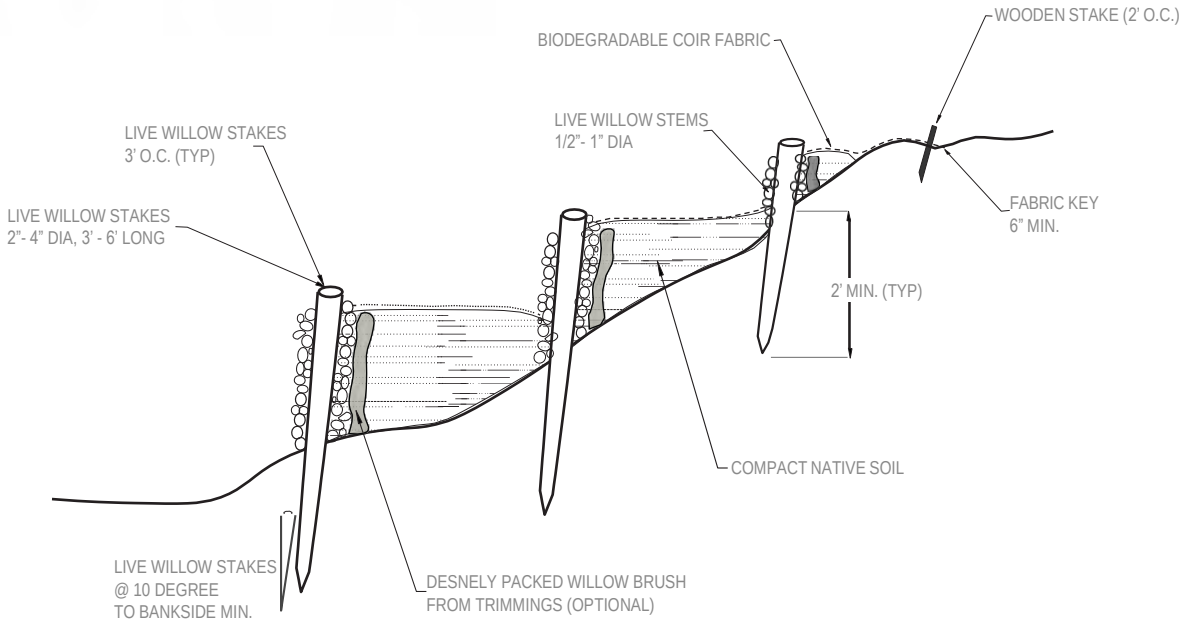
DESIGNED BY: JC	VEGETATED SOIL LIFT - BANK STABILIZATION		SCALE: NONE
CHECKED BY: AL/JC	COUNTY OF SAN MATEO		DATE: 04-14-2023
DRAWN BY: ADG	ROUTINE MAINTENANCE PROGRAM		FILE NO: NONE

ANN M. STILLMAN, DIRECTOR OF PUBLIC WORKS
COUNTY OF SAN MATEO

555 COUNTY CENTER, 5TH FLOOR
REDWOOD CITY, CALIFORNIA 94063-1665





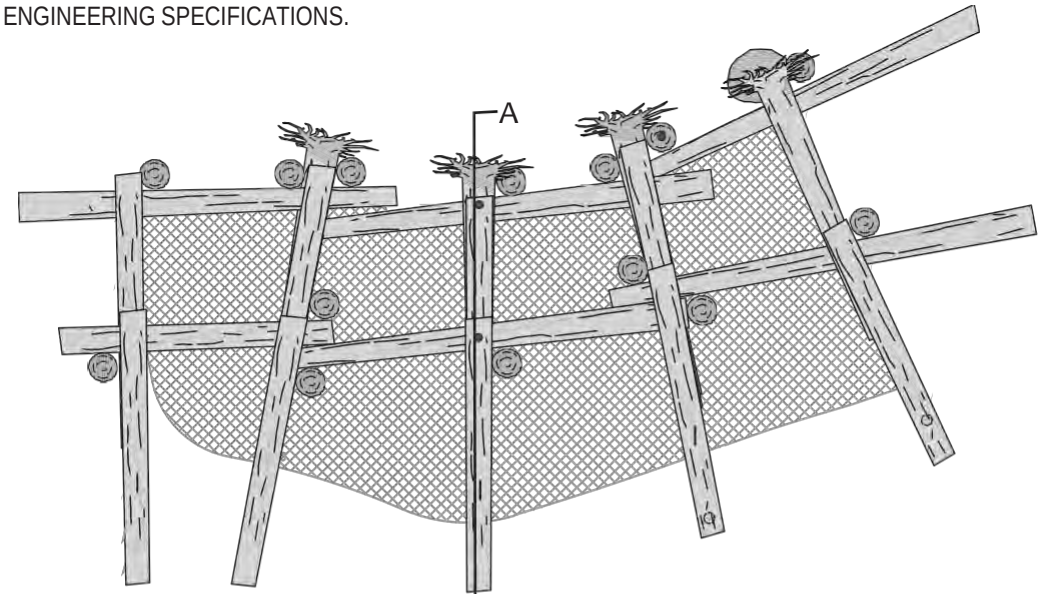


S:\1_Projects\16.007_Napa_SMP_Support_2016-2018\Draft Manual Update\Appendices\Appendix I_Biotech Treatment Designs

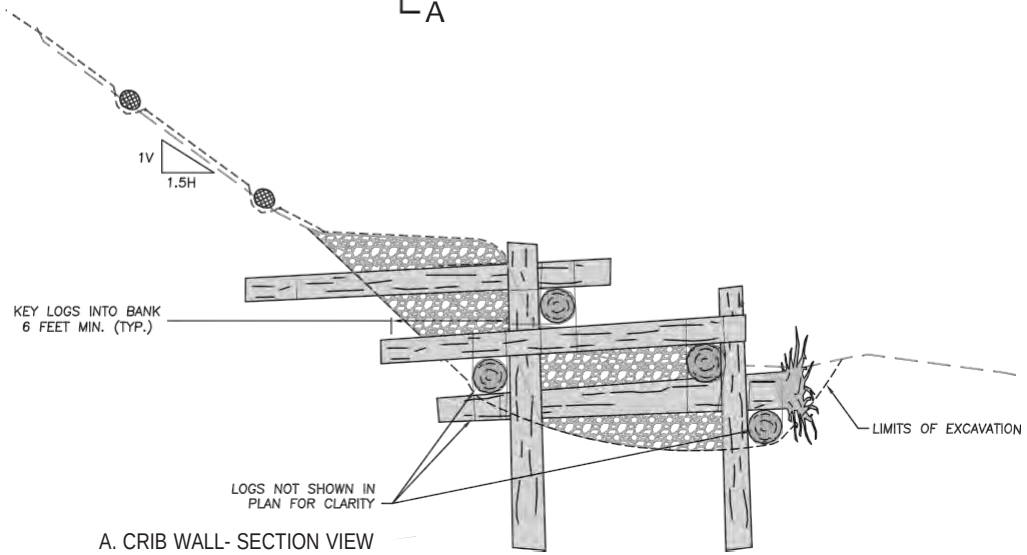
Horizon WATER and ENVIRONMENT

Figure EC-13
Plan Details for Willow Wall

*THESE ARE FOR CONCEPTUAL PURPOSES ONLY. LOG DIAMETER/LENGTH, EMBEDMENT DEPTH, AND NUMBER/TYPE OF CONNECTORS ARE DEPENDENT UPON SITE CONDITIONS AND ENGINEERING SPECIFICATIONS.

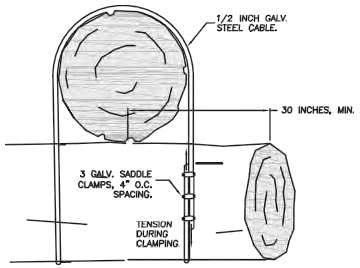


CRIB WALL - PLAN VIEW

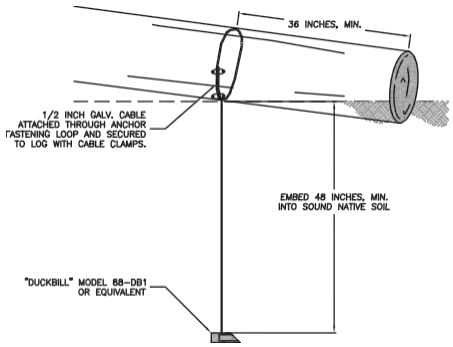


A. CRIB WALL- SECTION VIEW





EXAMPLE: LOG/LOG CONNECTION



EXAMPLE: EARTH ANCHOR DETAIL

S:\1_Projects\16.007_Napa_SMP_Support_2016-2018\Draft Manual Update\Appendices\Appendix I_Biotech Treatment Designs

Horizon
WATER and ENVIRONMENT

Figure EC-13
Plan Details for Log Crib Wall

BMP: SC-1

SANDBAGS AND GRAVEL BAGS

DESCRIPTION

Sandbags and gravel bags are pre-manufactured cloth or plastic bags filled with sand or gravel. These can be used to keep water away from work areas and unstable slopes, and to construct curb inlet sediment barriers. Both are also used as protection against flooding, as ballast.

APPLICATIONS

This BMP may be used during emergencies to control the flow and level of water. It may be used during construction to form dewatered areas such as cofferdams and clean water bypasses. Sandbags and gravel bags may also be used to protect storm drain inlets, gutters, ditches, and drainage courses.

LIMITATIONS

Do not use this BMP where prohibited by permit conditions or as a permanent structure.

CONSTRUCTION GUIDELINES

- When using this BMP in water bodies, fulfill appropriate permit conditions.
- Secure ends of sandbags to ensure material does not scatter.
- Carefully handle sandbags and gravel bags to prevent them from breaking.
- When used as a barrier, stack bags tightly together and in alternative (brick-layer) fashion.
- Fill bags with clean sand or gravel.

BMP MAINTENANCE

- During construction, inspect daily during the workweek. Schedule additional inspections during storm events. Make any required repairs.
- Replace damaged sandbags.
- Remove sediment when deposits reach ½ the height of the sandbag barrier.

BMP REMOVAL

- Evaluate site to determine when BMP is no longer needed.
- Remove sediment buildup in front of BMP.
- Remove BMP, recycle and/or re-use if applicable.
- Revegetate area disturbed by BMP removal.
- Material in sandbags may be spread on slopes and stable areas where allowed by permit conditions.

BMP: SC-2

SILT FENCE

DESCRIPTION

A silt fence is a temporary sediment barrier consisting of fabric stretched across and attached to supporting posts and entrenched into the soil. It is generally installed perpendicular to the flow direction to slow or stop water and to allow perimeter filtration, settling of soil particles, and to reduce water velocity. Alternative materials that could be used as a substitute for silt fencing include newer perimeter control technologies such as Ertec® and Durawattle®.

APPLICATIONS

This BMP may be used for perimeter protection (around construction work sites, slide debris stockpiles, etc.). It may be used in combination with other BMPs.

LIMITATIONS

This BMP should not be used:

- where rock or hard surfaces prevent full and uniform anchoring of the barrier.
- directly in streams or water courses.
- around drop inlets or in front of storm drain inlets.
- as a diversion dam.

CONSTRUCTION GUIDELINES

- Place silt fence or alternative perimeter material fencing along contours.
- Stakes or posts should be to the downhill side of the fence.
- The bottom of the fabric must be continuously and securely anchored for its entire length to prevent undermining.
- Increase the elevation at the ends of the BMP installation to prevent “end runs.”

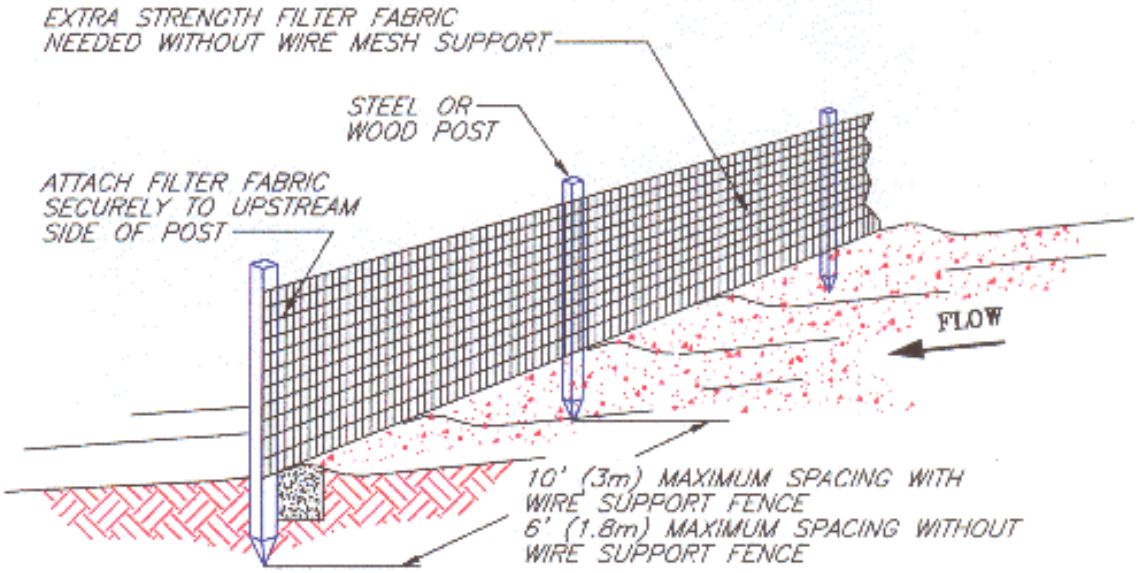
BMP MAINTENANCE

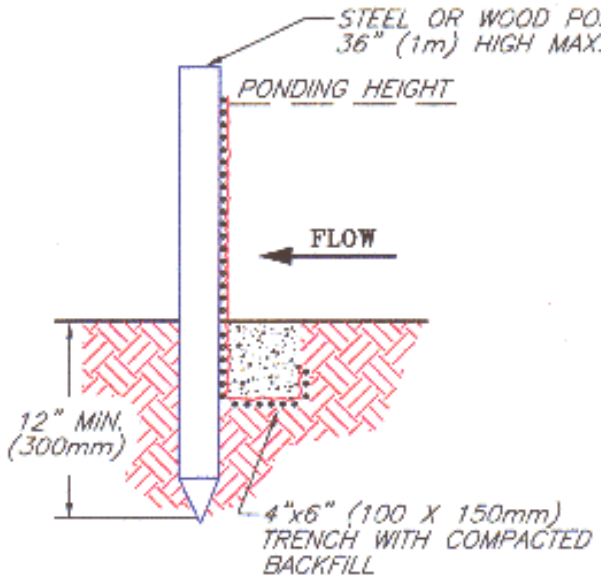
- During construction, inspect daily during the workweek. Schedule additional inspections during storm events. Make any required repairs.
- Replace damaged sections.
- Remove sediment when deposits reach ½ the height of the silt fence.

BMP REMOVAL

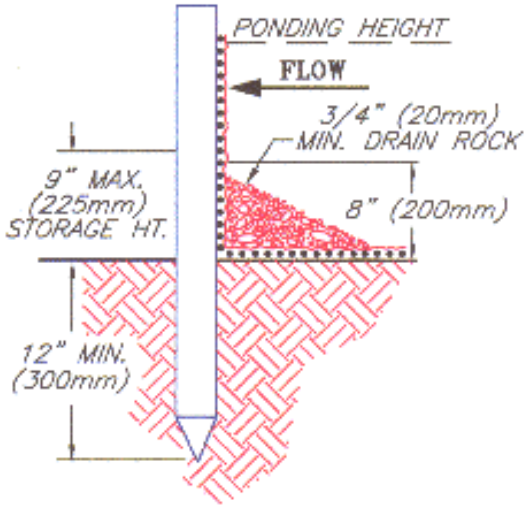
- Evaluate site to determine when BMP is no longer needed.
- Remove sediment buildup in front of BMP.

- Remove BMP, recycle and/or re-use if applicable.
- Revegetate area disturbed by BMP removal.





TRENCH DETAIL



INSTALLATION WITHOUT TRENCHING

NOTES:

1. SILT FENCE SHALL BE PLACED ON SLOPE CONTOURS TO MAXIMIZE PONDING EFFICIENCY.

2. INSPECT AND REPAIR FENCE AFTER EACH STORM EVENT AND REMOVE SEDIMENT WHEN NECESSARY. 9" (225mm) MAXIMUM RECOMMENDED STORAGE HEIGHT.

3. REMOVED SEDIMENT SHALL BE DEPOSITED TO AN AREA THAT WILL NOT CONTRIBUTE SEDIMENT OFF-SITE AND CAN BE PERMANENTLY STABILIZED.

NOT TO SCALE

SILT FENCE

FILE: SILTFENC

© 1994 JOHN McCULLAH

BMP: SC-3

STRAW ROLL, STRAW LOG, COIR LOG

DESCRIPTION

Straw rolls/logs are manufactured from straw wrapped in netting. Coir logs are similar, but are filled with coconut fiber rather than straw. As an alternative, compostable filter socks/berms comprised of natural fibers and other bio-based materials, may be used in lieu of straw rolls/logs or coir logs. The logs or berms are placed and staked in shallow trenches along the contour of newly constructed or disturbed slopes. They can be used to provide perimeter protection, settling, reduction in water velocity/erosive forces and habitat protection.

APPLICATIONS

The BMP may be used for temporary soil stockpile protection; protection of storm drains, gutters, and drainage courses; temporary check dams; bank or slope stabilization; and streambank toe protection. This BMP may be used for perimeter sediment control, and is preferred over silt fencing and straw bales. It may also be used to replace missing sections of earthen berms (example: above new ditch relief culverts).

Straw rolls/logs should be manufactured of rice straw or a sterile (non-seed bearing) straw to prevent the introduction of non-native grasses. Polypropylene or coir netting is preferred over plastic netting. Compostable filter socks/berms should be manufactured of recycled, bio-based, and natural materials.

LIMITATIONS

This BMP should not be used:

- where flow volume or water velocity inhibit its usefulness.

CONSTRUCTION GUIDELINES

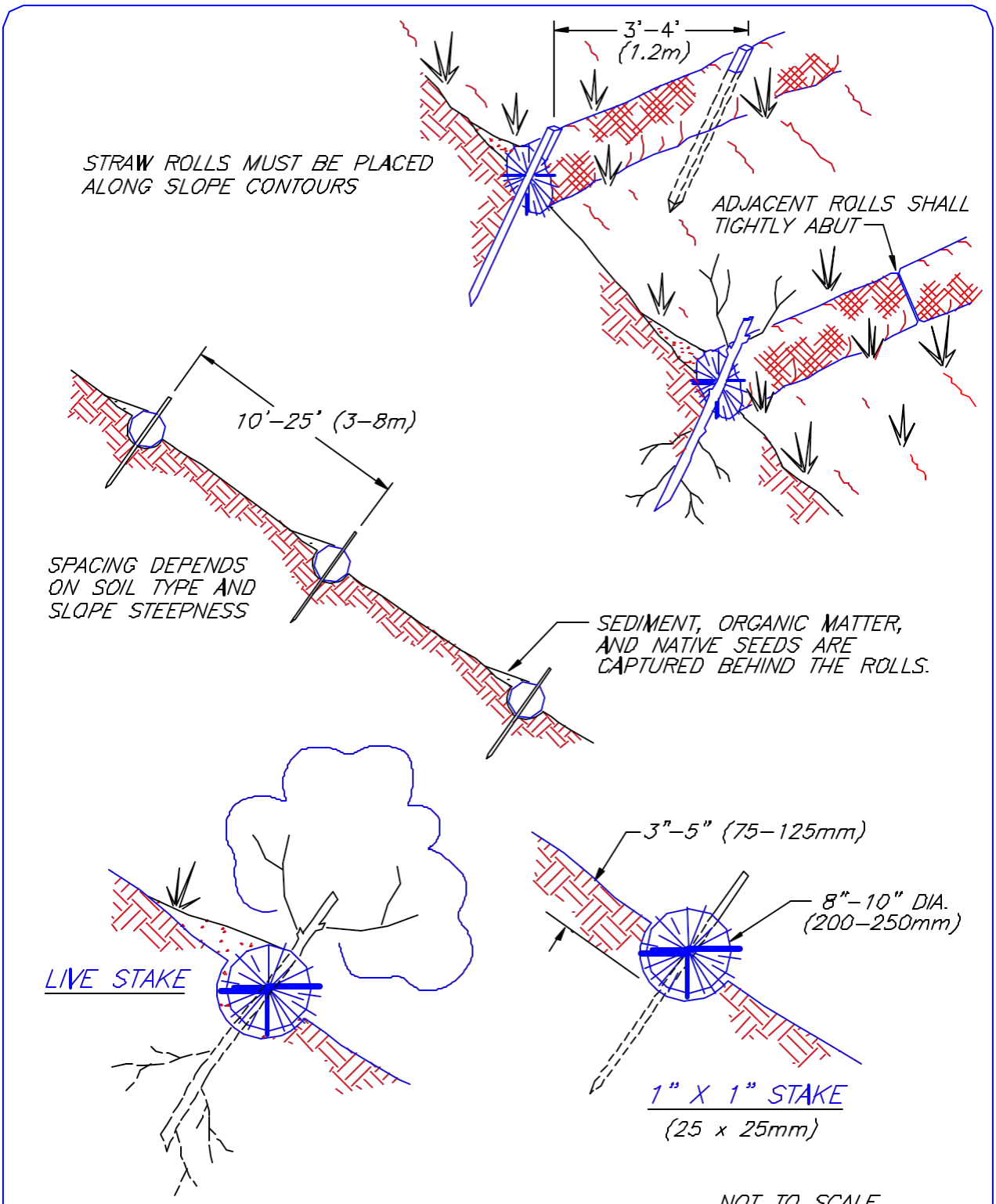
1) Logs are placed in 2- to 3- inch deep trenches and staked along the contours of newly constructed or disturbed slopes.
2) Log spacing depends on soil type and slope steepness.
3) Adjacent logs shall be tightly abutted to prevent water flow and gully formation between logs.
4) Ensure that logs are in contact with the ground in the trenches to prevent water flow under logs.
5) Live staking may be used in conjunction with logs.

BMP MAINTENANCE

- During construction, inspect daily during the work week.
- Schedule additional inspections during storm events.
- Make any required repairs immediately.
- For perimeter control installations (securing spoils, etc.), remove sediment deposits when they reach ½ the height of the log/roll.

BMP REMOVAL

- Remove sediment buildup in front of BMP.
- Revegetation of the site may be necessary.
- Dispose of netting properly. Straw or coir filling may be used as mulch.
- BMP removal may not be necessary.



NOT TO SCALE

NOTE:

1. STRAW ROLL INSTALLATION REQUIRES THE PLACEMENT AND SECURE STAKING OF THE ROLL IN A TRENCH, 3"-5" (75-125mm) DEEP, DUG ON CONTOUR. RUNOFF MUST NOT BE ALLOWED TO RUN UNDER OR AROUND ROLL.

STRAW ROLLS

© 1998 JOHN McCULLAH

FILE: STRWROLL

BMP: SC-4

INLET PROTECTION

DESCRIPTION

Inlet protection may be achieved by using temporary barriers typically constructed from silt fences, gravel filled sandbags, and other proprietary barriers such as geotextile inserts, biofilter bags, or compost socks.

APPLICATIONS

Inlet sediment barriers are intended to prevent and reduce the sediment discharged into storm drains by ponding the runoff and allowing the sediment to settle out. The structures allow for overflow from high runoff events, and some devices allow the ponds to dewater rapidly. Inlet sediment barriers should be used where new construction, maintenance, reconstruction and/or where private development has potential for generating sediment or polluted runoff. Inlet sediment barriers may be comprised of sandbags, straw rolls/logs, or compostable filter socks comprised of natural fibers or other bio-based materials. See BMP-3 (Straw Roll, Straw Log, Coir Log) for additional detail regarding installation guidelines for the straw rolls/logs method. Temporary geotextile storm drain inserts may also be inserted underneath storm drain grates to capture and filter stormwater.

LIMITATIONS

- Do not use this BMP on steep sloping streets.
- Consider this BMP a “backup,” used in addition to controlling potential erosion at the source.
- Drainage area should not exceed 1 acre.
- Do not use straw bales for inlet protection.
- Requires an adequate area for water to pond without encroaching into portions of the roadway subject to traffic.
- Sediment removal may be inadequate to prevent sediment discharges in high flow conditions or if runoff is heavily sediment laden. If high flow conditions are expected, use other onsite sediment trapping techniques in conjunction with inlet protection.

DESIGN AND LAYOUT

The following design and layout considerations are based on guidance provided in the California Stormwater BMP Handbook Construction (CASQA 2015).

1) Identify existing and planned storm drain inlets that have the potential to receive sediment-laden surface runoff. Determine if drain inlet protection is needed and which method to use.

- Determine where runoff that is directed toward the inlet to be protected will pond or be diverted as a result of installing the protection device.
- Determine the extent of potential runoff diversion caused by the storm drain inlet protection device. Runoff ponded by inlet protection devices may flow around the devices and towards the next downstream inlet. In some cases, this is acceptable and in other cases, this could cause erosion or downstream property damage. The possibility of runoff diversions will influence whether or not storm drain inlet protection is suitable; and, if suitable, the type and design of the device.

2) The location and extent of ponding, and the extent of the diversion, can usually be controlled through appropriate placement of the inlet protection device. In some cases, moving the inlet protection device a short distance upstream of the inlet can provide more efficient sediment control, limit ponding to desired areas.
3) Seven types of inlet protection are presented below. However, it is recognized that other effective methods and proprietary devices exist and may be selected.
   - Silt fence: appropriate for drainage basins with less than a 5% slope, sheet flows, and flows under 0.5 cfs.
   - Excavated drop inlet sediment trap: an excavated area around the inlet to trap sediment.
   - Gravel bag barrier: Used to create a small sediment trap upstream of inlets on sloped, paved streets. Appropriate for sheet flow or when concentrated flow may exceed 0.5 cfs, and where overtopping is required to prevent flooding.
   - Block and gravel filter: appropriate for flows greater than 0.5 cfs.
   - Temporary geotextile storm drain inserts: different products provide different features. Refer to manufacturer details for targeted pollutants and additional features.
   - Biofilter bag barrier: Used to create a small retention area upstream of inlets and can be located on pavement or soil. These bags slowly filter runoff allowing sediment to settle out. Appropriate for flows under 0.5 cfs.
   - Compost socks: allow filtered runoff to pass through the compost while retaining sediment and potentially other pollutants. Appropriate for flows under 1.0 cfs.
4) Select the appropriate type of inlet protection and design as referred to or as described below.
5) Provide sufficient area around the inlet for water to pond without flooding structures and property.
6) Grates and spaces around all inlets should be sealed to prevent seepage of sediment-laden water.
7) Excavate sediment sumps (where needed) 1 to 2 feet with 2:1 side slopes around the inlet.

CONSTRUCTION GUIDELINES

The following construction guidelines are based on those provided in the California Stormwater BMP Handbook (CASQA 2015).

Silt Fence (DI Protection Type 1): Do not place fabric underneath the inlet grate since the collected sediment may fall into the drain inlet when the fabric is removed or replaced and water flow through the grate will be blocked resulting in flooding.

1) Excavate a trench approximately 6 inches (in.) wide and 6 in. deep along the line of the silt fence inlet protection device.
2) Place 2 in. by 2 in. wooden stakes around the perimeter of the inlet a maximum of 3 ft apart and drive them at least 18 in. into the ground or 12 in. below the bottom of the trench. The stakes should be at least 48 in.
3) Lay fabric along bottom of trench, up side of trench, and them up stakes. The maximum silt fence height around the inlet should be 24 in.
4) Staple the filter fabric to wooden stakes. Use heavy-duty wire stapes at least 1 in. in length.
5) Backfill the trench with gravel or compacted earth all the way around.

Excavated Drop Inlet Sediment Trap (DI Protection Type 2): Install filter fabric fence in accordance with the guidelines described above for silt fencing. Size excavated trap to provide a minimum storage capacity calculated at the rate 67 yd3/acre of drainage area. See typical Type 2 installation details at the end of this fact sheet.

Gravel Bag (DI Protection Type 3): Flow from a severe storm should not overtop the curb. In areas of high clay and silts, use filter fabric and gravel as additional filter media. Construct gravel bags in accordance with BMP SC-1 (Sandbags and Gravel Bags). Gravel bags should be used due to their high permeability. See typical Type 3 installation details at the end of this fact sheet.

1) Construct on gently sloping street.
2) Leave room upstream of barrier for water to pond and sediment to settle.
3) Place several layers of gravel bags – overlapping the bags and packing them tightly together.
4) Leave gap of one bag on the top row to serve as a spillway. Flow from a severe storm (e.g., 10 year storm) should not overtop the curb.

Block and Gravel Filter (DI Protection Type 4): Block and gravel filters are suitable for curb inlets commonly used in residential, commercial, and industrial construction. See typical Type 4 installation details at the end of this fact sheet.

1) Place hardware cloth or comparable wire mesh with 0.5 in. openings over the drop inlet so that the wire extends a minimum of 1 ft beyond each side of the inlet structure. If more than one strip is necessary, overlap the strips. Place woven geotextile over the wire mesh.
2) Place concrete blocks lengthwise on their sides in a single row around the perimeter of the inlet, so that the open ends face outward, not upward. The ends of adjacent blocks should abut. The height of the barrier can be varied, depending on design needs, by stacking combinations of blocks that are 4 in., 8 in., and 12 in. wide. The row of blocks should be at least 12 in. but no greater than 24 in. high.

3) Place wire mesh over the outside vertical face (open end) of the concrete blocks to prevent stone from being washed through the blocks. Use hardware cloth or comparable wire mesh with 0.5 in. opening.
4) Pile washed stone against the wire mesh to the top of the blocks. Use 0.75 to 3 in.

Temporary Geotextile Insert (DI Protection Type 5): Many types of temporary inserts are available. Most inserts fit underneath the grate of a drop inlet or inside of a curb inlet and are fastened to the outside of the grate or curb. These inserts are removable and many can be cleaned and reused. Installation of these inserts differs between manufacturers. Please refer to manufacturer instruction for installation of proprietary devices.

Biofilter bags (DI Protection Type 6): Biofilter bags may be used as a substitute for gravel bags in low-flow situations. These consist of a plastic mesh bag filled with recycled wood product waste and are generally an effective short-term solution for preventing runoff from flowing into inlets.

1) Construct in a gently sloping area.
2) Biofilter bags should be placed around inlets to intercept runoff flows.
3) All bag joints should overlap by 6 in.
4) Leave room upstream for water to pond and for sediment to settle out.
5) Stake bags to the ground as described in the following detail. Stakes may be omitted if bags are placed on a paved surface.

Compost Socks (DI Protection Type 7): A compost sock can be assembled on site by filling a mesh sock (e.g., with a pneumatic blower). Compost socks do not require special trenching compared to other sediment control methods (e.g., silt fence).

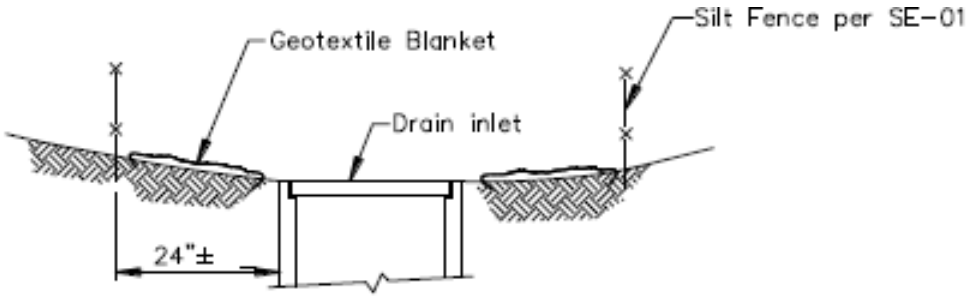
BMP MAINTENANCE

- Inspect and clean barrier during and after each significant storm and remove sediment from behind sandbag structure after every storm.
- Silt fences: If the fabric becomes clogged, torn or degrades, it should be replaced. Make sure the stakes are securely driven in the ground and are in good shape (i.e., not bent, cracked, or splintered, and are reasonably perpendicular to the ground). Replace damaged stakes. At a minimum, remove the sediment behind the fabric fence when accumulation reaches one-third the height of the fence or barrier height.
- Gravel Filters. If the gravel becomes clogged with sediment, it should be carefully removed from the inlet and either cleaned or replaced. Since cleaning gravel at a construction site may be difficult, consider using the sediment-laden stone as fill material and put fresh stone around the inlet. Inspect bags for holes, gashes, and snags, and replace bags as needed. Check gravel bags for proper arrangement and displacement.

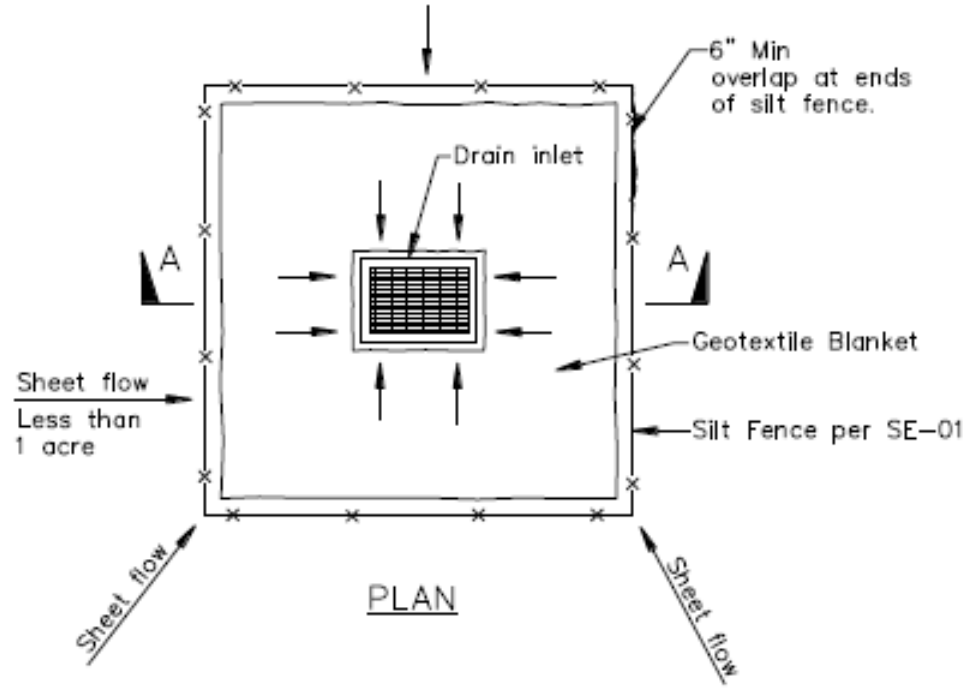
- Any sediment and gravel shall be immediately removed from the traveled way of roads.
- The removed sediment shall be placed where it cannot enter a storm drain, stream, or be transported off site.
- If the gravel becomes clogged with sediment, it must be carefully removed from the inlet and either cleared or replaced.
- Geotextile Insert Devices: Inspect and maintain temporary geotextile insert devices according to manufacturer's specifications.

BMP REMOVAL

- Remove storm drain inlet protection once the drain area is stabilized. Clean and regrade area around the inlet and clean the inside of the storm drain inlet, as it should be free of sediment and debris at the time of final inspection.



SECTION A–A

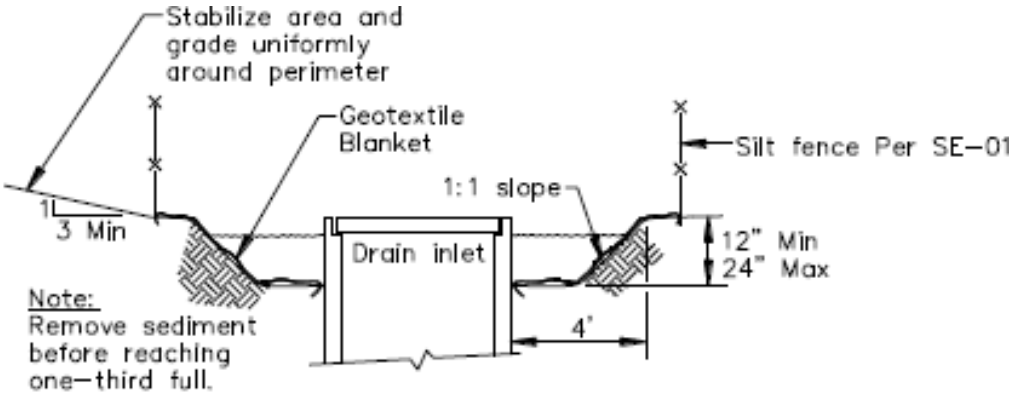


PLAN

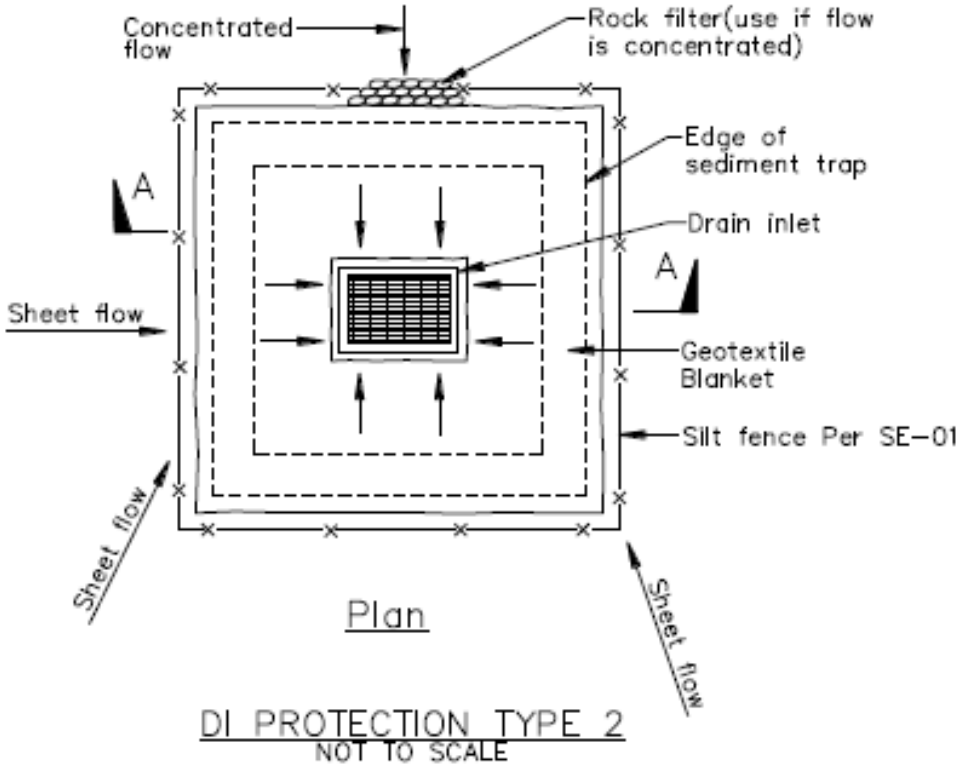
DI PROTECTION TYPE 1
NOT TO SCALE

NOTES:

1. For use in areas where grading has been completed and final soil stabilization and seeding are pending.
2. Not applicable in paved areas.
3. Not applicable with concentrated flows.



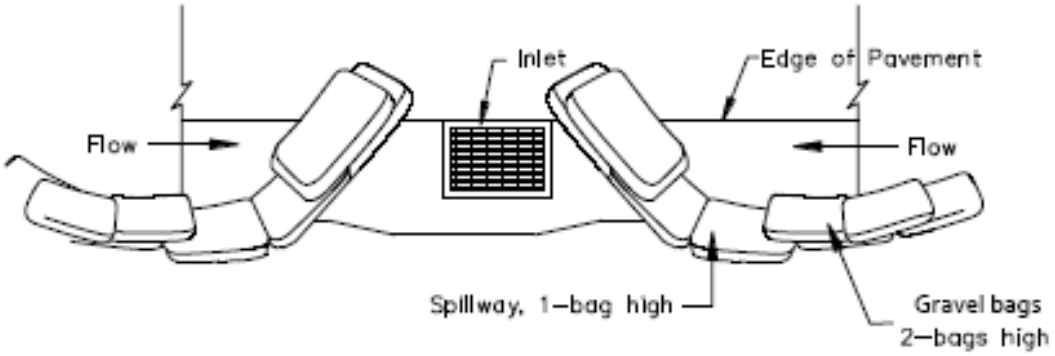
Section A–A



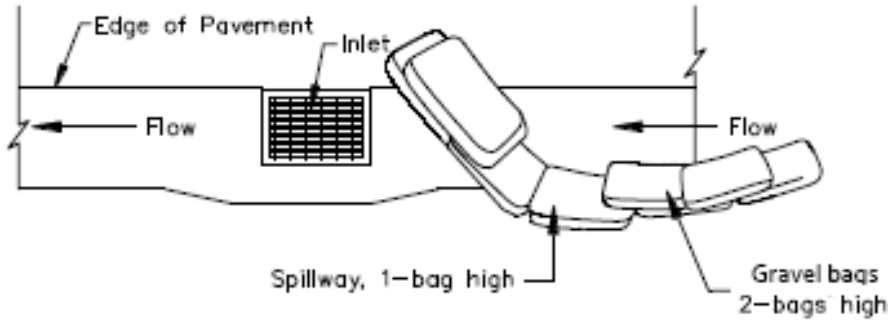
Plan

DI PROTECTION TYPE 2
NOT TO SCALE

Notes
1. For use in cleared and grubbed and in graded areas.
2. Shape basin so that longest inflow area faces longest length of trap.
3. For concentrated flows, shape basin in 2:1 ratio with length oriented towards direction of flow.



TYPICAL PROTECTION FOR INLET ON SUMP



TYPICAL PROTECTION FOR INLET ON GRADE

NOTES:

1. Intended for short-term use.
2. Use to inhibit non-storm water flow.
3. Allow for proper maintenance and cleanup.
4. Bags must be removed after adjacent operation is completed
5. Not applicable in areas with high silts and clays without filter fabric.
6. Protection can be effective even if it is not immediately adjacent to the inlet provided that the inlet is protected from potential sources of pollution.

DI PROTECTION TYPE 3
NOT TO SCALE

BMP: SC-6

DIVERSION BERM

DESCRIPTION

A diversion berm is a temporary ridge of compacted soil or aggregate base material, sandbags or continuous bag berm constructed at the top or base of a disturbed slope. A diversion berm may also consist of a ridge of asphalt concrete or “cutback” constructed at the top of a disturbed slope. The purpose of the BMP is direct stormwater runoff away from an unstable slope.

APPLICATIONS

This BMP may be used wherever stormwater runoff must be temporarily diverted away from a disturbed slope and toward a sediment containment facility or stable runoff.

LIMITATIONS

This is not a routine maintenance BMP. This BMP should not be used:

- in fast flowing water.
- as a replacement for failing roadway shoulders.
- as slide debris storage within 150’ of any water body.

Asphalt berms shall not be used:

- to concentrate runoff onto unstable, eroded areas.
- near edges of slides or streambanks where cutback berms could slip into a stream.

CONSTRUCTION GUIDELINES

- Berm material should be adequately compacted to prevent failure.
- Temporary seeding and mulch shall be applied to all surfaces of a soil diversion berm according to the “Timing of Work” BMP.
- For asphalt berms, construct the berm to the minimum height and width needed to divert runoff without adding unnecessary weight.
- Asphalt berms may be striped or marked for traffic safety.
- Asphalt berms may be used to anchor temporary plastic sheeting.

BMP MAINTENANCE

- Periodic inspection should be conducted, and berms repaired as necessary.

BMP REMOVAL

- Evaluate site to determine BMP is no longer needed (the area has stabilized – potential of sediment laden water exiting the area has passed).
- Remove sediment buildup.
- Remove BMP – recycle and/or re-use if applicable.
- Revegetate area disturbed by BMP removal if applicable.
- Asphalt berm removal may not be necessary, or may be conducted during permanent slope or streambank repair activities.
- Recycle or reuse asphalt berm material.

BMP: DW-1

COFFERDAM OR CLEAN WATER BYPASS INSTALLATION METHODS FOR CHANNEL DEWATERING

DESCRIPTION

When work in flowing streams is unavoidable, streamflow shall be diverted around work areas by either installing cofferdams and/or clean water bypass systems.

A cofferdam is a temporary structure built into a waterway to enclose a construction area and reduce sediment pollution from construction work in or adjacent to water. Cofferdams may be made of rock, gravel bags, wood or aqua barriers. They may also be composed of inflatable rubber material.

A clean water bypass enables operators or maintenance workers to transport surface or subsurface flows around a construction area without adding significant amounts of turbidity or sediment. Clean water bypasses are typically used for short-term diversion of small amounts of water over short distances to enable dewatering of minor construction or repair sites. Depending on site conditions of the work area, clean water bypasses may be either gravity driven or require use of a pump to divert water around a construction area.

APPLICATIONS AND DESIGN CONSIDERATIONS

Clean water bypasses may be used to divert low flow volumes away from culvert replacements/installations, bridge and headwall repairs, bank stabilization projects, or other in-stream maintenance activities. Clean water bypasses may not be used in active streams or tributaries inhabited by anadromous fishes (i.e., Gazos, Pescadero, Butano, Alpine, etc.) at migration times. Cofferdams may be used on similar projects listed above and may be used in combination with clean water bypasses and/or pumps.

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. Dewatering will be conducted per the detailed concept included below or per the site-specific dewatering plan reviewed by the appropriate regulatory agencies. The area to be dewatered shall encompass the minimum area necessary to avoid impacts to waters of the U.S./state in order to perform the maintenance activity. The period of dewatering should 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.

LIMITATIONS

Do not use this BMP:

- in deep water unless designed or reviewed by the Project Engineer, or
- to completely dam stream flows.

CONSTRUCTION GUIDELINES

1) When used in watercourses or streams, cofferdams and clean water bypasses must be used in accordance with permit requirements. Materials for cofferdams should be selected based on ease of maintenance and complete removal following construction activities.
2) Where feasible and appropriate, dewatering shall occur via gravity driven systems.
3) Cofferdams shall be installed both upstream and downstream not more than 100 feet from the extent of the work areas.
4) Instream cofferdams shall only be built from materials such as clean gravel or rubber bladders which cause little or no siltation or turbidity. No earthen fill shall be used to construct the cofferdam. Plastic sheeting (e.g., visqueen) shall be placed over bags filled with clean gravel to minimize water seepage into the maintenance areas. The plastic sheets shall be firmly anchored to the streambed to minimize water seepage. If necessary, the footing of the cofferdam shall be keyed into the channel bed at an appropriate depth to capture the majority of subsurface flow needed to dewater the streambed.
5) Stream flows shall be allowed to gravity flow around or through the work site using temporary bypass pipes. Bypass pipe diameter shall be sized to convey, at a minimum, the 2-year, 24-hour design storm, or anticipated high-flow conditions if applicable. This is shown as ‘Diversion A (through work area)’ on the Dewatering Plan – Sheet 1.
6) When gravity-based dewatering is not feasible, stream flow shall be pumped around the work site. This is shown as ‘Diversion B (around work area)’ on the Dewatering Plan – Sheet 1.
7) All dewatering/diversion methods shall be installed such that natural flow is maintained upstream and downstream of the Project area.
8) Any temporary dams or diversions shall be installed such that the diversion does not cause sedimentation, siltation, or erosion upstream or downstream of the project area.

IMPLEMENTATION PROCEDURES

1) A qualified biologist shall 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 shall be surveyed by a qualified biologist. If sensitive species are observed: a

relocation effort will be led by a qualified biologist, the stream channel will be blocked with fish mesh above and below the work area (mesh will be no greater than 3.1 mm), and pumps will be screened. During cofferdam installation, the downstream cofferdam shall be installed first. Most of the upstream cofferdam, with the exception of an opening large enough for fish passage, shall then be constructed. Then, qualified biologists shall 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 shall 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 work area to support fish, but sufficient water is present downstream from the work area, then the process shall 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 work area, the biologist shall capture fish within the project area, using seines, dip nets, or electrofishing, and relocate the fish to suitable habitat within another reach of a particular creek (the relocation site to be determined in consultation with NMFS, USFWS, and/or CDFW as applicable).

2) Diverted water shall be protected from maintenance activity-related pollutants, such as soils or equipment lubricants or fuels.
3) If a pump is required to route water around the work area, the pump inlets shall be outfitted with appropriate screens that meet CDFW and NMFS criteria to prevent entrainment of fish and other sensitive aquatic organisms. Ensure that BMP 9 (Vehicle Maintenance & Parking) and BMP 10 (Equipment Maintenance & Fueling) are also implemented to ensure that fuels are properly contained near waterways and proper containment is provided during vehicle maintenance and cleaning activities. A back-up plan should also be developed and implemented in the event that the pump fails.
4) For full channel dewatering, pumped water shall be pre-filtered with a gravel pack and/or perforated pipe around sumps for subsurface flows and a silt fence around pumps for surface flow, or as otherwise directed by the Project Engineer, 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 shall be implemented such as a larger settling basin or additional filtration. If increases in turbidity persist, the County's Project Manager shall be alerted, and turbidity reduction measurements implemented immediately.
5) If necessary, discharged water shall pass over some form of energy dissipation to prevent downstream erosion and increased turbidity. Energy dissipation and turbidity reduction methods may include the following: settling basin, settling tank, upland vegetated area, dewatering silt bags, gravel bags, or other energy dissipation device. Sediment control, such as natural fiber straw wattles, will be placed downstream during the installation and removal of BMPs to ensure there is not a significant increase in sediment.

BMP MAINTENANCE

- Inspect during the construction of the system to ensure there is not an increase in turbidity. Should turbidity increase during cofferdam installation, a turbidity curtain or some other method will be installed downstream of the lower cofferdam. An inspection and assessment action plan will be utilized:
    - Ensure that bypass pump(s) can handle incoming flows, especially after precipitation.
    - Inspect flow barriers (dams, berms, etc.) at the start and end of each work day and if excess water is observed in work areas that are supposed to be dry. Inspect for leakage and repair.
    - Inspect diversion channels for signs of erosion, and repair or replace lining as necessary.
    - Inspect pumped and piped diversions to ensure flow is adequately diverted. Inspect for leakage and repair as necessary.
    - Inspect the diversion path for erosion and repair any damages with rock, gravel, or other appropriate methods.
    - Inspect the diversion discharge point for erosion and repair as necessary.
    - Inspect dewatering device(s) and ensure that discharge is not sediment laden. Check for buildup of sediment and debris and remove as needed.

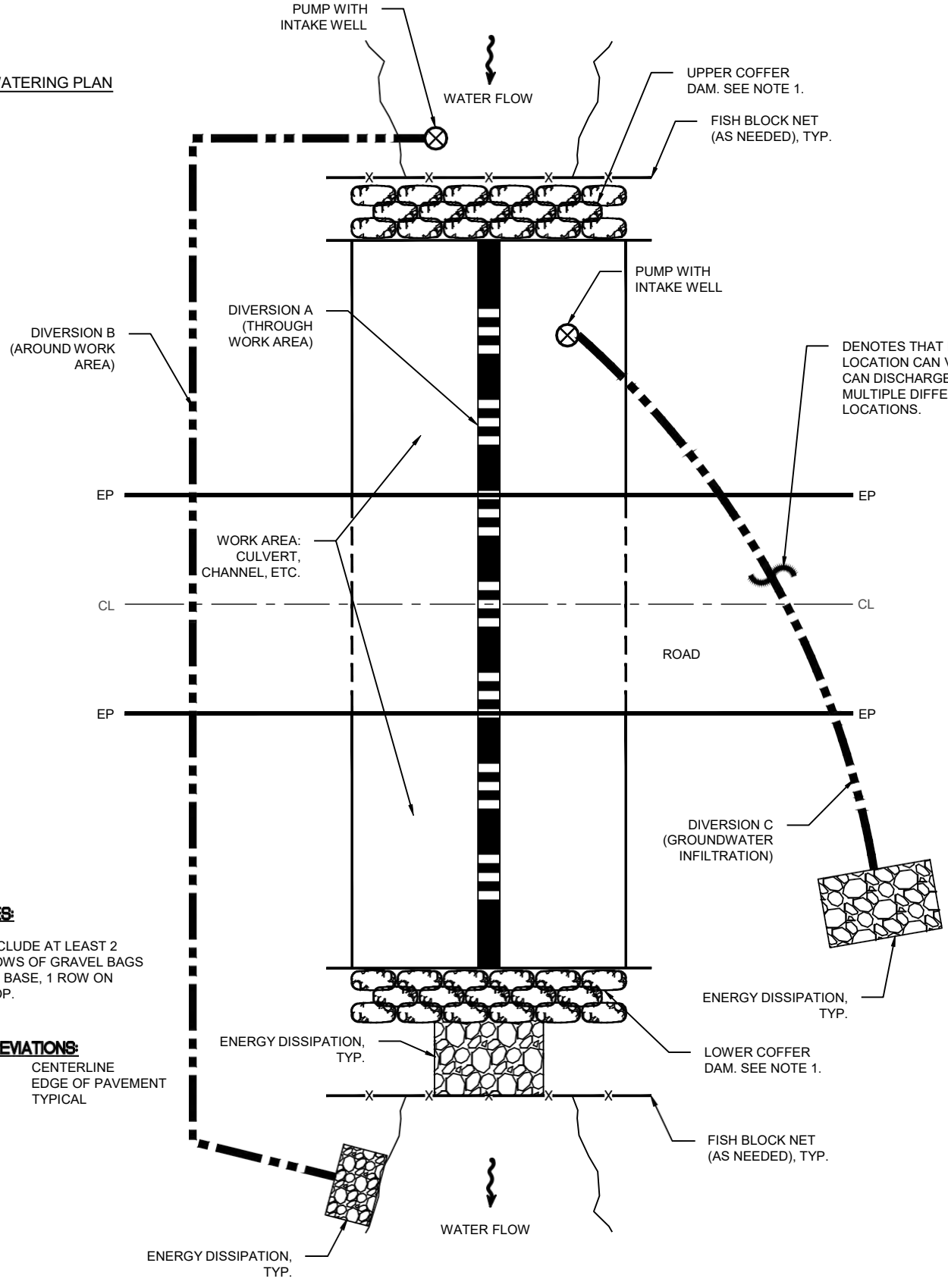
- During construction, inspect daily during the work week to observe the condition of the system. If the capacity of the system needs to be increased, consult with the Project Engineer for appropriate re-sizing.
- Schedule additional inspections during storm events. If an increase in turbidity is observed, work shall halt immediately.
- Immediately repair any gaps, holes or scour.
- Block nets shall be maintained throughout construction. Maintenance includes periodic removal of accumulated debris, as necessary to ensure function.

BMP REMOVAL

- When in-stream maintenance is completed, the flow diversion structure shall be removed as soon as possible. Impounded water shall be released at a reduced velocity to minimize erosion, turbidity, or harm to downstream habitat. Cofferdams shall 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 shall be directed into the low-flow channel within the work site to minimize downstream water quality impacts.
- The area disturbed by flow bypass mechanisms shall be restored at the completion of the project. This may include, but is not limited to, recontouring the area and planting of riparian vegetation.
- If the County is unable to complete work and remove the system by the stop-work deadline, coordination with the agencies will take place during the permit extension request.

- A contingency plan describing what the County will do should a flow event occur that exceeds the capacity of the system shall be developed. The plan should address at least the following:
    - Descriptions of the measures the County will take (e.g., increase the capacity of the system, demobilize and stabilize the construction site and remove the system, etc.);
    - The length of time it will take the County to enact the above measures.

DEWATERING PLAN



NOTES:

1. INCLUDE AT LEAST 2 ROWS OF GRAVEL BAGS AT BASE, 1 ROW ON TOP.

ABBREVIATIONS:

CL	CENTERLINE
EP	EDGE OF PAVEMENT
TYP	TYPICAL

FILENAME: F:\USERS\DESIGN\C3D\RMP EXHIBITS\DWG\RMP EXHIBITS.DWG

DESIGNED BY: JC	DEWATERING PLAN - SHEET 1	SCALE: NONE
CHECKED BY: AL/JC	COUNTY OF SAN MATEO	DATE: 04-14-2023
DRAWN BY: ADG	ROUTINE MAINTENANCE PROGRAM	FILE NO: NONE

ANN M. STILLMAN, DIRECTOR OF PUBLIC WORKS
COUNTY

555 COUNTY CENTER, 5TH FLOOR
REDWOOD CITY, CALIFORNIA 1665



Examples of ground stone tools.

County of San Mateo BMPs (cont.)

- Retaining a qualified cultural resources specialist to conduct a review and inventory of locations that involve soil disturbance in natural channels or native soils identified as Highly to Moderately Sensitive for cultural deposits.
- The County may require an archaeologist (and a Native American representative) to be present on-site during ground disturbing activities within areas identified as Highly Sensitive.
- The County will conduct annual cultural resources training sessions prior to commencing ground disturbing activities.

Inadvertent Discovery Procedures

- Stop work if you see something that could be archaeological, such as artifacts or dark soil changes with shellfish remains during excavation, or what might be human remains--or if an archaeological or tribal monitor is present and they ask you to stop work to inspect something.
- Redirect work to areas outside a radius of at least 50-feet from the find.
- Contact the Project Construction Supervisor, RMP Department of Public Works Lead, or RMP Parks Department Lead.
- Treat the archaeological remains with respect.

Inadvertent Discovery Procedures (cont.)

- Begin work again in the area only after clearance has been provided by an archaeologist or Native American representative, as appropriate.

Why Protect Cultural Resources?

Protection of cultural resources is important not only because it is required by law, but also because it is important to our community. Cultural resources are deeply beneficial to people by providing us a sense of continuity, identity, history, and ancestry. By protecting cultural resources, we respect our cultural heritage and preserve our history for future generations. Cultural resources are non-renewable; once they are destroyed, they are lost forever.

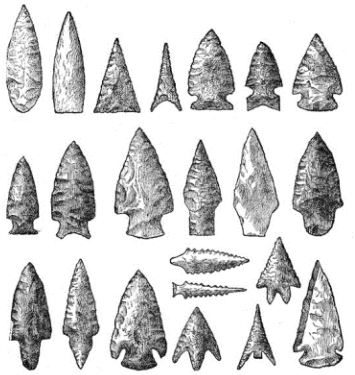
Contact Us

- **RMP Department of Public Works**:
  Julie Casagrande
  jcasagrande@smcgov.org
  (650) 599-1457
- **RMP Parks Department**:
  Evan Cole
  ecole@smcgov.org
  (650) 599-1375
- **Project Construction Supervisor**

COUNTY OF SAN MATEO CALIFORNIA

Cultural Resources

Guide to Identification and Protection Protocols during the Routine Maintenance Program Activities



Examples of prehistoric lithic artifacts.

What is a Cultural Resource?

At the most basic level, cultural resources are anything made by human beings or are associated with the beliefs or activities of human beings. Legislated definitions of significant cultural resources include:

National Historic Preservation Act (NHPA): Any prehistoric or historic district, site, building, structure, or object, including artifacts, records, and remains associated with the resources. The term also includes properties of traditional and cultural importance to a Native American tribe.

California Environmental Quality Act (CEQA): Any object, building, structure site, area place, record, manuscript, or tribal cultural resource significant in the architectural, engineering, scientific, economic, agricultural, educational, social, political, military, or cultural annals of California.

Native American Cultural Resources (most commonly prehistoric material, circa ~12K Years Ago-1770s)

(may include but not limited to):

- Flaked stone tools (arrowheads, knives, etc.).
- Waste flakes that resulted from the manufacture of flaked stone tools.
- Ground stone tools such as mortars and pestles. Layers (strata) of discolored earth resulting from fires.
- Dietary debris (such as animal bone, shellfish, or plant remains).
- Human remains.
- Structural remains, compact soils, wooden beams, poles, or fire hearths.

Euro-American Cultural Resources (historic period, circa ~1770s-1970s)

(may include but are not limited to):

- Glass (from bottles, vessels, windows, etc.). Ceramic (from dinnerware, vessels, etc.).
- Metal (nails, drink/food cans, tobacco tins, industrial parts, etc.).
- Building materials (brick, shingles, nails, etc.). Building remains (foundations, wall, etc.).
- Old wooden posts, pilings, or planks. Trash deposits (garbage heaps or dumps).
- Built Environment resources, such as roads, bridges, structures, and homesteads.



Examples of historic-era artifacts.

CULTURAL RESOURCE REGULATIONS

Federal, state and local regulations exist to protect cultural resources. Mistreatment of cultural resources can result in a misdemeanor or felony offense. Some relevant cultural resource regulations include:

- The NHPA, which requires that Federal agencies consider the effects of their actions on cultural resources.
- CEQA, which requires that effects to cultural resources be considered in the planning process for discretionary projects.

County of San Mateo Internal Best Management Practices (BMPs)

The Routine Maintenance Program (RMP) has Cultural Resource BMPs that are implemented depending on the nature of the maintenance project and the location of the project. Prior to beginning work at a given location, a sensitivity rating will be assigned to each project that may require steps such as:

APPENDIX C

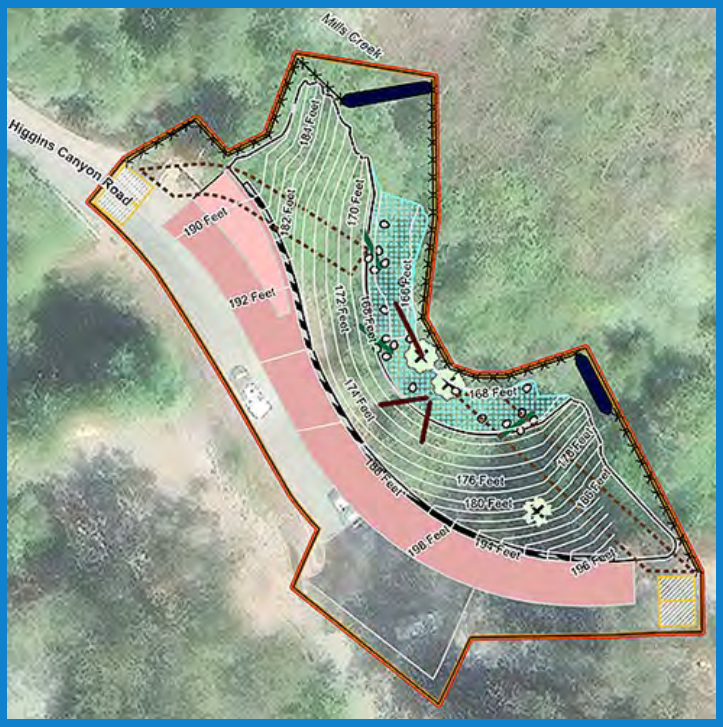
Biological Resources Technical Studies

APPENDIX C1

Biological Resources Evaluation

Biological Resources Evaluation for the Slip-Out Repair and Bank Stabilization Near 1780 Higgins Canyon Road Project, San Mateo County, California

DECEMBER 2024



PREPARED FOR

County of San Mateo
Department of Public Works

PREPARED BY

SWCA Environmental Consultants

BIOLOGICAL RESOURCES EVALUATION FOR THE SLIP-OUT REPAIR AND BANK STABILIZATION NEAR 1780 HIGGINS CANYON ROAD PROJECT, SAN MATEO COUNTY, CALIFORNIA

Prepared for

County of San Mateo
Department of Public Works
555 County Center, 5th Floor
Redwood City, California 94063-1665
Attn: Julie Casagrande, Senior Natural Resource Specialist

Prepared by

SWCA Environmental Consultants
60 Stone Pine Road, Suite 201
Half Moon Bay, California 94019
(650) 440-4160
www.swca.com

SWCA Project No. 86468

December 2024

EXECUTIVE SUMMARY

The County of San Mateo Department of Public Works (County) is proposing the Slip-Out Repair and Bank Stabilization Near 1780 Higgins Canyon Road Project (project), which consists of road repairs, bank stabilization, and habitat enhancement activities along the southwestern bank of Mills Creek adjacent to Higgins Canyon Road in San Mateo County, California. The proposed project activities include approximately 185 linear feet of bank stabilization with a total project envelope of approximately 20,040 square feet. The project area or envelope is larger than the planned disturbance area. Within that envelope, the project footprint includes approximately 15,078 square feet of planned disturbance.

The County retained SWCA Environmental Consultants (SWCA) to provide environmental support services, including conducting a biological resources survey and preparing a Biological Resources Evaluation (BRE), in support of the project. The purpose of this BRE is to document the biological resources within the project biological study area (BSA), which consists of the project area and an adjacent buffer (defined as being 100 feet from the outside edge of the project area). SWCA conducted a literature review of existing sources of information regarding occurrences of special-status species and sensitive resources near the BSA. Field surveys were conducted within the BSA in May 2024 to document biological resources, including special-status plant and wildlife species and potentially jurisdictional wetlands and other waters.

Based on the results of the literature review and field survey, the BSA contains or has the potential to support the following:

- One sensitive natural community: Red Alder Forest (see Section 5.1.1.1)
- Four federally-listed/proposed listed or state-listed wildlife species: California red-legged frog (*Rana draytonii*), San Francisco garter snake (*Thamnophis sirtalis tetrataenia*), northwestern pond turtle (*Actinemys marmorata*), Central California Coast steelhead (*Oncorhynchus mykiss irideus*) Distinct Population Segment, and Central California Coast coho salmon (*Oncorhynchus kisutch)* Evolutionarily Significant Unit (see Sections 5.2.2.1–5.2.2.5).
- Two California Department of Fish and Wildlife (CDFW) Species of Special Concern: California giant salamander (*Dicamptodon ensatus*) and San Francisco dusky-footed woodrat (*Neotoma fuscipes annectens*) (see Sections 5.2.2.6–5.2.2.7)
- Suitable habitat for several nesting migratory birds covered under the Migratory Bird Treaty Act (see Section 5.2.2.9)
- One potentially jurisdictional perennial channel – Mills Creek (see Section 5.5)

No special-status plant or wildlife species were observed during the field survey.

Construction activities, including road repairs, bank stabilization, and habitat enhancement, may directly impact Mills Creek. Such impacts will likely require the County to obtain a Clean Water Act (CWA) Section 404 Permit from the U.S. Army Corps of Engineers (USACE), a CWA Section 401 Water Quality Certification from the Regional Water Quality Control Board, and a California Fish and Game Code Section 1602 Lake or Streambed Alteration Agreement from the CDFW.

It is anticipated that with the implementation of the recommended avoidance and minimization measures described in Section 6, project activities will not result in substantial impacts to any special-status species or sensitive habitats. However, due to the potential impacts to federally listed species, it is anticipated the USACE will need to conduct consultation under Section 7 of the Endangered Species Act with both the

U.S. Fish and Wildlife Service and National Oceanic and Atmospheric Administration National Marine Fisheries Service.

CONTENTS

Executive Summary ..... **i**

1 Introduction **1**

1.1 Project Location 1

1.2 Project Overview 1

2 Regulatory Overview **5**

2.1 Federal 5

2.1.1 Bald and Golden Eagle Protection Act 5

2.1.2 Clean Water Act 5

2.1.3 Federal Endangered Species Act 5

2.1.4 Migratory Bird Treaty Act 6

2.1 State 6

2.1.1 California Endangered Species Act 6

2.1.2 Native Plant Protection Act 6

2.1.3 California Fish and Game Code 6

2.1.4 Porter-Cologne Water Quality Control Act 7

2.2 Local 8

2.2.1 California Coastal Act and County of San Mateo Local Coastal Program 8

3 Methods **8**

3.1 Definitions 8

3.1.1 Special-Status Plant Species 8

3.1.2 Special-Status Wildlife Species 9

3.1.3 Species Potentials to Occur 9

3.2 Background Research 9

3.3 Field Surveys 11

3.3.1 Natural Community and Other Land Cover Mapping 11

3.3.2 Aquatic Resources Delineations 11

3.3.3 Special-Status Species Assessments 12

4 Environmental Setting **12**

4.1 Climate and Precipitation 13

4.3 Hydrology 13

4.4 Soils 14

5 Results **14**

5.1 Natural Communities and Other Land Covers 14

5.1.1 Natural Communities 17

5.1.2 Other Land Cover Types 18

5.2 Special-Status Species 19

5.2.1 Special-Status Plants 19

5.2.2 Special-Status Wildlife 19

5.3 Critical Habitat 23

5.4 Essential Fish Habitat 24

5.5 Jurisdictional Waters 24

5.6 Sensitive Natural Communities 24

5.7 Special-Status Species 25

5.7.1 Potential Impacts to Special-Status Plants 25

5.7.2 Potential Impacts to Special-Status Wildlife 27
5.8 Wildlife Habitat and Movement Corridors 31
5.9 Potential Impacts to Critical Habitat and Essential Fish Habitat 32
5.10 Potential Impacts to Jurisdictional Wetlands/Waters 32
6 Recommendations/Avoidance and Minimization Measures 33
7 Literature Cited 35

Appendices

Appendix A. Representative Photographs
Appendix B. Project Design Plans
Appendix C. Special-Status Species with Potential to Occur in the BSA
Appendix D. CNDDB, CNPS, and IPaC Database Queries
Appendix E. Species Observed in the BSA
Appendix F. County of San Mateo Routine Maintenance Program Best Management Practices

Figures

Figure 1. Project area location and regional vicinity. 2
Figure 2. Project area and surrounding parcels. 3
Figure 3. NWI, NHD, and NRCS soils map. 15
Figure 4. Natural communities and other land cover in the BSA. 16
Figure 5. Delineation results map within the BSA. 26

Tables

Table 1. Soil Types Present in the BSA 14
Table 2. Natural Communities and Other Land Covers Present in the BSA 17
Table 3. Preliminary Jurisdictional Waters in the Survey Area and Impact Area 34

1 INTRODUCTION

This Biological Resources Evaluation (BRE) has been prepared by SWCA Environmental Consultants (SWCA) at the request of the County of San Mateo Department of Public Works (County). The purpose of this report is to identify sensitive biological resources that may be impacted by the Slip-Out Repair and Bank Stabilization Near 1780 Higgins Canyon Road Project (project). This BRE describes the regulatory setting for the project, the methods and results of the background research and reconnaissance-level field survey, a discussion of the possible permitting implications for the project, and recommended measures to avoid and minimize project impacts. SWCA anticipates that this document will be used in support of future regulatory permitting and California Environmental Quality Act (CEQA) compliance.

1.1 Project Location

The project is located immediately upstream of the Higgins Canyon Road bridge, where Higgins Canyon Road crosses over Mills Creek in unincorporated San Mateo County, south of the city of Half Moon Bay, California. Higgins Canyon Road begins at the south end of the city of Half Moon Bay, approximately 25 miles south of San Francisco, and extends southeast from California State Route (SR) 1, ending at its junction with Purisima Creek Road. The slip-out is approximately 1.5 miles east of SR 1. Figure 1 shows the project area location and regional vicinity.

Higgins Canyon Road is a narrow two-lane paved roadway that is approximately 18 to 21 feet in width and trends northwest to southeast. The slope requiring repair sits on a southwestern creek bank along Mills Creek and is moderately vegetated with small to large trees and shrubs (see photographs in Appendix A). The portion of Mills Creek within the project area is slightly horseshoe-shaped and flows downstream from the northeast, bending to the northwest at the project area; this is assumed to be contributing to the erosion at the top of the slope. The road elevation ranges between 200 and 202 feet above mean sea level (amsl). The creek bottom is approximately 174 feet amsl.

Surrounding land uses include rural residential, Burleigh H. Murray State Park, and Lazy H Ranch. The project area includes portions of Assessor's Parcel Numbers (APNs) 066-100-100 (1780 Higgins Canyon Road), 064-370-120 and 064-370-160 (1601 Higgins Canyon Road [Burleigh H. Murray Ranch State Park]), and 064-370-300 (305 Higgins Canyon Road) (Figure 2).

1.2 Project Overview

The proposed project consists of road repairs and bank stabilization activities along the southwestern bank of Mills Creek adjacent to the northeastern side of Higgins Canyon Road in San Mateo County. The project components include: 1) an approximately 192-linear-foot-long soldier pile retaining wall, 2) an approximately 185-foot biostabilization-based bank repair (soil lifts and vegetated boulder revetments), 3) approximately 110 linear feet of engineered creek bed to restore the channel to its pre-erosional flow path, and 4) reconstruction of approximately 180 linear feet of failed roadway within the existing footprint to restore the travel lane and shoulder area, including the addition of asphalt concrete dike, drainage swales, and Midwest guardrails.

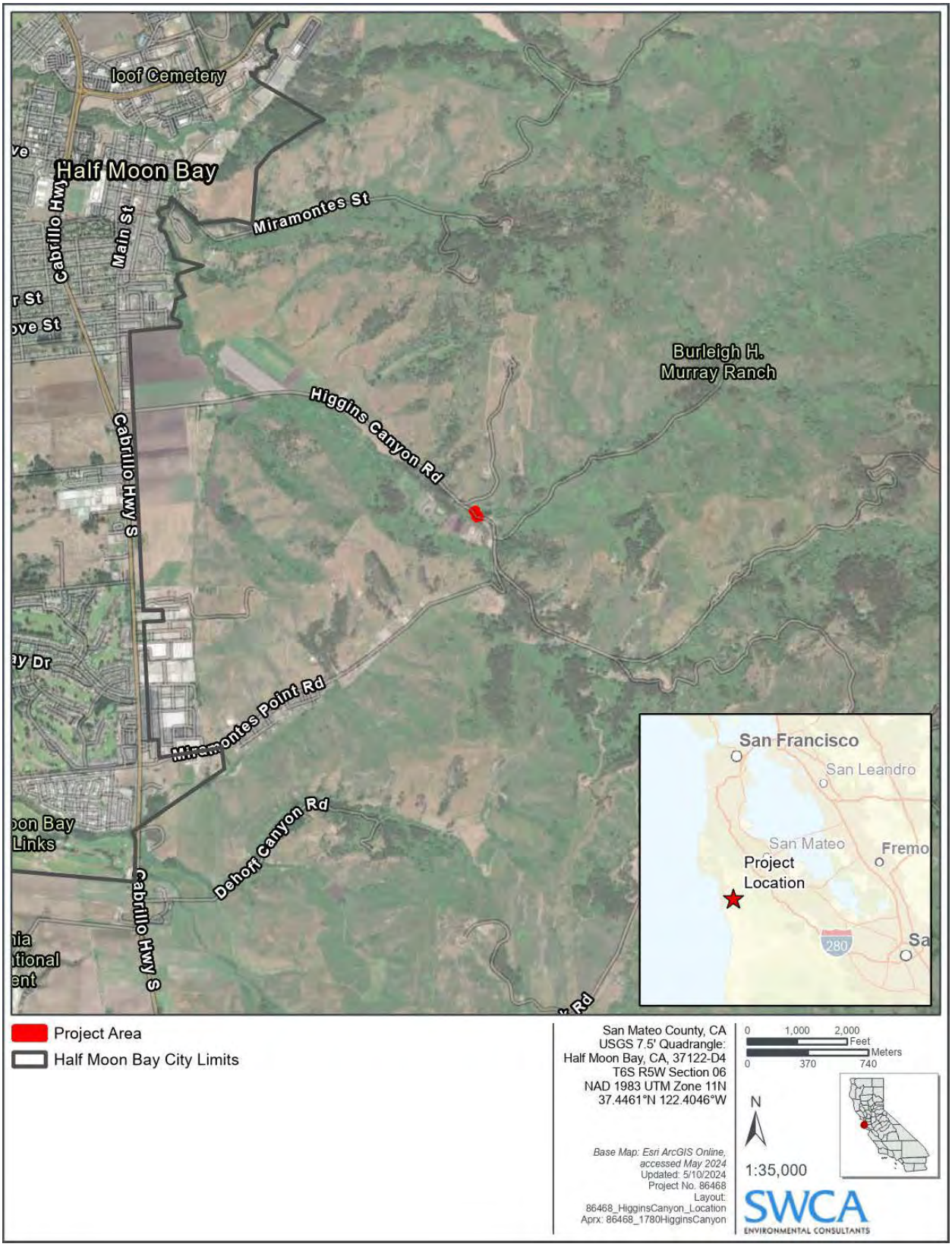


Figure 1. Project area location and regional vicinity.

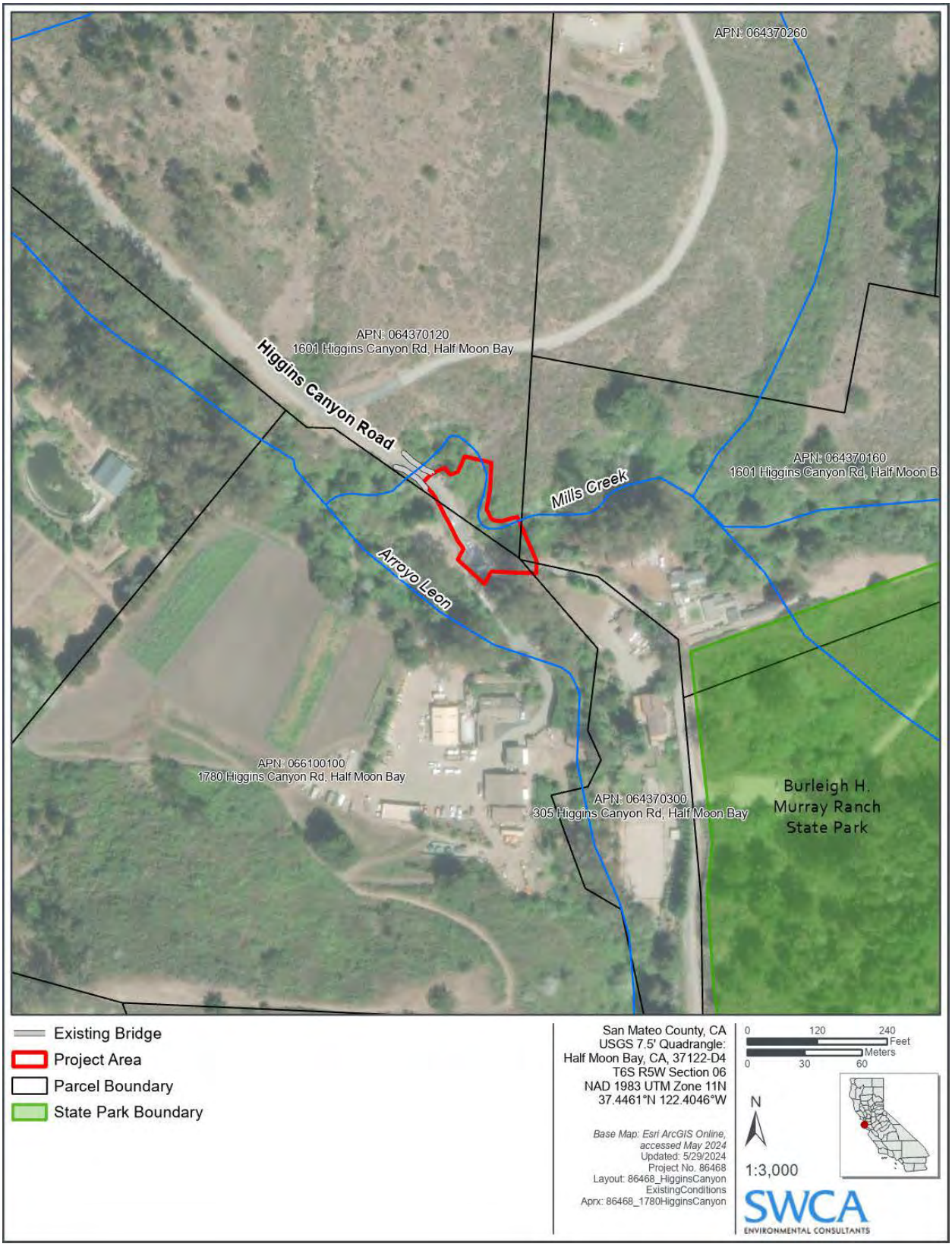


Figure 2. Project area and surrounding parcels.

Prior to commencement of creek and road repair, the project would include installation of erosion control Best Management Practices (BMPs), removal of some vegetation to gain access to the work area and creek, and installation of two temporary cofferdams and a diversion system to reroute water around the construction area. Fish relocation and dewatering would occur once the temporary cofferdams are in place. Vegetation removal would include removal of six arroyo willows (*Salix lasiolepis*), three red alders (*Alnus rubra*), and one red elderberry (*Sambucus racemosa*) as well as understory vegetation. All six willows would be salvaged and used for live pole planting in the revegetation stage.

Given the steep slope and limited right-of-way width in the project area, a hardscape engineered feature consisting of an approximately 192-foot-long soldier pile retaining wall with slope soil nailing is required in order to stabilize the roadbed and restore the failed section of roadway. The retaining wall will be a maximum of 24.8 feet in height, but will be fronted by a biostabilization-based bank repair with features to enhance habitat. The biostabilization-based bank repair will include a combination of vegetated boulder revetment and vegetated soil lift features. The voids of the boulder revetment will be filled with a mix of universal gravel filter and topsoil, covered with erosion blankets, and vegetated using a combination of native live pole plantings, container plantings, and seed. The vegetated boulder revetment and engineered creek bed will incorporate rootwads at the base of the revetment and specimen boulders in selected areas along the base of the revetment and throughout the channel. The width and length of the designed engineered creek bed is consistent with and restores the channel to pre-erosional conditions. The project would recontour the creek bed to restore the channel to its original flow path, by moving the current thalweg location away from the base of the eroding slope and closer to the existing center of the channel. Rootwads are tree trunk segments with roots attached that are used for streambank stabilization and to provide fish habitat. This method is effective in higher velocity streams at trapping sediment between components, supporting restoration of slope vegetation, and distributing flow velocities. The features also enhance habitat by providing cover and flow refuge for salmonids and amphibians and promoting channel diversity (i.e., formation of scour pools). Vegetated soil lifts would be constructed in the upper part of the riparian area. These would be comprised of layers of topsoil wrapped in a double layer of biodegradable fabric and revegetated with live pole plantings, native container plantings, and seed.

The project would replace and restore approximately 4,556 square feet of existing roadway and create approximately 383 square feet of new impervious surface with the new retaining wall. The project would also create a new graveled shoulder/drainage swale covering approximately 218 square feet and revegetate approximately 724 square feet of road shoulder.. The finished roadway would be approximately 20 feet wide. The asphalt road would consist of 4 inches of asphalt pavement underlain by 12 inches of Class II aggregate base rock. Guardrail posts would be installed 3 feet below ground surface. The existing ground surface would be grubbed and graded, which would require excavation of approximately 3,385 cubic yards (CY) of debris and existing soil and 120 CY of road excavation. Some of the excavated soil may be suitable for reuse on-site. The project would require importation of approximately 1,680 CY of soil, as well as aggregate base, asphalt for the roadway, concrete for the retaining wall, and rock and gravel for the revetments and engineered creek bed. Excavation depths would not exceed 29 feet. The exported materials would be hauled off-site for disposal or recycling. Following completion of the project, temporary work areas will be returned to preconstruction conditions.

Access to the project area would be from the west via SR 1 and Higgins Canyon Road. The location of the staging area has not yet been determined. Construction and demolition materials and supplies would be limited to designated off-site staging area(s).

Construction activities would occur for approximately 70 working days during summer 2025. Construction is anticipated to be completed by October 15, 2025.

Construction equipment would likely include the following:

- drill rig,
- asphalt paver,
- CAT long-reach excavator,
- hauling trucks (14-CY dump truck),
- cement mixer,
- bobcat,
- drum roller,
- water truck, and
- hand tools for trimming vegetation, such as chainsaws and saws.

Project plans are provided in Appendix B.

2 REGULATORY OVERVIEW

2.1 Federal

2.1.1 Bald and Golden Eagle Protection Act

The Bald and Golden Eagle Protection Act regulates take, possession, sale, purchase, barter, transport, import, and export of any bald or golden eagle or its parts (e.g., nests, eggs, young) unless allowed by permit (16 United States Code [USC] 668(a); 50 Code of Federal Regulations [CFR] 22). Take is broadly defined to include shoot, wound, kill, capture, collect, molest, or disturb.

2.1.2 Clean Water Act

The Clean Water Act (CWA) is the primary federal law regulating water quality. The implementation of the CWA is the responsibility of the U.S. Environmental Protection Agency (EPA). However, the EPA depends on other agencies, such as the individual states and the U.S. Army Corps of Engineers (USACE), to assist in implementing the CWA. The objective of the CWA is to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters." Sections 404 and 401 of the CWA apply to activities that would impact waters of the United States (WOTUS). The USACE enforces Section 404 of the CWA, and the California State Water Resources Control Board (State Water Board)/Regional Water Quality Control Board (RWQCB) enforces Section 401, as well as state water laws.

2.1.3 Federal Endangered Species Act

The Federal Endangered Species Act (FESA) of 1973, as amended, provides the regulatory framework for the protection of plant and animal species (and their associated critical habitats) that are formally listed, proposed for listing, or candidates for listing as endangered or threatened under the FESA. Under FESA Section 7, any federal agency that is authorizing, funding, or carrying out an action that may jeopardize the continued existence of federally listed threatened or endangered species or result in the destruction or adverse modification of critical habitat for these species must consult with the federal agency that oversees the protection of that species, typically the U.S. Fish and Wildlife Service (USFWS) and/or National Oceanic and Atmospheric Administration National Marine Fisheries Service (NOAA Fisheries), depending on the species that may be affected. Non-federal agencies and private entities can seek

authorization for take of federally listed species under FESA Section 10, which requires the preparation of a Habitat Conservation Plan.

2.1.4 Migratory Bird Treaty Act

The Migratory Bird Treaty Act (MBTA; 16 USC 703 et seq.; 50 CFR 10) states it is "unlawful at any time, by any means or in any manner, to pursue, hunt, take, capture, kill; attempt to take, capture or kill; possess, offer for sale, sell, offer to barter, barter, offer to purchase, purchase, deliver for shipment, ship, export, import, cause to be shipped, exported, or imported, deliver for transportation, transport or cause to be transported, carry or cause to be carried, or receive for shipment, transportation, carriage, or export any migratory bird, any part, nest, or egg of any such bird, or any product, whether or not manufactured, which consists, or is composed in whole or in part, of any such bird or any part, nest or egg thereof . . . " Actions causing take (including incidental take) are currently prohibited under the MBTA.

2.1 State

2.1.1 California Endangered Species Act

The California Endangered Species Act (CESA; California Fish and Game Code 2050 et seq.) generally parallels the FESA. It establishes the policy of the state to conserve, protect, restore, and enhance threatened or endangered species and their habitats. Section 2080 of the California Fish and Game Code prohibits the take, possession, purchase, sale, and import or export of endangered, threatened, or candidate species, unless otherwise authorized by permit or by the regulations. "Take" is defined in California Fish and Game Code Section 86 as to "hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill." This definition differs from the definition of "take" under the FESA. The CESA is administered by the California Department of Fish and Wildlife (CDFW). The CESA allows for take incidental to otherwise lawful projects but mandates that state lead agencies consult with the CDFW to ensure that a project would not jeopardize the continued existence of threatened or endangered species.

2.1.2 Native Plant Protection Act

The Native Plant Protection Act (NPPA) was created in 1977 with the intent to preserve, protect, and enhance rare and endangered plants in California (California Fish and Game Code Sections 1900–1913). The NPPA is administered by the CDFW, which has the authority to designate native plants as endangered or rare and to protect them from "take." The CDFW maintains a list of plant species that have been officially classified as endangered, threatened or rare. These special-status plants have special protection under California law and projects that directly impact them may not qualify for a categorical exemption under the State CEQA Guidelines.

2.1.3 California Fish and Game Code

2.1.3.1 SECTIONS 1600 THROUGH 1607

California Fish and Game Code Sections 1600 through 1607 require that a Notification of Lake or Streambed Alteration Agreement (LSAA) application be submitted to the CDFW for "any activity that may substantially divert or obstruct the natural flow or substantially change the bed, channel, or bank of any river, stream, or lake." The CDFW reviews the proposed actions in the application and, if necessary, prepares an LSAA that includes measures to protect affected fish and wildlife resources, including mitigation for impacts to bats and bat habitat.

2.1.3.2 SECTIONS 3503 AND 3513

Nesting birds, including raptors, are protected under California Fish and Game Code Section 3503, which reads, "It is unlawful to take, possess, or needlessly destroy the nest or eggs of any bird, except as otherwise provided by this code or any regulation made pursuant thereto." In addition, under California Fish and Game Code Section 3503.5, "it is unlawful to take, possess, or destroy any birds in the orders Falconiformes or Strigiformes (birds-of-prey) or to take, possess, or destroy the nest or eggs of any such bird except as otherwise provided by this code or any regulation adopted pursuant thereto." Passerines and non-passerine land birds are further protected under California Fish and Game Code 3513. As such, the CDFW typically recommends surveys for nesting birds that could potentially be directly (e.g., actual removal of trees/vegetation) or indirectly (e.g., noise disturbance) impacted by project-related activities. Disturbance during the breeding season could result in the incidental loss of fertile eggs or nestlings, or otherwise lead to nest abandonment. Disturbance that causes nest abandonment and/or loss of reproductive effort is considered "take" by the CDFW.

2.1.3.3 SECTIONS 3511, 4700, 5050, AND 5515

The classification of California Fully Protected (FP) species was the CDFW's initial effort to identify and provide additional protection to those animals that were rare or faced possible extinction. Lists were created for birds, mammals, amphibians and reptiles, and fish. Most of the species on these lists have subsequently been listed under the FESA and/or CESA. The California Fish and Game Code sections (3511 for birds, 4700 for mammals, 5050 for amphibian and reptiles, and 5515 for fish) deal with FP species and state that these species " . . . may not be taken or possessed at any time and no provision of this code or any other law shall be construed to authorize the issuance of permits or licenses to take any fully protected species" (California Fish and Game Commission 1998). "Take" of these species may be authorized for necessary scientific research. This language makes the FP designation the strongest and most restrictive regarding the "take" of these species. In 2003 the sections dealing with FP species were amended to allow the CDFW to authorize take resulting from recovery activities for state-listed species.

2.1.3.4 SECTIONS 4150 THROUGH 4155

California Fish and Game Code 4150 through 4155 protect non-game mammals, including bats. Section 4150 states "A mammal occurring naturally in California that is not a game mammal, fully protected mammal, or fur-bearing mammal is a nongame mammal. A non-game mammal may not be taken or possessed except as provided in this code or in accordance with regulations adopted by the commission." The non-game mammals that may be taken or possessed are primarily those that cause crop or property damage. Bats are classified as a non-game mammal and are protected under California Fish and Game Code.

2.1.4 Porter-Cologne Water Quality Control Act

The intent of the Porter-Cologne Water Quality Control Act (Porter-Cologne Act) is to protect water quality and the beneficial uses of water, and it applies to both surface and ground water. Under this law, the State Water Board develops statewide water quality plans, and the RWQCBs develop basin plans, which identify beneficial uses, water quality objectives, and implementation plans. The RWQCBs have the primary responsibility to implement the provisions of both statewide and basin plans. Waters regulated under the Porter-Cologne Act, referred to as "waters of the state," include isolated waters that are not regulated by the USACE. Projects that require a USACE permit, or fall under other federal jurisdiction, and have the potential to impact waters of the state are required to comply with the terms of the Water Quality Certification Program. If a proposed project does not require a federal license or permit, any person discharging, or proposing to discharge, waste (e.g., dirt) to waters of the state must file

a Report of Waste Discharge and receive either waste discharge requirements (WDRs) or a waiver to WDRs before beginning the discharge.

2.2 Local

2.2.1 California Coastal Act and County of San Mateo Local Coastal Program

The California Coastal Act (CCA) of 1976 governs the decisions made by the California Coastal Commission (CCC) regarding coastal issues, such as shoreline public access and recreation, terrestrial and marine habitat protection, water quality, commercial fisheries, and development within the California Coastal Zone. Development within the Coastal Zone would require either a Coastal Development Permit (CDP) or CDP Exemption from the CCC or from a local government with a CCC-certified Local Coastal Program (LCP).

In late 1980, the County of San Mateo Board of Supervisors and the CCC approved the County of San Mateo LCP. In April 1981, the County of San Mateo assumed responsibility for implementing the CCA in the unincorporated area of San Mateo County, including issuance of CDPs. All development in the Coastal Zone requires either a CDP or an exemption from CDP requirements. For a permit to be issued, the development must comply with the policies of the LCP and those ordinances adopted to implement the LCP. The project must also comply with other provisions of the County of San Mateo Ordinance Code, such as zoning, building, and health regulations.

The County of San Mateo LCP establishes General Policies 7.1 through 7.14 (Sensitive Habitats), which are applicable to the proposed project and concern the protection of special-status species and sensitive habitats.

3 METHODS

3.1 Definitions

3.1.1 Special-Status Plant Species

For the purposes of this document, special-status plant species are defined as the following:

- Plants listed or proposed for listing as threatened or endangered under the FESA
- Plants listed, proposed, or candidates for listing by the State of California as threatened or endangered under the CESA
- Plants considered by the California Native Plant Society (CNPS) to be “rare, threatened, or endangered” in California (California Rare Plant Ranks 1A, 1B, 2A, 2B, and 3).
- Plants listed under the NPPA

3.1.2 Special-Status Wildlife Species

For the purposes of this document, special-status wildlife species are defined as the following:

- Wildlife listed or proposed for listing as threatened or endangered under the FESA
- Wildlife that are candidates for possible future listing as threatened or endangered under the FESA
- Wildlife listed, proposed, or candidates for listing as threatened and endangered under the CESA
- CDFW Species of Special Concern (SSC)
- CDFW Fully Protected (FP) species

3.1.3 Species Potentials to Occur

The likelihood of special-status species occurrences was determined based on natural history parameters, including, but not limited to, the species' range, habitat, foraging needs, migration routes, and/or reproductive requirements, as well as recent occurrence records. Appendix C (Table C-1) summarizes the potential for special-status species to occur in the biological study area (BSA). For this report, the BSA is defined as the project area and an adjacent buffer (defined as being 100 feet from the outside edge of the project area). The potential for occurrence is defined as follows:

- **Present:** The species has been documented within the BSA by a reliable observer during recent surveys and habitat has not significantly been degraded or eliminated since the observation was made (e.g., no habitat removal associated with a development).
- **Likely to occur:** The species has a strong likelihood to be present in the BSA as indicated by factors such as habitat quality, proximity to known records, presence of suitable dispersal corridors, etc. The BSA contains suitable habitat and is located within the elevational and geographic ranges of the species.
- **Unlikely to occur:** The species is not likely to occur in the BSA. Potentially suitable habitat is present, but the project area may be outside of the species' elevational and/or geographic ranges, contain substantially degraded or fragmented habitat, lack recent occurrence records within dispersal distance, be isolated from known populations by barriers to migration/dispersal, and/or contain predators or invasive species that inhibit survival or occupation.
- **No potential:** The species is not expected to occur in the BSA due to one or more of the following conditions: suitable habitat is absent from the BSA, the BSA is located substantially outside of the species' elevational and/or geographic ranges, or the species is restricted to or known to be present only within a specific area outside of the BSA.

3.2 Background Research

SWCA performed a literature and database review to identify potential sensitive biological resources that have the potential to occur in the BSA. The database review consisted of a California Natural Diversity Database (CNDDB) record search for special-status species within 2 miles of the BSA (CDFW 2024a), a CNPS Rare Plant Program Inventory of Rare and Endangered Plants of California record search of the nine U.S. Geological Survey (USGS) 7.5-minute quadrangles surrounding the project area (CNPS 2024a), and the USFWS Information for Planning and Consultation (IPaC) planning tool (USFWS 2024a) (Appendix D).

Other sources reviewed included the following:

- Aerial imagery
- CDFW California Natural Communities List (CDFW 2024b)
- CDFW *Special Vascular Plants, Bryophytes, and Lichens List* (CDFW 2024c)
- CDFW Special Animals List (CDFW 2024d)
- eBird (Cornell Lab of Ornithology 2024)
- NOAA Fisheries Essential Fish Habitat Mapper (NOAA Fisheries 2024a)
- The Consortium of California Herbaria (2024)
- Natural Resources Conservation Service (NRCS) Web Soil Survey (NRCS 2024)
- USFWS Critical Habitat Mapper (USFWS 2024b)
- USFWS National Wetlands Inventory (NWI) (USFWS 2024c)
- USGS National Hydrography Dataset (NHD) (USGS 2024a)

Additionally, SWCA received background literature pertaining to the BSA as part of the *County of San Mateo Routine Maintenance Program Manual* (County RMP; Montrose Environmental 2023) and associated permit documents as well as other documents provided by the County or on file with SWCA. This included the following documents:

- *Arroyo Leon Creek Stream Inventory Report* and Pilarcitos Creek (CDFW 2013a, 2013b)
- *Formal Consultation on the County of San Mateo Routine Maintenance Program in San Mateo County, California* (USFWS 2022)
- *Endangered Species Act Section 7(a)(2) Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the County of San Mateo, Regional General Permit* (NOAA Fisheries 2020)
- *County of San Mateo Routine Maintenance Program. Aquatic Resources Delineation Report.* (Horizon Water and Environment 2019)
- *County of San Mateo Routine Maintenance Program.* [National Marine Fisheries Service] *NMFS Biological Assessment/EFH Assessment* (H. T. Harvey & Associates 2019a)
- *County of San Mateo Routine Maintenance Program. USFWS Biological Assessment* (H. T. Harvey & Associates 2019b)
- *Biological Resources Evaluation for the Pilarcitos Avenue/Kehoe Watercourse Outfall Repair Project, Half Moon Bay, San Mateo County, California* (SWCA 2023)
- *Endangered Species Act Section 7(a)(2) Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the County of San Mateo, Regional General Permit* (NOAA Fisheries 2020)
- *Pilarcitos Integrated Watershed Management Plan* (San Mateo Resource Conservation District 2008)
- *Pilarcitos Creek Restoration Plan* (Philip Williams & Associates, Ltd. 1996)
- *Steelhead/Rainbow Trout (Pncorhynchus myukiss) Resources South of the Golden Gate, California* (Becker and Reining 2008)
- *History and Status of steelhead in California Coastal Drainages South of San Francisco Bay* (Titus, Erman, and Snider 2002)

- *Pilarcitos Lagoon Habitat Enhancement Feasibility Study* (Wetlands and Water Resources Inc. 2010)
- *Higgins Canyon Road Bridge Repair Biological Monitoring Logs* (September 2022–January 2023) (County of San Mateo 2023)

3.3 Field Surveys

3.3.1 Natural Community and Other Land Cover Mapping

On May 2, 2024, SWCA biologists Erich Schickenberg and Alec Villanueva conducted surveys to characterize natural vegetation communities and describe existing land covers within the BSA. Vegetation classification and mapping was conducted in accordance with applicable methods and guidance in *The Survey of California Vegetation Classification and Mapping Standards* (CDFW 2022). Vegetation assemblages occurring at 0.25 acre or greater were described to the alliance level based on the descriptions provided in the California Natural Community List (CDFW 2024b), which is adapted from the technical approach and vegetation alliance classification system described in *A Manual of California Vegetation* (MCV) (Sawyer et al. 2009), the MCV Online (CNPS 2024a), and pertinent wildlife habitats contained in the California Wildlife Habitat Relationships (CDFW 2024e). When necessary, SWCA biologists referred to Jepson eFlora (Jepson Flora Project 2024) to identify and key plant species.

The CDFW considers riparian habitat to be a sensitive natural community. To map riparian habitat in the BSA, SWCA biologists selected all MCV natural vegetation communities dominated by plant species typically found in riparian systems and then generated a crosswalk of those riparian alliances to those most representative to the segment within the BSA. This crosswalk, including all classifications found in the BSA, is included below in Section 5.10, *Potential Impacts to Jurisdictional Wetlands/Waters* (Table 3).

3.3.2 Aquatic Resources Delineations

On May 2, 2024, SWCA biologists conducted an on-site routine delineation of potentially jurisdictional aquatic resources in the BSA. Prior to conducting the field survey, existing information was reviewed, including aerial imagery, soil survey data (NRCS 2024), and NWI maps (USFWS 2024b). The aquatic resource delineation was conducted in accordance with the *National Ordinary High Water Mark Field Delineation Manual for Rivers and Streams (Interim Version)* (David et al. 2022) for non-wetland aquatic features with an ordinary high water mark (OHWM). The *Corps of Engineers Wetlands Delineation Manual* (Environmental Laboratory 1987) was not utilized during the delineation as no potential wetlands were identified during the survey. Potentially jurisdictional aquatic resources were mapped using a GPS unit with submeter accuracy. All spatial data were collected in the World Geodetic System 1984 (WGS84) coordinate system. Photographs were also taken at each sample point. Descriptions of each water feature, OHWM indicators, and measurements of OHWM and top of bank were recorded using Rapid Ordinary High Water Mark Data Forms. Inaccessible areas were digitized using geographic information systems (GIS), available aerial imagery, and topographic contour data. Riparian vegetation communities were mapped to the edge of the riparian canopy, as defined by the outer edge of the drip line. Riparian vegetation was mapped throughout the survey area using GPS data and aerial imagery.

3.3.3 Special-Status Species Assessments

3.3.3.1 BOTANICAL SURVEYS

No protocol-level botanical surveys were conducted for this project. Reconnaissance-level habitat surveys were conducted in the BSA on May 2, 2024. The potential for special-status plant species was evaluated based on the presence or absence of suitable habitat within the BSA, consistent with the prior County RMP analysis. See Section 5.7, *Species-Specific Measures*, for recommended botanical surveys within the BSA. A full list of plant species observed within the BSA is included in Appendix E.

3.3.3.2 WILDLIFE SURVEYS

SWCA biologists conducted a reconnaissance-level survey of the BSA on May 2, 2024, to evaluate the presence or absence of sensitive biological resources, including suitable habitat for special-status species determined to have the potential to occur in the BSA. Where accessible, SWCA biologists walked the BSA and documented suitable habitat (e.g., burrows) and active bird nests. Areas adjacent to the BSA that were inaccessible or located on private property were surveyed visually with binoculars or through desktop aerial review, unless otherwise noted. Wildlife observed during the field survey were also recorded and are listed in Appendix E.

4 ENVIRONMENTAL SETTING

San Mateo County is situated along the central coast of California and encompasses approximately 554 square miles of the San Francisco Peninsula. The Santa Cruz Mountain Range traverses San Mateo County in a north–south direction, effectively dividing the county into two distinct regions—the Coastside and the Bayside—and defining the topography in this region. On the coast, the steep mountain slopes transition into gradually sloped coastal terraces along the northern portion of the region near Half Moon Bay. Many small creeks drain the western hillslopes of the Santa Cruz Mountains; the largest include Pilarcitos Creek, Purisima Creek, Lobitos Creek, Tunitas Creek, San Gregorio Creek, Pescadero Creek, and Gazos Creek. Development in this region is limited due to the presence of several parks, open space preserves, and the region's steep topography. However, coastal terraces and alluvial valleys support farming and livestock grazing.

Coastside San Mateo County lies within the Coast Range Ecoregion, a region that extends north to south from western Washington, western Oregon, and northwestern California along the low mountains of the Coast Range. This region is characterized by highly productive, rain-drenched coniferous forests. In California, redwood (*Sequoia sempervirens*) forests are a dominant component in much of the region. Coastal headlands, high and low marine terraces, sand dunes, and beaches also characterize the region (EPA 2013).

The BSA is located just east of the Higgins Canyon Road bridge over Mills Creek. The slope requiring repair sits on a southwest creek bank along Mills Creek and is moderately vegetated with small to large trees and shrubs (see Appendix A). Natural communities and land cover types are described in detail in Section 5.1, *Natural Communities and Other Land Covers.*

4.1 Climate and Precipitation

The temperature and precipitation data described in this section are based on the closest National Weather Service Field Office climate data for the San Francisco (KHB49), California weather station (National Weather Service 2024). Half Moon Bay experiences a coastal Mediterranean climate, characterized by frequent fog and persistent sea breezes with cool to mild temperatures year-round, dry summers, and wet winters. Average minimum and maximum annual temperatures range from 42 to 66 degrees Fahrenheit. Average annual precipitation at the Half Moon Bay weather station is 29 inches, with most rainfall occurring between October and April.

Hydrologic conditions were within the normal range (compared to the rolling 30-year period averages) and in a period of mild wetness during field surveys conducted in May 2024 (USACE 2024). No abnormal drought or wetness conditions were present, and conditions were appropriate for evaluating hydrologic indicators. The BSA had average precipitation levels typical of the dry season leading up to the biological field survey, with no rain recorded prior to the first day of field surveys on May 2, 2024. In addition, the National Drought Mitigation Center does not show San Mateo County as an area experiencing drought in the time leading up to the field investigations (National Drought Mitigation Center 2024). Precipitation preceding delineation fieldwork is reported in the *Preliminary Jurisdictional Delineation Report for the Slip-Out Repair and Bank Stabilization Near 1780 Higgins Canyon Road Project, San Mateo County, California* (SWCA 2024).

4.2 Topography

The topography within the BSA is generally hilly and gently slopes westward toward the Pacific Ocean. The banks of Mills Creek within the riparian canopy are steep with loose soil and erosion, and the elevation is between approximately 174 and 202 feet amsl (USGS 2024b).

4.3 Hydrology

The BSA is located near a bridge crossing where Higgins Canyon Road crosses Mills Creek immediately upstream of its confluence with Arroyo Leon (see Figure 2). Mills Creek is a tributary of the Pilarcitos Creek watershed (Hydrologic Unit Code 12- 180500060201), which, after the confluence with Arroyo Leon, flows into Pilarcitos Creek before emptying directly into the Pacific Ocean. The NWI wetlands mapping tool (USFWS 2024b) classifies Mills Creek and Arroyo Leon as Freshwater Forested/Shrub Wetland (PFOC) following *Classification of Wetlands and Deepwater Habitats of the United States* (Cowardin et al. 1979). According to the NHD, Mills Creek is characterized as a "perennial" stream (USGS 2024a). Perennial, intermittent, and ephemeral channels are not defined under federal law or regulation. However, the EPA describes perennial, intermittent, and ephemeral channels as follows (EPA 2024):

> Year-round streams (perennial) typically have water flowing in them year-round. Most of the water comes from smaller upstream waters or groundwater while runoff from rainfall or other precipitation is supplemental.
>
> Seasonal streams (intermittent) flow during certain times of the year when smaller upstream waters are flowing and when groundwater provides enough water for stream flow. Runoff from rainfall or other precipitation supplements the flow of seasonal stream. During dry periods, seasonal streams may not have flowing surface water. Larger seasonal streams are more common in dry areas.

Rain-dependent streams (ephemeral) flow only after precipitation. Runoff from rainfall is the primary source of water for these streams. Like seasonal streams, they can be found anywhere but are most prevalent in arid areas.

4.4 Soils

Based on the NRCS Web Soil Survey data, the survey area contains four soil types: 1) Dublin clay, moderately steep, eroded; 2) Gullied land (Tierra and Watsonville soil materials); 3) Mixed alluvial land; and 4) Tierra loam, steep, eroded (NRCS 2024; Figure 3). Soils were incidentally investigated as part of the wetland delineation effort. However, detailed soil mapping was not conducted as part of these surveys throughout the BSA. The soil types are shown in Table 1 in order of prevalence in the BSA.

Table 1. Soil Types Present in the BSA

Map Unit Symbol	Map Unit Name	Soil Characteristics	Acreage in BSA	Acreage in Project Area
Ma	Mixed alluvial land	Alluvial land is land area where soil consists of loose clay, silt, sand, or gravel that has been deposited by running water in a stream bed, on a floodplain, in an alluvial fan or beach, or in similar settings.	1.379	0.171
Gw	Gullied land (Tierra and Watsonville soil materials)	Gullied land is land areas where all soil horizons have been removed by flowing water, resulting in V- or U-shaped channels.	0.938	0.289
TeE2	Tierra loam, steep, eroded	The Tierra series consists of deep, moderately well drained soils that formed in alluvial materials from sedimentary rocks. Tierra soils are gently sloping to steep and are on dissected terraces and low hills at elevations of 100 to 1,200 feet. Slopes are 2 to 50 percent. The series formed in weakly consolidated somewhat stratified old alluvium interspersed with beds of sandstone. The climate is subhumid mesothermal with cool moist winters and cool dry summers. Moderately well drained; slow to rapid runoff; very slow permeability.	0.327	0
DuD2	Dublin clay, moderately steep, eroded	N/A	0.068	0

Source: NRCS (2024).

5 RESULTS

5.1 Natural Communities and Other Land Covers

Two natural communities and three other land cover types were mapped in the BSA, as shown in Figure 4 and Table 2. The following subsections describe each in more detail.

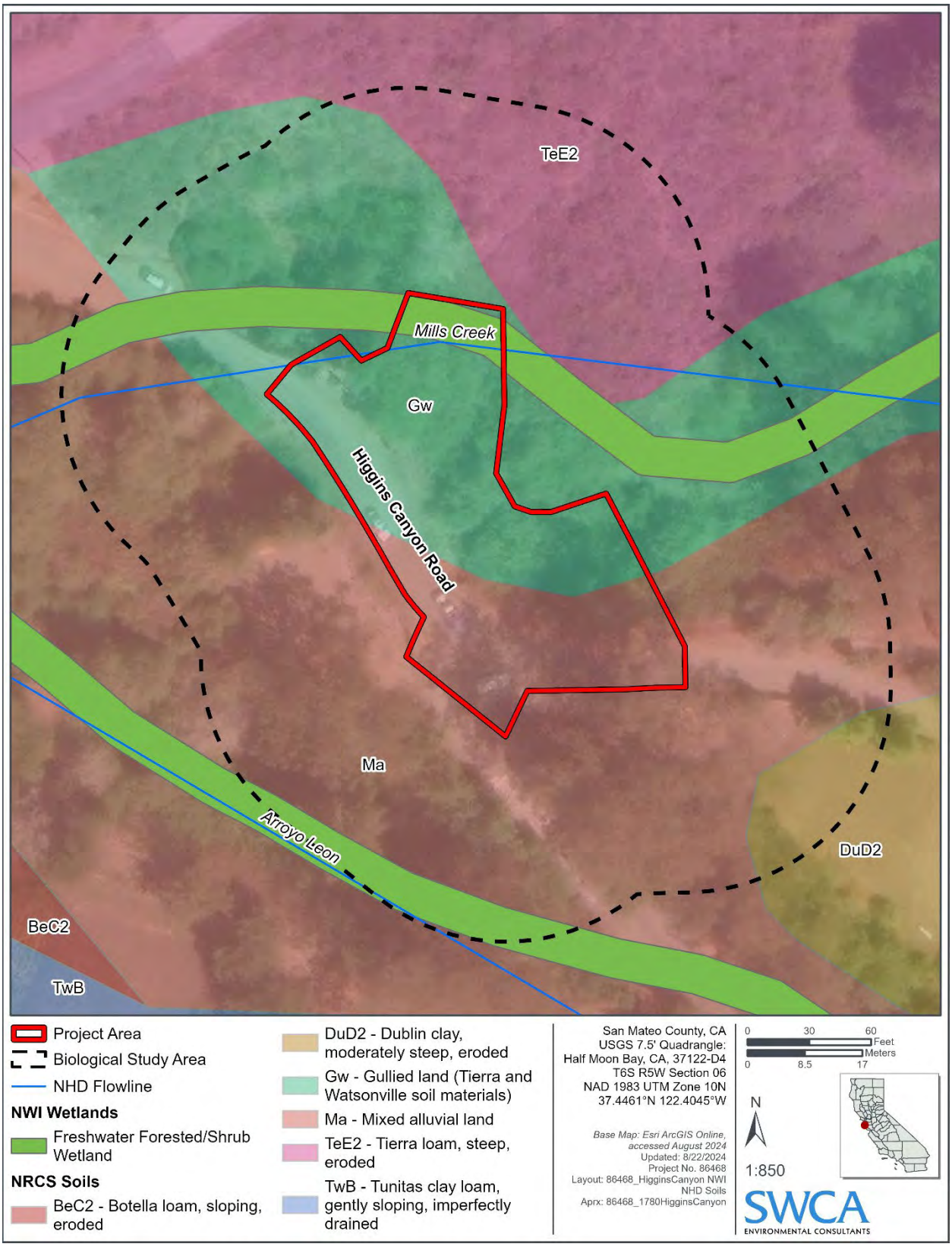


Figure 3. NWI, NHD, and NRCS soils map.

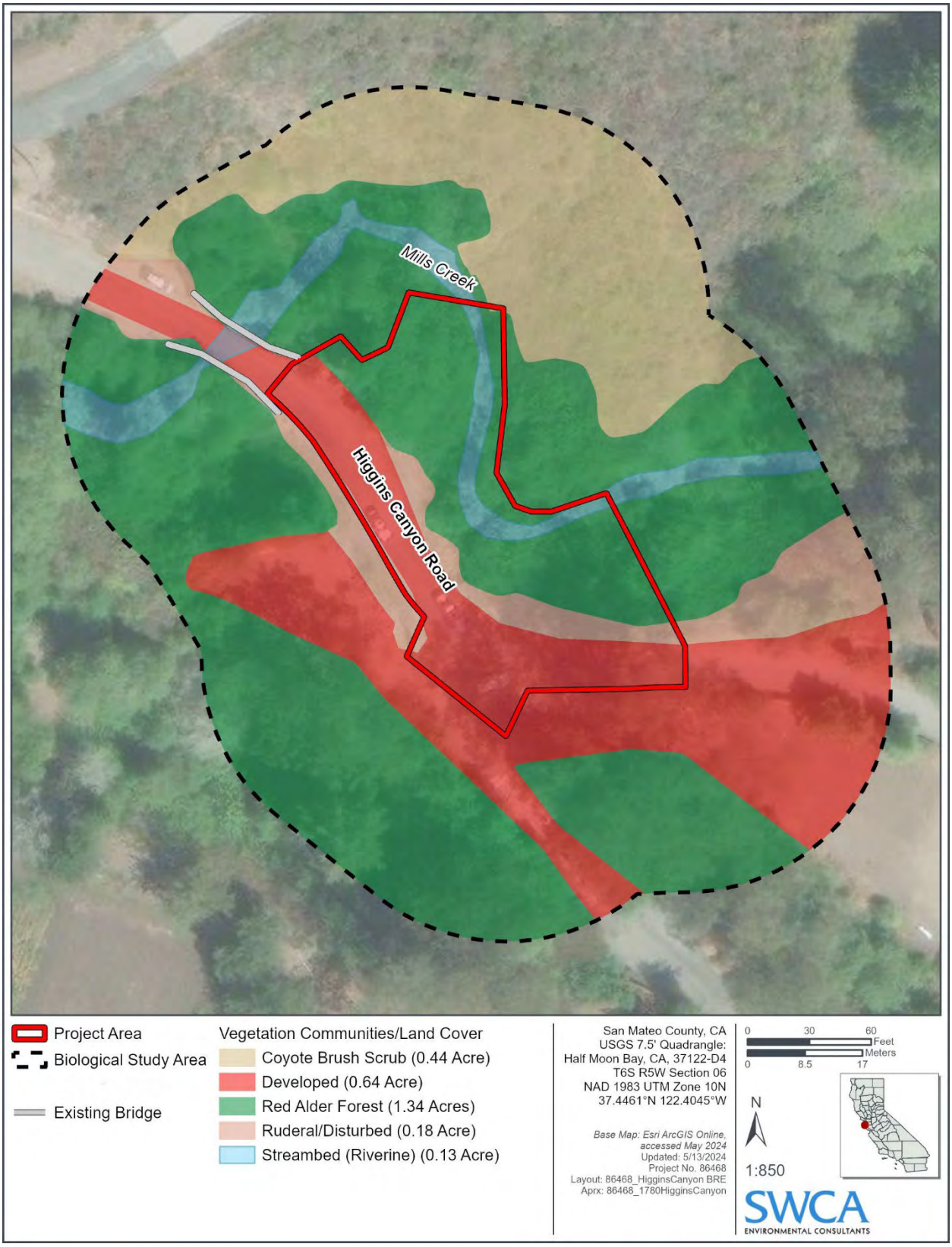


Figure 4. Natural communities and other land cover in the BSA.

Table 2. Natural Communities and Other Land Covers Present in the BSA

Natural Community/ Land Cover Type	MCV Alliance[1]	California Natural Community List[2] (* Association Considered Sensitive)	Acreage in the BSA
Natural Communities			
Red Alder Forest	*Alnus rubra* Forest Alliance	*Alnus rubra / Salix lasiolepis – Rubus* spp. Association*	1.34
Coyote Brush Scrub	*Baccharis pilularis* Shrubland Alliance	*Baccharis pilularis* Association	0.44
Other Land Cover Types			
Ruderal/Disturbed	N/A	N/A	0.18
Developed	N/A	N/A	0.64
Streambed (Riverine)	N/A	N/A	0.13

N/A = not applicable

Sources:

[1] Vegetation alliance classification system described in the MCV (Sawyer et al. 2009) and the MCV Online (CNPS 2024a).

[2] "California Natural Community List" refers to the classification types described in the CDFW Natural Communities List, which is adapted from the MCV (CDFW 2024b)

5.1.1 Natural Communities

SWCA mapped two MCV natural vegetation communities (CDFW 2024b)—Red Alder Forest and Coyote Brush Scrub—in the BSA to the alliance or association level, as described in this section. A full list of plant species observed during the field survey is included in Appendix E.

5.1.1.1 RED ALDER FOREST

Red Alder Forest occurs in riparian areas along Mills Creek and Arroyo Leon and covers approximately 1.34 acres of the BSA. This community meets the membership rules for the *Alnus rubra* Forest Alliance (CNPS 2024a). Red alder is dominant or co-dominant in the tree canopy along with other riparian shrub species such as arroyo willow, hedge nettle (*Stachys chamissonis*), red elderberry, thimbleberry (*Rubus parviflorus*), and salmonberry (*Rubus spectabilis*). This community can further be classified as *Alnus rubra / Salix lasiolepis – Rubus* spp. Association (CDFW 2024b). Red Alder Forest is considered a sensitive community by CDFW (CDFW 2024b). This vegetation community occurs along stream and river backwaters, banks, bottoms, floodplains, mouths, terraces, and slopes (Sawyer et al. 2009).

Red Alder Forest habitat may serve as suitable non-breeding/upland, foraging, and dispersal habitat for California red-legged frog (*Rana draytonii*) and San Francisco garter snake (*Thamnophis sirtalis tetrataenia*). In addition, this community has the potential to support nesting and foraging birds protected under the MBTA.

5.1.1.2 COYOTE BRUSH SCRUB

Coyote Brush Scrub is characterized by coyote brush (*Baccharis pilularis*) as the dominant or co-dominant in the shrub canopy along with poison oak (*Toxicodendron diversilobum*), French broom (*Genista monspessulana*), jubatagrass (*Cortaderia jubata*), California blackberry (*Rubus ursinus*), sticky monkeyflower (*Diplacus aurantiacus*), poison hemlock (*Conium maculatum*), and California man-root (*Marah fabacean*). This community meets the membership rules for the *Baccharis pilularis* Shrubland Alliance (CNPS 2024a). This community can further be classified as *Baccharis pilularis* Association (CDFW 2024b), which is not considered a sensitive community by CDFW (CDFW 2024b). This vegetation community occurs on river mouths, stream sides, terraces, stabilized dunes of coastal bars,

spits along the coastline, coastal bluffs, open slopes, and ridges with variable soils ranging from sandy to relatively heavy clay (Sawyer et al. 2009). The BSA contains approximately 0.44 acre of coyote brush scrub. This habitat occurs on the northern edge of the BSA, upslope of the riparian corridor along Mills Creek.

Coyote Brush Scrub habitat in the BSA has the potential to serve as upland and/or dispersal habitat for California red-legged frog and San Francisco garter snake. In addition, this community has the potential to support nesting and foraging birds protected under the MBTA. This habitat occurs outside the project area and will not be impacted by construction activities.

5.1.2 Other Land Cover Types

5.1.2.1 RUDERAL/DISTURBED

Approximately 0.18 acre of the BSA was mapped as Ruderal/Disturbed. This land cover type occurs along the margins and roadside swales/ditches along Higgins Canyon Road. This community is dominated by nonnative grasses and forbs such as wild oat (*Avena barbata*), ribwort (*Plantago lanceolata*), spring vetch (*Vicia sativa*), wild geranium (*Geranium dissectum*), ripgut brome (*Bromus diandrus*), and California burclover (*Medicago polymorpha*). This community does not meet the membership rules for any naturally occurring or semi-natural MCV alliance or association and, therefore, is not considered a sensitive community due to the dominance of nonnative plant species (Sawyer et al. 2009; CDFW 2024b; CDFW 2024e).

Areas of the BSA dominated by Ruderal/Disturbed land cover show signs of recent mowing and other anthropogenic disturbance. These areas are not likely to support special-status species due to the frequent and high level of disturbance and human activity.

5.1.2.2 DEVELOPED

Approximately 0.64 acre of the BSA was mapped as Developed land. This land cover type includes areas that contain significant human-made impervious cover or are highly altered by humans. Developed areas are generally characterized by residential or commercial development and are often dominated by a mix of exotic ornamental and native plant species. Vegetation density, canopy cover, and species composition will vary based on purpose and/or design. Vegetation present in developed areas of the BSA include manicured lawns as well as ornamental trees such as coast redwood, blue gum eucalyptus (*Eucalyptus globulus*), Mexican fan palm (*Washingtonia robusta*), Ngaio tree (*Myoporum laetum*), and Monterey cypress (*Hesperocyparis macrocarpa*). This community does not meet the membership rules for any naturally occurring or semi-natural MCV alliance or association and, therefore, is not considered a sensitive community due to the dominance of nonnative plant species (Sawyer et al. 2009; CDFW 2024b).

Developed areas are not likely to support special-status species due to the high level of disturbance and human activity. However, residential structures and ornamental trees have the potential to support nesting birds protected under the MBTA.

5.1.2.3 STREAMBED (RIVERINE)

Approximately 0.13 acre of the BSA was mapped as Streambed (Riverine), which consists of Mills Creek, a perennial stream.

Within the BSA, the streambed of Mills Creek is largely unvegetated, consisting of mostly runs with a few riffles and pools. Mills Creek was estimated to have an average width of 14 feet and an average depth

of approximately 8 inches, with pools up to 2 feet deep observed. Mills Creek is deeply incised along much of its length with steep slopes extending to top of bank. The substrate present consisted of a mixture of fine/silt, small cobble, and exposed bedrock (see Appendix A).

The portion of Mills Creek within the BSA may provide suitable nonbreeding dispersal and foraging habitat for California red-legged frog and San Francisco garter snake and may provide suitable breeding and foraging habitat for California giant salamander (*Dicamptodon ensatus*). California red-legged frog and Central California Coast steelhead (*Oncorhynchus mykiss irideus*) have also been documented within Arroyo Leon and in Mills Creek as recently as 2022 (personal communication, Julie Casagrande 2024). Suitable rearing habitat for juvenile steelhead and Central California Coast coho salmon (*Oncorhynchus kisutch*) may be present. However, the portion of Mills Creek within the BSA does not contain ideal breeding habitat for spawning salmonids due to the lack of abundant in-stream cover, 1:1 pool-to-riffle ratio, and loose, silt-free, coarse gravel for spawning (Moyle 2002).

5.2 Special-Status Species

5.2.1 Special-Status Plants

The background research conducted for this BRE resulted in eight special-status plants that have potential to occur in the project area, as described in Table C-1 (see Appendix C). Table C-1 describes each species' preferred habitat, status, and potential to occur. None of these eight special-status plants are likely to occur in the project area based on habitat suitability (e.g., soils, elevation, vegetation communities, etc.), proximity of recent occurrences, and species' geographic ranges. Additionally, the May 2, 2024, field survey was conducted during the blooming period for seven of the eight plant species. No special-status plants were observed.

5.2.2 Special-Status Wildlife

Based on a CNDDB query and a review of existing literature, 18 special-status wildlife species were identified within 2 miles of the project area, as described in Table C-1 (see Appendix C). Table C-1 describes each species' preferred habitat, status, and potential to occur. SWCA evaluated these 18 species to identify which species have the potential to occur within the BSA. This analysis compared the known habitat requirements of those species to the BSA's existing conditions. Two of these species listed under the FESA and/or CESA were determined to be "present" within BSA—California red-legged frog (CRLF) and Central California Coast steelhead Distinct Population Segment (DPS). Two species listed under the FESA and/or CESA were determined to be "unlikely to occur"—San Francisco garter snake and Central California Coast coho salmon. One species proposed threatened under FESA and a CDFW SSC Species, northwestern pond turtle (WPT) (*Actinemys marmorata*) was determined to be "unlikely to occur". One CDFW SSC species, California giant salamander, was determined to be "likely to occur" and one CDFW SSC species, San Francisco dusky-footed woodrat (*Neotoma fuscipes annectens*), was determined to be "present" in the BSA. The remaining 13 species are either "unlikely to occur," or have "no potential" to occur (i.e., are absent from the project area) due to a lack of suitable foraging and/or breeding habitat, aestivating habitat, and/or other biotic considerations, or the BSA is outside of the species' current known range; these species, aside from San Francisco garter snake and Central California Coast coho salmon, are not discussed further in this document. The special-status wildlife species that are present or were determined to be likely to occur are discussed in the sections that follow. Coho salmon, despite being unlikely to occur, was included in the section below because Mills Creek within the BSA is designated as coho salmon critical habitat. San Francisco garter snake, despite being unlikely to occur, was included because historical population in the Pilarcitos creek watershed. WPT, despite being unlikely to occur, was included because of the potential for marginal dispersal, foraging, and refuge habitat in the BSA.

No special-status species were observed during the field survey.

5.2.2.1 CALIFORNIA RED-LEGGED FROG

California red-legged frog, a federally threatened species and CDFW SSC, occurs in various habitat types depending on its life cycle stage. Breeding areas include aquatic habitats, such as lagoons, streams, and natural and artificial ponds. This species prefers aquatic habitats with little or no flow, the presence of surface water to at least early June, surface water depths to approximately 2 feet, and the presence of emergent vegetation (e.g., cattails and bulrush). During periods of wet weather, some individuals may make overland dispersals through adjacent upland habitats of distances up to 1 mile (USFWS 2002). Upland habitats, including small mammal burrows and woody debris, can also be used as refuge during the summer if water is scarce or unavailable (Jennings and Hayes 1994). California red-legged frog typically travels between sites and is unaffected by topography and vegetation types during migration. Dispersal habitat makes it possible for California red-legged frog to locate new breeding and non-breeding sites and is crucial for conservation of the species.

Suitable breeding habitat for California red-legged frog is not present within the BSA due to the lack of emergent vegetation, canopy cover, and pools with limited flow. Suitable upland, foraging, and dispersal habitat for California red-legged frog is present within the BSA. Coast Ridge Ecology, LLC (CRE), biologists identified three California red-legged frogs (two adults and one subadult) within Mills Creek at Higgins Canyon Road bridge in August 2022. The frogs were relocated outside of the project area (CRE 2022). In addition, seven CNDDB occurrences have been recorded within 2 miles of the BSA between 2001 and 2019 (CDFW 2024a). The closest CNDDB occurrence (2019) was located approximately 0.3 mile north of the BSA. A second occurrence (2001) was located approximately 0.7 mile downstream of the BSA in Arroyo Leon. Critical habitat is present approximately 1.5 mile north of the BSA. Therefore, California red-legged frog is assumed to be present within the BSA, and this species could easily enter the project area while traveling through Arroyo Leon and Mills Creek.

5.2.2.2 SAN FRANCISCO GARTER SNAKE

San Francisco garter snake is a federally and state endangered/fully protected species. This species' historical range is entirely within San Mateo County and the very northern extent of Santa Cruz County. The two main components of San Francisco garter snake habitat are 1) wetlands supporting its prey species (e.g., California red-legged frog and Pacific chorus frog [*Pseudacris regilla*]), and 2) surrounding uplands that are adjacent to waterways and that support small mammal burrows used by the snakes for escape cover and brumation or estivation (USFWS 2006). San Francisco garter snake inhabits various aquatic habitats, including reservoirs, freshwater marshes, creeks, drainage ditches, ponds, and lakes. Less ideal habitats can also be used by San Francisco garter snake, such as ditches and other waterways or floating algal or rush mats. Suitable breeding habitat includes shallow marshlands with an abundance of emergent vegetation. Grasslands and low ground cover are also an important upland habitat for this species, as they provide areas for thermoregulation and cover. Small mammal burrows are used by San Francisco garter snake during hibernation. During the warm days of summer, most activity occurs during the morning and afternoon. Preferred nocturnal retreats are thought to be holes, especially mammal burrows, crevices, and surface objects (USFWS 2007).

No CNDDB occurrences of SFGS have been recorded within 2 miles of the BSA (CDFW 2024a). The occurrence locations are obscured to the USGS quadrangle level, likely to protect limited populations from illegal collection. One occurrence was listed within the Half Moon Bay, California (3712244) USGS 7.5-minute quadrangle and four associated within the Woodside, California (3712243) USGS 7.5-minute quadrangle. Except for one occurrence from the 1980s, all observations of SFGS were made within the last 20 years. Historical populations have been documented within the Half Moon Bay area around Denniston Creek and Pilarcitos Creek mouth. The status of these populations is uncertain as there have

been no recent observations in the last 30 years, but any extant population is thought to be heavily impacted by habitat alteration and degradation (USFWS 2020).

The BSA lacks terrestrial habitat required for San Francisco garter snake thermoregulation, breeding, estivation, and brumation. Heterogeneous grasslands with rodent burrows adjacent to aquatic resources are absent from the BSA. Aquatic habitat within the BSA is marginal for foraging and dispersal. Aquatic habitats with an abundance of dense emergent or floating vegetation typically associated with San Francisco garter snake (e.g., cattails [*Typha* spp.], bulrushes [*Scirpus* spp.]) are absent in the BSA. In addition, the steep slopes of Mills Creek within the BSA are not ideal for San Francisco garter snake aquatic basking and foraging.

However, given the connectivity of the lower reaches of Arroyo Leon and its associated riparian corridor to the BSA, the BSA may provide marginal dispersal and foraging habitat for the species. Aquatic habitat in the BSA may support breeding populations of one primary prey species—Pacific chorus frog, but not of CRLF. Therefore, San Francisco garter snake is unlikely to occur within the BSA due to a lack of terrestrial habitat and marginally suitable aquatic habitat.

5.2.2.3 NORTHWESTERN POND TURTLE

USFWS published a proposal in October 2023 to list the now two species formerly known as the western pond turtle (*Actinemys marmorata*) as threatened under the FESA (88 Federal Register [FR] 68370), which also served as the 12-month finding on the petition to list the western pond turtle. USFWS found that listing the now two recognized species is warranted, northwestern pond turtle (*Actinemys marmorata*; WPT) and southwestern pond turtle (*Actinemys pallida*), and listing is proposed under the FESA.

The current WPT range in coastal California includes areas of the Coast Range from the Oregon-California border south to Monterey County (USFWS 2023a). WPT are habitat generalists that occur in a broad range of permanent and ephemeral water bodies from remote to urban landscapes, including flowing rivers and streams, lakes, ponds, reservoirs, settling ponds, marshes, vernal pools irrigation ditches, and other wetlands, including some estuaries with tidal influence (USFWS 2023b). WPT may remain active throughout the year in warmer climates, but overwinter underwater or in adjacent uplands in colder climates (Hays et al. 1999). Key habitat elements for this species include sun basking sites; slow moving waters; underwater shelter sites; sandy stream channel bars and banks; algal mats/aquatic vegetation in slow moving water; and suitable nesting, estivation, and overwintering habitat. Sun basking sites include downed woody debris, logs, emergent vegetation, exposed roots, and rock along stream channel. Nesting habitat includes upland meadows, short grasslands, and mixed woodland with limited canopy cover, all with compact dry soils loose enough to allow for nest excavation within areas of sparse vegetation.

No CNDDB occurrences of WPT have been recorded within 2 miles of the BSA (CDFW 2024a). The steep, densely vegetated slopes of Mills Creek within the BSA are not ideal for WPT basking, breeding, and estivation. However, given the connectivity of the lower reaches of Arroyo Leon and its associated riparian corridor to the BSA, the BSA may provide marginal dispersal, foraging, and refuge habitat for the species. Therefore, WPT are unlikely to occur within the BSA due to a lack of nearby occurrence records and marginally suitable aquatic and terrestrial habitat.

5.2.2.4 STEELHEAD (CENTRAL CALIFORNIA COAST DPS)

Steelhead (Central California Coast DPS), a federally threatened species and CDFW SSC, is an anadromous fish that occurs along the entire California coast and inland to the Sacramento–San Joaquin River system. Steelhead spends a portion of its life cycle in the Pacific Ocean before returning upstream to spawn. Steelhead requires beds of loose, silt-free, coarse gravel for spawning. Suitable stream habitat

contains adequate cover, cool water, and sufficient dissolved oxygen. However, upstream migration is often limited due to upstream barriers such as waterfalls and cataracts as well as human-made dams and diversions. Steelhead feeds on aquatic and terrestrial insects, frogs, and small fish (Moyle 2002).

Mills Creek likely contains suitable rearing habitat for juvenile steelhead. However, the portion of Mills Creek within the BSA does not contain ideal breeding habitat for spawning steelhead due to the lack of abundant in-stream cover, 1:1 pool-to-riffle ratio, and loose, silt-free, coarse gravel for spawning (Moyle 2002). CRE biologists observed two steelhead/rainbow trout parr just upstream of the Higgins Canyon Road bridge. Both of these fish were recorded as young-of-year, and approximately 2 to 3 inches in size (75 millimeters) (CRE 2022). Additionally, one CNDDB steelhead occurrence was recorded in 2000 approximately 2 miles northeast and upstream of the Mills Creek and Arroyo Leon confluence in the BSA (CDFW 2024a). Steelhead were captured by the CDFW via electrofishing in Arroyo Leon and Pilarcitos Creek both upstream and downstream of the of the BSA as recently as 2011 (CDFW 2013). Steelhead have occurred within Mills Creek as recently as 2022, and steelhead could enter the BSA traveling upstream from Arroyo Leon. Additionally, Mills Creek and the rest of the Pilarcitos Creek watershed is designated critical habitat for steelhead (NOAA Fisheries 2024b). Therefore, steelhead are assumed to be present within the BSA.

5.2.2.5 COHO SALMON (CENTRAL CALIFORNIA COAST ESU)

Coho salmon (Central California Coast Evolutionarily Significant Unit [ESU]), a federally endangered species, is an anadromous fish whose range extends to all rivers, including estuarine areas and tributaries between Punta Gorda in Humboldt County and the San Lorenzo River in Santa Cruz County. This includes San Francisco Bay and associated tributaries, although coho are considered extirpated from all San Francisco Bay rivers (NOAA Fisheries 2012). Threats to Central California Coast coho salmon ESU include human-induced factors such as habitat degradation and water diversion.

Based on historical data and recent surveys, Central California Coast coho salmon are not expected to be present in the BSA (NOAA Fisheries 2021). Within coastal San Mateo County, coho have been historically documented in Pescadero-Butano, San Gregorio, and Gazos Creek watersheds. Coho have been recently observed in Pescadero Creek, Gazos, and San Gregorio Creek as the result of juvenile coho releases as part of the conservation hatchery program at Scotts Creek in Santa Cruz County (NOAA Fisheries 2020). Occasional strays from the hatchery have the potential to enter the Pilarcitos Creek watershed and spawn. However, this is highly unlikely due to unsuitable conditions such as a low flows and high sediment discharge at the entrance of Pilarcitos Creek and poor lagoon quality for salmonid smolts and kelts (San Mateo Resource Conservation District 2008; Wetlands and Water Resources Inc. 2010). As such, Central California Coast coho salmon are unlikely to occur within the BSA.

5.2.2.6 CALIFORNIA GIANT SALAMANDER

California giant salamander, a CDFW SSC, is a year-round resident of north-central California, from southern Santa Cruz County to extreme southern Mendocino and Lake Counties. This species occurs up to 2,160 meters (6,500 feet), primarily in humid coastal forests, especially in Douglas fir (*Pseudotsuga menziesii*), redwood, red fir (*Abies magnifica*), and montane and valley-foothill riparian habitats (Stebbins 1972). California giant salamander lives in or near streams in damp forests and tends to be common where it occurs (Stebbins 1985). Aquatic adults and larvae are found in cool, rocky streams and occasionally in lakes and ponds (Nussbaum and Clothier 1973).

California giant salamander has the potential to occur in riparian areas within the BSA along Mills Creek. One CNDDB occurrence has been recorded approximately 2 miles southeast of the BSA along Purisima Creek (CDFW 2024a). This species has also been observed by the CDFW in 2011 in Pilarcitos Creek,

which lies within the same watershed (CDFW 2013). This species could enter the project area while traveling through Arroyo Leon.

5.2.2.7 SAN FRANCISCO DUSKY-FOOTED WOODRAT

San Francisco dusky-footed woodrat, a CDFW SSC, is a medium-sized rodent found in grassland, scrub, and wooded areas throughout the San Francisco Bay Area. The species is generally found in habitats with moderate canopy cover and often found in riparian areas. The woodrat uses sticks and leaves to construct nests (i.e., middens), which can be located at ground level or in trees and reach approximately 8 feet in height.

There are no recorded CNDDB occurrences of San Francisco dusky-footed woodrat within 2 miles of the BSA. However, there is one unpublished CNDDB record of a woodrat nest relocation effort from a previous project in the BSA (personal communication, Rosa Albanese 2024). A nest was also observed as recently as 2023 in the BSA (personal communication, Julie Casagrande 2024). Therefore, the species is assumed to be present in the project area.

5.2.2.8 ROOSTING BATS

Roosting bat habitat preference varies by species, but in general, bats roost in a variety of natural and human-made structures. Some species prefer to roost in tree cavities, among leaves and under bark. Trees such as oak (*Quercus* sp.), beech (*Fagus* sp.), and ash (*Fraxinus* sp.) are particularly suitable for bats. Other bat species prefer to roost in caves and rock crevices. Many bat species will also readily occupy human-made structures such as houses, barns, bridges or culverts (Western Bat Working Group 2023). Several project locations contain suitable roosting for many bat species in the form of large oak trees, as well as human-made structures including houses, barns, bridges, and culverts.

There are no recent CNDDB occurrences of special-status bat species within 2 miles of the BSA (CDFW 2024a). However, there is suitable habitat for roosting bats present within the eucalyptus groves and houses bordering the BSA that may be impacted by project activities. No bat roosts or bat roosting evidence (urine staining or guano) was observed during the reconnaissance-level bat survey for the project or during previous work in 2022 (personal communication, Julie Casagrande 2024).

5.2.2.9 NESTING MIGRATORY BIRDS/RAPTORS

The BSA contains suitable nesting and foraging habitat for avian species protected under the MBTA and California Fish and Game Code Sections 3503 and 3513 during the typical nesting season (February 15–September 15). Suitable nesting and foraging habitats would include the Red Alder Forest, Coyote Brush Scrub, and ornamental trees within and adjacent to nearly all project areas. Nesting is unlikely outside of the typical nesting season, although some avian species may forage year-round near the project area. Avian species protected by the MBTA and California Fish and Game Code observed in the BSA during the May 2024 field survey are included in Appendix E. No nesting birds were observed during the field survey, which occurred well into the nesting season.

5.3 Critical Habitat

Mills Creek and Arroyo Leon are designated as critical habitat for Central California Coast DPS steelhead and Central California Coast Evolutionary Significant Unit (ESU) coho salmon (*Oncorhynchus kisutch*). However, it was determined that coho salmon are unlikely to occur due to the lack of suitable habitat and lack of recent occurrences of this species within the Pilarcitos Creek watershed as discussed in Section 5.2.2.4, *Coho Salmon (Central California Coast ESU)*, and in Table C-1 in Appendix C.

The BSA is not located within designated or proposed critical habitat for any other terrestrial species. Critical habitat for California red-legged frog is present approximately 1.5 mile north of the BSA. Designated critical habitat for western snowy plover (*Charadrius nivosus nivosus*) is located approximately 2.7 miles northwest of the BSA.

5.4 Essential Fish Habitat

The Pacific Fishery Management Council (PFMC) has delineated Essential Fish Habitat (EFH) for the Pacific Salmon Fishery Management Plan (FMP). The FMP identifies coho salmon freshwater EFH within nearly every all of the Pacific coast drainages within San Mateo County (NOAA Fisheries 2024a). As defined in the FMP, the coho salmon freshwater EFH includes all waterbodies currently or historically occupied by PFMC-managed coho in Washington, Oregon, Idaho, and California. Relevant habitat parameters for coho salmon freshwater EFH include 1) spawning and incubation, 2) juvenile rearing, 3) juvenile migration corridors, and 4) adult migration corridors (NOAA Fisheries 2024a).

Mills Creek likely does not contain suitable freshwater spawning/incubation or rearing habitat for coho salmon. As discussed in Section 5.2.2.4, *Coho Salmon (Central California Coast ESU)*, and in Table C-1 in Appendix C, coho salmon are unlikely to occur due to the lack of suitable habitat and lack of recent occurrences of this species within the Pilarcitos Creek watershed. There are no recent CNDDB occurrences of coho salmon within 2 miles of the BSA (CDFW 2024a). No coho salmon were captured via electrofishing in Arroyo Leon and Pilarcitos Creek in 2011 by CDFW (CDFW 2013). In addition, the BSA does not contain any marine habitat that could support coho salmon. While coho salmon is not expected to occur in the watershed or in the BSA, the Pilarcitos Creek watershed is mapped as Pacific Coast Salmon EFH.

5.5 Jurisdictional Waters

No wetlands were observed in the BSA. Approximately 1.47 acres (63,871 square feet) of potentially jurisdictional streambed and riparian non-wetlands waters were mapped in the BSA, as depicted in Figure 5. These features include a perennial channel and associated riparian vegetation; photographs of potentially jurisdictional features are included in Appendix A.

In accordance with the 2023 WOTUS final rule amendment, which updated the definition of WOTUS, perennial channels would likely be considered Relatively Permanent Waters and would be considered USACE jurisdictional where they maintain consistent or continuous surface water connections to downstream jurisdictional waters. Mills Creek, within the BSA, is likely considered jurisdictional under the USACE, RWQCB/State Water Board, and CDFW.

Riparian vegetation along Mills Creek, within the BSA, was dominated by Red Alder Forest with a sparse to moderately dense canopy in the tree and shrub layer. Red alder is dominant or co-dominant in the tree canopy along with other riparian species such as arroyo willows. The understory of Red Alder Forest, within the survey area, was dominated by hedge nettle, red elderberry, thimbleberry, and salmonberry. The streambed of Mills Creek is largely unvegetated consisting of mostly runs with a few riffles averaging 8 inches in depth and occasional small pools reaching 2 feet in depth. The substrate present consisted of a mixture of fine/silt, small cobble, and exposed bedrock.

5.6 Sensitive Natural Communities

The BSA contains one sensitive natural community: Red Alder Forest. Project activities are likely to significantly impact Red Alder Forest habitat as the majority of proposed activities would occur along the

westbound shoulder of Higgins Canyon Road, which lies adjacent to Mills Creek and its riparian corridor. Project activities would require the removal of vegetation along Mills Creek to facilitate repairs. Project activities would result in up to 0.16 acre (6,782 square feet) of permanent impacts and 0.03 acre (1,118 square feet) of temporary impacts to Red Alder Forest habitat. The implementation of BMPs from the County RMP (GEN-1 through GEN-14, GEN-22, GEN-23, GEN-25 through GEN-28, and BIO-18) (Montrose Environmental 2023; Appendix F) would minimize impacts from temporary disturbance, vegetation removal, and the spread of invasive plant species. Project areas that are permanently and temporarily disturbed during construction shall be restored as described in the project Revegetation Plan (Appendix G). Direct and indirect impacts to Red Alder Forest will be avoided and minimized to the extent possible through the implementation of the BMPs listed above.

5.7 Special-Status Species

5.7.1 Potential Impacts to Special-Status Plants

None of the eight special-status plants identified in the background research (see Table C-1 in Appendix C) are likely to occur in the BSA due to the lack of suitable habitat. The May 2, 2024, field survey was conducted during the blooming period for seven of the plant species and no special-status plants were observed. The one special-status plant species with a blooming period outside of when the field survey occurred, wooly-headed lessingia (*Lessingia hololeuca*), has no potential to be within the BSA due to a lack of suitable habitat. Therefore, impacts to special-status plants as a result of project activities are not expected to occur.

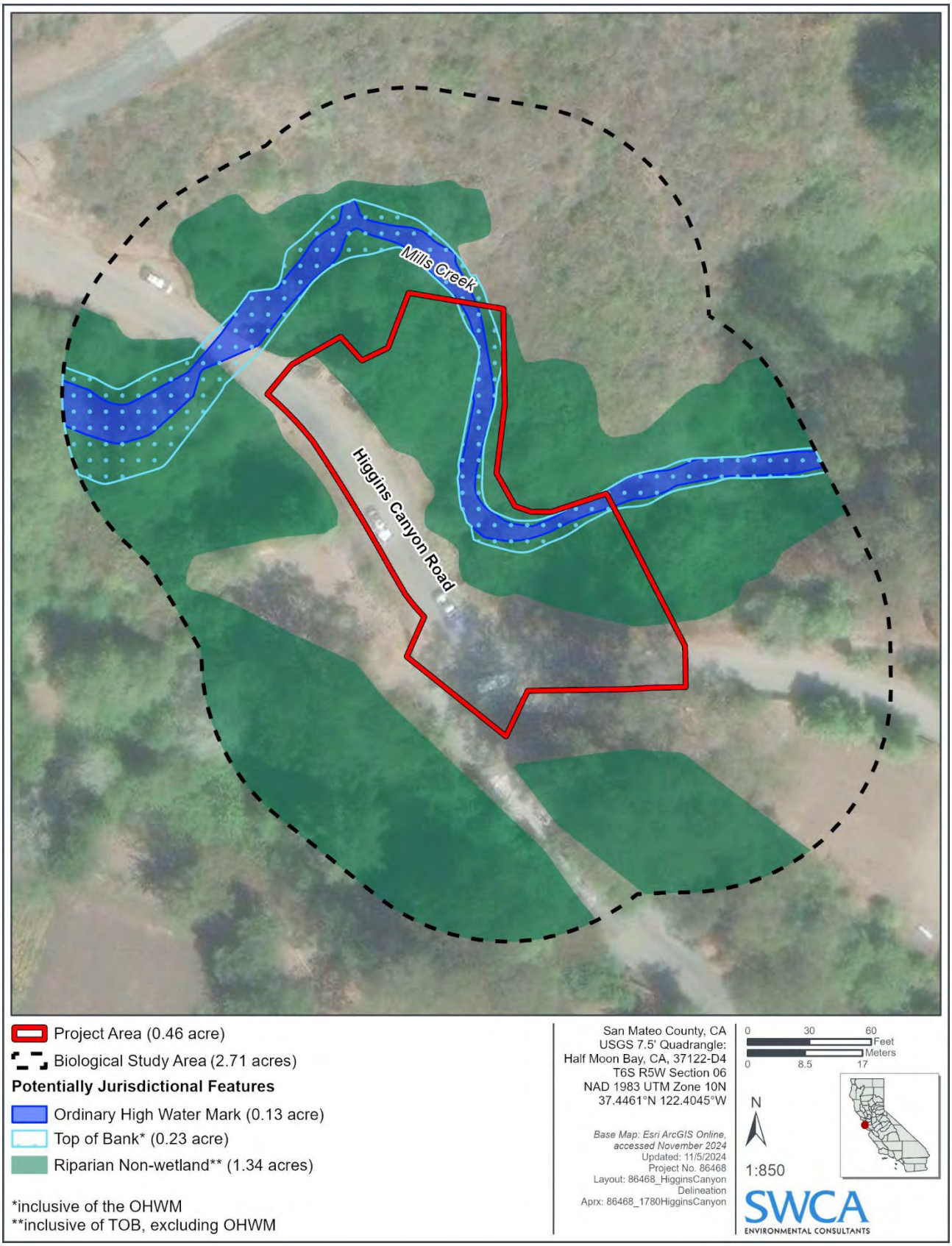


Figure 5. Delineation results map within the BSA.

5.7.2 Potential Impacts to Special-Status Wildlife

California red-legged frog, San Francisco garter snake, steelhead (Central California Coast DPS), coho salmon (Central California Coast ESU), California giant salamander, and San Francisco dusky-footed woodrat were determined to have potential to occur in the project area based on habitat suitability, proximity of recent occurrences, and species' geographic ranges. Therefore, there is the potential for these species to be adversely impacted by project activities. The implementation of County RMP BMPs GEN 1 through 28, BIO-1, BIO-2, BIO-3, BIO-5, BIO-7, BIO-8, BIO-19, BIO-21, and BIO-24 would prevent harm to wildlife that may be present during project construction (see Appendix F).

5.7.2.1 CALIFORNIA RED-LEGGED FROG

Based on recent records of California red-legged frog within the vicinity of the BSA, there are likely to be frogs present in the BSA. California red-legged frog is most likely to occur in the channel and riparian areas along Mills Creek and Arroyo Leon. Therefore, construction activities within the riparian zone could result in disturbance, injury, and/or mortality. This species may also occur in upland habitats within the BSA, especially areas with suitable cover. Impacts to adult and juvenile frogs could occur as a result of construction activities. Individuals could be crushed by equipment or entrained into the dewatering pump, causing injury or mortality. Potential direct impacts could occur if California red-legged frog individuals were to enter the active project area or staging area during project activities and be killed or injured by project equipment or vehicle traffic. County RMP BMP BIO-3 includes measures such as preconstruction surveys, biological monitoring, and dry and daylight work restrictions to avoid potential direct impacts to California red-legged frog (see Appendix F).

The potential for harm or mortality of California red-legged frog may still exist during project construction despite efforts by the contractor to avoid it. A portion of Mills Creek will be dewatered to facilitate repair activities. Therefore, frogs may need to be relocated from the project area by a qualified biologist, as described in County RMP BMP BIO-2 (see Appendix F), to prevent injury or mortality should they enter the project area.

Potential indirect impacts to California red-legged frog could include temporary alteration of migration behavior because of project activities. Construction noise may also disturb frogs in the vicinity of the project area. Project activities are limited to maintenance and repair of existing infrastructure and would not result in the creation of any new permanent barriers that would prevent dispersal of California red-legged frog between stock ponds and wetlands or other suitable breeding sites within the vicinity of the BSA. The project is therefore unlikely to substantially interfere with California red-legged frog dispersal. Indirect effects to California red-legged frog also include potential increased erosion and sedimentation or release of hazardous substances, associated with equipment spills, within aquatic habitat. County RMP BMPs GEN-1 through GEN-28; EC-1, EC-3, EC-5, EC-6, EC-7, EC-8, EC-9, EC-10, and EC-13 (Erosion Control Measures); SC-1, SC-2, SC-3, SC-4, SC-7, and SC-8 (Sediment/Water Quality Control Measures); and DW-1 are designed to avoid and minimize potential impacts to aquatic habitat associated with erosion, sedimentation, and release of hazardous substances (see Appendix F). Indirect project impacts to California red-legged frog are not anticipated with the implementation of these BMPs. In addition, habitat enhancement is part of the project design and will ultimately improve and stabilize the existing habitat for California red-legged frog in the project area.

Project activities will result in a total of approximately 0.03 acre of temporary impacts and approximately 0.20 acre of permanent impacts to suitable California red-legged frog non-breeding, foraging, and dispersal habitat (i.e., Red Alder Forest, open water, and ruderal disturbed). The temporary and permanent impact areas would be restored. Restoration of the permanent impact area includes the addition of features such as an engineered creek bed with specimen boulders and rootwads, vegetated soil lifts, and vegetated boulder revetment to provide habitat and promote channel diversity. The proposed actions of

biostabilization and vegetated revetment will enhance habitat following the completion of the project. Specifically, the suitability of the site for California red-legged frog with added vegetation on the banks of Mills Creek providing instream cover and habitat complexity could lead to long-term benefits for dispersing California red-legged frog. In addition, the placement of large woody debris and specimen boulders would increase the structural richness of Mills Creek. Finally, bank stabilization would improve the stability of the banks, reduce incision and erosion, and improve habitat quality on the portion of Mills Creek in the project area.

5.7.2.2 SAN FRANCISCO GARTER SNAKE

Potential direct impacts to San Francisco garter snake could occur if individuals were to enter the active project area or staging area during project activities and be killed or injured by project equipment or vehicle traffic. Project activities may also cause San Francisco garter snake to alter activity patterns to avoid the area, and disruptions in activity of prey species such as California red-legged frog may temporarily decrease the suitability of the immediate BSA for San Francisco garter snake foraging. With implementation of seasonal restrictions, pre-activity surveys, speed limit restrictions, and staged material best practices, under County RMP BIO-5, potential direct impacts to San Francisco garter snake should be avoided (see Appendix F).San Francisco garter snake could be indirectly impacted by potential erosion and sedimentation during construction activities. There is potential for increased erosion and sedimentation due to the temporary loss of herbaceous vegetation. Erosion control measures would be implemented during construction (e.g., BMPs GEN-1 through GEN-28; EC-1, EC-3, EC-5, EC-6, EC-7, EC-8, EC-9, EC-10, and EC-13 (Erosion Control Measures); SC-1, SC-2, SC-3, SC-4, SC-7, and SC-8 (Sediment/Water Quality Control Measures); and DW-1 in Appendix F). Following completion of the project, the suitability of the site for San Francisco garter snake will likely be improved with the addition of features such as an engineered creek bed with specimen boulders and rootwads, vegetated soil lifts, and vegetated boulder revetment to provide habitat and promote channel diversity. In addition, the placement of large woody debris and specimen boulders would increase the structural richness of Mills Creek. Finally, bank stabilization would improve the stability of the banks, reduce incision and erosion, and improve habitat quality on the portion of Mills Creek in the project area.

Project activities will result in a total of approximately 0.03 acre of temporary impacts and approximately 0.18 acre of permanent impacts to suitable San Francisco garter snake foraging, dispersal, and refuge habitat (i.e., Red Alder Forest and open water). As with California red-legged frog above, the temporary and permanent impact areas would be restored. Restoration of the permanent impact area includes the addition of features such as an engineered creek bed with specimen boulders and rootwads, vegetated soil lifts, and vegetated boulder revetment to provide habitat and promote channel diversity. The proposed actions of biostabilization and vegetated revetment will enhance habitat following the completion of the project. Specifically, the suitability of the site for San Francisco garter snake with added vegetation on the banks of Mills Creek providing instream cover and habitat complexity could lead to long-term benefits for dispersing or foraging individuals. In addition, the placement of large woody debris and specimen boulders would increase the structural richness of Mills Creek. Finally, bank stabilization would improve the stability of the banks, reduce incision and erosion, and improve habitat quality on the portion of Mills Creek in the project area.

5.7.2.3 WESTERN POND TURTLE

Based on a lack of recent occurrences of WPT within the watershed and marginal habitat, it is possible, but unlikely, for WPT to be present within the project area. WPT is most likely to occur within the Mills Creek channel, but may also occur in the riparian area. Therefore, construction activities within the channel and riparian area could result in disturbance, injury, and/or mortality.

Potential direct impacts to WPT could occur if individuals were to enter the active project area or staging area during project activities and be killed or injured by project equipment or vehicle traffic. Project activities may also cause WPT to alter activity patterns to avoid the area and decrease the suitability of the project area for WPT foraging. With implementation of pre-activity surveys and avoidance under County RMP BIO-6, potential direct impacts to WPT should be avoided (see Appendix F). A portion of Mills Creek will be dewatered to facilitate repair activities. Therefore, WPT may need to be relocated from the project area by a qualified biologist to prevent injury or mortality should they enter the project area.

WPT could be indirectly impacted by potential erosion and sedimentation during construction activities. There is potential for increased erosion and sedimentation due to the temporary loss of herbaceous vegetation. Erosion control measures would be implemented during construction (e.g., BMPs GEN-1 through GEN-28; EC-1, EC-3, EC-5, EC-6, EC-7, EC-8, EC-9, EC-10, and EC-13 (Erosion Control Measures); SC-1, SC-2, SC-3, SC-4, SC-7, and SC-8 (Sediment/Water Quality Control Measures); and DW-1 in Appendix F). Following completion of the project, the suitability of the site for WPT will likely be improved with the addition of features such as an engineered creek bed with specimen boulders and rootwads, vegetated soil lifts, and vegetated boulder revetment to provide habitat and promote channel diversity. In addition, the placement of large woody debris and specimen boulders would increase the structural richness of Mills Creek. Finally, bank stabilization would improve the stability of the banks, reduce incision and erosion, and improve habitat quality on the portion of Mills Creek in the project area.

Project activities will result in a total of approximately 0.03 acre of temporary impacts and approximately 0.18 acre of permanent impacts to suitable WPT foraging, dispersal, and refuge habitat (i.e., Red Alder Forest and open water). As with California red-legged frog and San Francisco garter snake above, the temporary and permanent impact areas would be restored. The proposed actions of biostabilization and vegetated revetment will enhance habitat following the completion of the project.

5.7.2.4 STEELHEAD AND COHO SALMON

Mills Creek likely contains suitable rearing habitat for juvenile steelhead and coho salmon. However, the portion of Mills Creek within the BSA does not contain ideal spawning habitat for steelhead and the project will be occurring outside of spawning season. Although Mills Creek contains marginal rearing habitat for coho salmon (i.e., lacks deep pools, slow water habitat, and ample cover), suitable spawning habitat for this species is not present within the BSA. There are records of steelhead occurring within Mills Creek as recently as 2022, and steelhead could enter the BSA traveling upstream from Arroyo Leon. Coho has not been documented in the Pilarcitos Creek watershed, but there is some potential, however unlikely, for a stray adult from the Scotts Creek hatchery to enter the watershed to spawn outside of the BSA.

Construction activities within Mills Creek could result in disturbance, injury, and/or mortality of steelhead and coho salmon (although rare). Potential direct impacts could occur if salmonid individuals were to enter the active project area during project activities and be killed or injured by project equipment. To ensure salmonids will not use the active work area, a portion of Mills Creek will be dewatered. Prior to dewatering, steelhead may need to be relocated from the dewatered area by a qualified biologist, as described in County RMP BMP BIO-2 (see Appendix F), to prevent injury or mortality should they enter the area during the dewatering process. Coho salmon that could be captured as a result of dewatering would be limited to young-of-the-year and pre-smolting juveniles. However, coho salmon juveniles are not anticipated due to the lack of spawning habitat in the Pilarcitos Creek watershed.

Potential indirect impacts to salmonids could include temporary alteration of migration behavior because of project activities. Project activities would likely result in the creation of temporary barriers (i.e., cofferdam) that would inhibit the upstream and downstream migration of salmonids. However, all work within Mills Creek will occur outside of the migration season for salmonids, which generally takes place

during the rainy season (November–March). Indirect effects to salmonids also include potential increased erosion and sedimentation or release of hazardous substances, associated with equipment spills, within aquatic habitat. County RMP BMPs GEN-1 through GEN-28; EC-1, EC-3, EC-5, EC-6, EC-7, EC-8, EC-9, EC-10, and EC-13 (Erosion Control Measures); SC-1, SC-2, SC-3, SC-4, SC-7, and SC-8 (Sediment/Water Quality Control Measures); and DW-1 are designed to avoid and minimize potential impacts to aquatic habitat associated with erosion, sedimentation, and release of hazardous substances (see Appendix F). Indirect project impacts to salmonids are not anticipated with the implementation of these BMPs.

Project activities will result in a total of approximately 0.01 acre of temporary and approximately 0.02 acre of permanent impacts to suitable salmonid stream habitat. However, as discussed above under California red-legged frog and San Francisco garter snake, the temporary and permanent impact areas would be restored. Restoration of the permanent impact area includes the addition of features such as an engineered creek bed, specimen boulders, rootwads, vegetated soil lifts, and vegetated boulder revetment to provide habitat and promote channel diversity. The proposed actions of biostabilization and vegetated revetment will enhance habitat following the completion of the project. Specifically, the suitability of the enhancement at the site will provide instream cover and habitat complexity that could lead to long-term benefits for salmonids. In addition, the placement of large woody debris and specimen boulders would increase the structural richness of Mills Creek. Finally, bank stabilization would improve the stability of the banks, reduce incision and erosion, and improve habitat quality on the portion of Mills Creek in the project area.

Mills Creek and the rest of the Pilarcitos Creek watershed are designated critical habitat for steelhead and coho salmon (NOAA Fisheries 2024b). Project activities are not expected to adversely impact steelhead or coho salmon critical habitat since the impacts will be localized and small in scale. In addition, the project will ultimately enhance habitat within this portion of Mills Creek as described above.

5.7.2.5 CALIFORNIA GIANT SALAMANDER

Project activities have the potential to adversely impact California giant salamander. This species may occur in riparian areas within the BSA along Mills Creek. Potential direct impacts could occur if individuals were to enter the active project area or staging area during project activities and be killed or injured by project equipment or vehicle traffic. The implementation of County RMP BMP BIO-6 should avoid potential direct impacts to California giant salamander (see Appendix F).

The potential for harm or mortality of California giant salamander may still exist during project construction despite efforts by the contractor to avoid it. A portion of Mills Creek will be dewatered to facilitate repair activities. Therefore, salamanders may need to be relocated from the project area by a qualified biologist, as described in County RMP BMP BIO-6 (see Appendix F), to prevent injury or mortality should they enter the project area.

Potential indirect impacts to California giant salamander could include temporary alteration of migration behavior because of project activities. Project activities would not result in the creation of any new permanent barriers to migration. The project is, therefore, not likely to result in substantial interference with amphibian migration and dispersal. Indirect effects to California giant salamander also include potential increased erosion and sedimentation or release of hazardous substances, associated with equipment spills, within aquatic habitat. County RMP BMPs EC-1, EC-3, EC-5, EC-6, EC-7, EC-8, EC-9, EC-10, and EC-13 (Erosion Control Measures); SC-1, SC-2, SC-3, SC-4, SC-7, and SC-8 (Sediment/Water Quality Control Measures); and DW-1 are designed to avoid and minimize potential impacts to aquatic habitat associated with erosion, sedimentation, and release of hazardous substances. Project impacts to California giant salamander are not anticipated with the implementation of the aforementioned BMPs.

5.7.2.6 SAN FRANCISCO DUSKY-FOOTED WOODRAT

San Francisco dusky-footed woodrat is known to exist in the BSA. San Francisco dusky-footed woodrat or nests (i.e., middens) were not observed during the survey; however, individuals could enter the BSA and construct nests before and/or during project activities. Direct impacts to the species could include being killed or injured by project equipment or vehicle traffic and construction activities within the project area could result in temporary impacts of disturbance to individuals or nests. County RMP BMP BIO-8 minimizes impacts to San Francisco dusky-footed woodrat nests through surveys by a qualified biologist 2 weeks prior to construction activities and providing a 10-foot buffer for any nests observed. In addition, County RMP BMP BIO-1 requires environmental awareness training, which includes species field identification and locations of sensitive biological resources. In addition, County RMP BMPs GEN 1 through 28 will further minimize impacts to San Francisco dusky-footed woodrat habitat. Project impacts to San Francisco dusky-footed woodrat are not anticipated with the implementation of the aforementioned BMPs. The species could benefit from habitat enhancement through bank stabilization, which provides stability of the banks, reduces incision and erosion, and improves structural richness on the portion of Mills Creek in the project area.

5.7.2.7 ROOSTING BATS

There are no recent CNDDB occurrences of special-status bat species within 2 miles of the BSA (CDFW 2024a). However, there is suitable habitat for roosting bats within the eucalyptus and other trees bordering the BSA that may be impacted by project activities. No bat roosts or bat roosting evidence (urine staining or guano) was observed during the reconnaissance-level bat survey for the project. In addition, County RMP BMP BIO-14 will ensure that no bat roosts are present and any observed bat roosts are adequately protected. Therefore, impacts to roosting bats are not anticipated with the implementation of the BMPs.

5.7.2.8 NESTING MIGRATORY BIRDS/RAPTORS

The BSA contains suitable nesting and foraging habitat for special-status bird species protected under the MBTA and California Fish and Game Code Sections 3503 and 3513 during the typical nesting season (February 15–September 15). Suitable nesting and forging habitats would include the trees and shrubs within and adjacent to BSA. Nesting is unlikely outside of the typical nesting season, although some avian species may forage year-round near the project area.

Project activities will require the removal of vegetation in the riparian zone and could result in impacts to nesting birds in the form of disturbance, injury, and/or mortality. Disturbance due to noise, dust, or vibration from construction equipment may also result in nest abandonment if nesting birds are present within the vicinity of any of the project areas during construction. Nest abandonment would be considered a significant impact under CEQA. Therefore, preconstruction nesting surveys as described in County RMP BMP BIO-9 will be implemented to minimize any impacts to nesting birds that may occur in the BSA (see Appendix F). Project impacts to nesting birds are not anticipated with implementation of this BMP.

5.8 Wildlife Habitat and Movement Corridors

Riparian corridors and contiguous habitat in the project area and adjacent habitats provide suitable wildlife and migration habitat for amphibians, reptiles, birds, and mammals. However, the short duration of construction activities are unlikely to substantially disrupt the migration of animals through the above-described areas. Given the above, and with implementation of County RMP BMPs GEN-1, GEN-2, GEN-

27, BIO-2, BIO-19, and BIO-21 (see Appendix F), the project is not expected to interfere substantially with the movement of any native resident or migratory wildlife.

5.9 Potential Impacts to Critical Habitat and Essential Fish Habitat

See Section 5.4 for a discussion of Essential Fish Habitat. As mentioned in Section 5.2, *Special-Status Species*, Mills Creek and the rest of the Pilarcitos Creek watershed are designated critical habitat for steelhead and coho salmon (NOAA Fisheries 2024b). Project activities are not expected to result in adverse modification to steelhead or coho salmon critical habitat due to the relatively small impact area and the implementation of proposed habitat enhancement such as increased vegetation cover and placement of large woody debris in the project area. In addition, the implementation of water quality measures as described in County RMP BMPs EC-1 through EC-14, SC-1 through SC-8, and DW-1, as well post-project stream restoration as described in County RMP BMP BIO-19, will reduce potential impacts to steelhead and coho salmon critical habitat (see Appendix F).

5.10 Potential Impacts to Jurisdictional Wetlands/Waters

Approximately 1.47 acres (64,053 square feet) of potentially jurisdictional perennial streams and riparian non-wetland were mapped in the BSA, as depicted in Figure 5. Anticipated impacts to jurisdictional aquatic resources were determined by proximity of these features to project areas as well as the specific work activities proposed along each road segment. Anticipated impacts to each potentially jurisdictional feature are not quantified in this report, but they are summarized below. See Appendix D of the *Preliminary Jurisdictional Delineation Report for the Slip-Out Repair and Bank Stabilization near 1780 Higgins Canyon Road Project, San Mateo County, California* (SWCA 2024) for a summary of all delineated features present within the BSA (ORM Upload Sheet).

Installation of the retaining wall and engineered creek bed may directly impact the jurisdictional feature of Mills Creek and its associated riparian vegetation along Higgins Canyon Road. Such impacts will likely require the County to obtain a Section 404 permit from the USACE, a Section 401 Water Quality Certification from the RWQCB, a Section 1602 LSAA from the CDFW, and a CDP from the County.

Impacts to jurisdictional features are anticipated to require authorizations from the afore-mentioned regulatory agencies. Impacts to all jurisdictional aquatic features will be reduced with implementation of County RMP BMPs (see Appendix F) to project water quality and those measures required under regulatory agency wetland/waters authorizations.

As shown in Table 3, approximately 0.01 acre of temporary impacts and 0.02 permanent fill to the perennial stream will occur as a result of the project. In addition, approximately 0.03 acre of temporary impacts and 0.16 acre of permanent fill to riparian habitat will occur as a result of the project. All temporary and permanent impact areas would be restored. Restoration of the permanent impact area includes the addition of features such as an engineered creek bed with specimen boulders and rootwads, vegetated soil lifts, and vegetated boulder revetment to provide habitat and promote channel diversity.

The proposed actions of biostabilization and vegetated revetment will enhance habitat following the completion of the project. Specifically, the suitability of the enhancement at the site will provide instream cover and habitat complexity that could lead to long-term benefits to the watershed. In addition, the placement of large woody debris and specimen boulders would increase the structural richness of Mills Creek. Finally, bank stabilization would improve the stability of the banks, reduce incision and erosion, and improve habitat quality on the portion of Mills Creek in the project area.

6 RECOMMENDATIONS/AVOIDANCE AND MINIMIZATION MEASURES

The project contractor will implement all applicable BMPs described in Table 9-1 of the County RMP (Montrose Environmental 2023) to avoid impacts to sensitive biological resources. These measures can be found in Appendix F. BMPs applicable to the project include the following:

- GEN-1 through GEN-28.
- EC-1, EC-3, EC-5, EC-6, EC-7, EC-8, EC-9, EC-10, EC-13 SC-1, SC-2, SC-3, SC-4, SC-7, SC-8
- SC-1, SC-2, SC-3, SC-4, SC-7, SC-8
- DW-1
- BIO-1 through BIO-3, BIO-5 through BIO-9, BIO-11, BIO-18, BIO-19, BIO-21, and BIO-24

In addition to the County RMP BMPs, the following avoidance and minimization measures (AMMs) are recommended to reduce or eliminate potentially significant biological impacts resulting from the project. These measures derive from previous guidance provided to the County by the USFWS, NOAA Fisheries, and CDFW; many are concurrent with the County RMP BMPs. These documents can be found in Appendix F. Specifically, the project will implement the following measures from the following sources:

- BMPs BIO-1, BIO-2, BIO-3, BIO-5, BIO-7, BIO-11, BIO-18, BIO-19, BIO-21, and BIO-24 from the Formal Consultation on the County of San Mateo Routine Maintenance Program in San Mateo County, California (Corps file number 2017-00213S) letter from USFWS (USFWS 2022)
- Measures 2.1 through 2.3, 2.5 through 2.42, 2.46, 2.47, 2.49 through 2.59, and 2.61 through 2.64 from the *Final Lake or Streambed Alteration Agreement, Notification No. 1600-2020-0144-R3, County of San Mateo Routine Maintenance Program Manual* (CDFW 2020)
- AMMs a, f, g, and i through q from the Endangered Species Act Section 7(a)(2) Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the County of San Mateo, Regional General Permit (NOAA Fisheries 2020)

In addition to the measures listed in this section, the project shall also adhere to any additional measures that may be required by the regulatory agencies (USACE, USFWS, NOAA Fisheries, CDFW, or RWQCB).

Table 3. Preliminary Jurisdictional Waters in the Survey Area and Impact Area

Potential Jurisdictional Waters[1]	Totals within the Survey Area			Temporary Impacts			Permanent Fill (Habitat Enhancement)[3]		
	Acres	Square Feet	Linear Feet[2]	Acres	Square Feet	Linear Feet	Acres	Square Feet	Linear Feet
USACE[4]									
WOTUS – Perennial Stream (Mills Creek)	0.13	5,681	170	0.01	382	57	0.02	915	114
State Water Board / RWQCB[5]									
Waters of the State – Perennial Stream (Mills Creek)	0.13	5,681	170	0.01	382	57	0.02	915	114
Waters of the State – Riparian Non-Wetland	1.34	58,190	NA	0.03	1,118		0.16	6,782	
Total Potential State Water Board / RWQCB Jurisdiction	**1.47**	**63,871**	**170**	**0.03**	**1,500**		**0.18**	**7,697**	
CDFW[6]									
Streambed (Mills Creek)	0.13	5,681	170	0.01	382	57	0.02	915	114
Riparian Non-Wetlands	1.34	58,190	NA	0.03	1,118		0.16	6,782	
Total Potential CDFW Jurisdiction	**1.47**	**63,871**	**170**	**0.03**	**1,500**		**0.18**	**7,697**	
LCP/CCA[7]									
Sensitive Habitat – Perennial Stream (Mills Creek)	0.13	5,681	170	0.01	382	57	0.02	915	114
Sensitive Habitat – Riparian Corridor	1.34	58,190	NA	0.03	1,118		0.16	6,782	
Total LCP/CCA Jurisdiction	**1.47**	**63,871**	**170**	**0.03**	**1,500**		**0.18**	**7,697**	

[1] Areas of potential jurisdiction are subject to final verification and approval by the regulatory agencies.

[2] Total linear footage is based on the largest linear length in the survey area.

[3] Project components that are permanently being placed in the project area are considered permanent fill, even though they may have overall beneficial impacts.

[4] Potential federal WOTUS include non-wetland portions of Mills Creek that occur at or below the OHWM. WOTUS within the survey area have been characterized as a "Perennial Stream."

[5] Potential waters of the state include a "Perennial Stream," a portion of Mills Creek occurring below the OHWM associated with potential WOTUS, and "Riparian Non-Wetland" habitat that includes areas above the OHWM to the outer edge of riparian vegetation associated with Mills Creek.

[6] Potential CDFW jurisdictional areas include a "Streambed" area that occurs below the OHWM associated with WOTUS and waters of the state characterized as a "Perennial Stream" and the "Riparian Non-Wetlands" habitat that includes TOB to the outer edge of riparian vegetation associated with Mills Creek, excluding areas within the OHWM.

[7] Potential LCP/CCA jurisdictional areas, called "Sensitive Habitat", include a "Perennial Stream" that occurs below the OHWM associated with WOTUS and waters of the state and a "Riparian Corridor" that extends above the OHWM to the outer edge of riparian vegetation associated with Mills Creek.

7 LITERATURE CITED

Albanese, Rosa. 2024. Senior Natural Resources Specialist. Woodrat nest observation. San Mateo County, California: County of San Mateo. July 11, 2024.

Baldwin, B., D. Goldman, D. Keil, R. Patterson, T. Rosatti (editors). 2012. *The Jepson Manual: Vascular Plants of California*. Second edition. Berkeley, California: University of California Press.

Becker, G.S. and I.J. Reining. 2008. *Steelhead/rainbow trout (Oncorhynchus mykiss) resources south of the Golden Gate, California*. Cartography by D.A. Asbury. Center for Ecosystem Management and Restoration. Oakland, CA.

California Department of Fish and Wildlife (CDFW). 2013a. *Stream Inventory Report: Arroyo Leon Creek*. California Department of Fish and Wildlife, San Mateo County, San Mateo Coastal Watersheds, Stream Habitat Assessment Reports. Available at: https://www.ca.gov/. Accessed July 2024.

———. 2013b. *Stream Inventory Report: Pilarcitos Creek*. San Mateo Coastal Watersheds Stream Habitat Assessment Reports. San Mateo County, California: California Department of Fish and Wildlife. Surveyed 2011; Report Completed in 2013. Available at: https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=94516. Accessed September 19, 2024.

———. 2020. *Final Lake or Streambed Alteration Agreement, Notification No. 1600-2020-0144-R3, County of San Mateo Routine Maintenance Program Manual*. To Krzysztof Lisaj, County of San Mateo Public Works Department. Redwood City, California. September 24.

———. 2022. *The Survey of California Vegetation Classification and Mapping Standards*. Available at: https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=102342&inline. Accessed May 7, 2024.

———. 2024a. California Natural Diversity Database. GIS data. Available at: https://wildlife.ca.gov/Data/CNDDB/Data-Updates. Accessed May 7, 2024.

———. 2024b. Natural Communities. June 1. Available at: https://wildlife.ca.gov/Data/VegCAMP/Natural-Communities#natural%20communities. Accessed May 7, 2024.

———. 2024c. *Special Vascular Plants, Bryophytes, and Lichens List*. October. Available at: https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=109383&inline. Accessed May 7, 2024.

———. 2024d. CNDDB – Plants and Animals. October. Available at: https://wildlife.ca.gov/Data/CNDDB/Plants-and-Animals. Accessed May 7, 2024.

———. 2024e. California Wildlife Habitat Relationship (CWHR). Available at: https://wildlife.ca.gov/Data/CWHR. Accessed on May 7, 2024.

California Fish and Game Commission. 1998. California Department of Fish and Wildlife – Fully Protected Animals. Available at: https://wildlife.ca.gov/Conservation/Fully-Protected. Accessed May 5, 2024.

California Native Plant Society (CNPS). 2024a. CNPS Rare Plant Inventory. Available at: https://www.rareplants.cnps.org/Search/Advanced. Accessed May 5, 2024.

———. 2024b. A Manual of California Vegetation Online. Available at: https://vegetation.cnps.org/. Accessed May 5, 2024.

Casagrande, Julie. 2024. Senior Natural Resources Specialist. Steelhead observation. San Mateo County, California: County of San Mateo. July 18, 2024.

Coast Ridge Ecology, LLC (CRE). 2022. Email Correspondence between Patrick Kobernus (Coast Ridge Ecology, LLC), and Ryan Olah (U.S. Fish and Wildlife Service). August 3 to August 5, 2022.

Consortium of California Herbaria. 2024. Biodiversity data provided by the participants of the Consortium of California Herbaria. Available at: https://ucjeps.berkeley.edu/consortium/. Accessed May 5, 2024.

Cornell Lab of Ornithology. 2024. eBird: An online database of bird distribution and abundance. Ithaca, New York: eBird, Cornell Lab of Ornithology. Available at: http://www.ebird.org. Accessed May 5, 2024.

County of San Mateo. 2023. *Higgins Canyon Road Bridge Repair Biological Monitoring Logs*. September 2022–January 2023. Unpublished.

Cowardin, L. M., V. Carter, F. C. Golet, E. T. LaRoe. 1979. *Classification of Wetlands and Deepwater Habitats of the United States*. Washington, D.C.: U.S. Department of the Interior, Fish and Wildlife Service.

David, G., K. Fritz, T. Nadeau, B. Topping, A. Allen, P. Trier, S. Kichefski, L. James, E. Wohl, and D. Hamill. 2022. *National Ordinary High Water Mark Field Delineation Manual for Rivers and Streams - Interim Version*. Technical Report ERDC/EL TR-22-26. Vicksburg, Mississippi: U.S. Army Engineer Research and Development Center.

Environmental Laboratory. 1987. *Corps of Engineers Wetlands Delineation Manual*. Technical Report Y-87-1. Vicksburg, Mississippi: U.S. Army Engineer Waterways Experiment Station.

Hayes, D. W., K. R. McAllister, S.A. Richardson, and D.W. Stinson. 1999. *Washington state recovery plan for the western pond turtle*. Washington Department of Fish and Wildlife. Olympia, WA.

H. T. Harvey & Associates. 2019a. *County of San Mateo Routine Maintenance. NMFS Biological Assessment/EFH Assessment*. Prepared for the County of San Mateo, Redwood City, California. April 8.

———. 2019b. *County of San Mateo Routine Maintenance. USFWS Biological Assessment*. Prepared for the County of San Mateo, Redwood City, California. April 9.

Horizon Water and Environment. 2019. *County of San Mateo Routine Maintenance Program, Aquatic Resources Delineation Report.* Prepared for the County of San Mateo, Redwood City, California. March 2019.

Jennings, M. R. and M. P. Hayes. 1994. *Amphibian and Reptile Species of Concern in California*. Sacramento, California: California Department of Fish and Game.

Jepson Flora Project (eds.). 2024. Jepson eFlora. Available at: https://ucjeps.berkeley.edu/eflora/. Accessed May 3, 2024.

Lichvar, R.W., D.L. Banks, W.N. Kirchner, and N.C. Melvin. 2020. The National Wetland Plant List: 2020 wetland ratings. Available at: https://cwbi-app.sec.usace.army.mil/nwpl_static/data/DOC/lists_2020/National/National_2020v1.pdf. Accessed May 5, 2024.

Linsdale, J.M., and L.P. Tevis. 1951. The Dusky-Footed Wood Rat: A Record of Observations Made on the Hastings Natural History Reservation. Berkeley, California: University of California Press.

Montrose Environmental. 2023. *County of San Mateo Routine Maintenance Program Manual*. Prepared for San Mateo County, Oakland, California. Revised May 2023. Available at: https://www.smcgov.org/publicworks/county-san-mateo-routine-maintenance-program. Accessed May 9, 2024.

Moyle, P.B. 2002. *Inland Fishes of California*. Berkeley, California: University of California Press.

National Drought Mitigation Center. 2024. U.S. Drought Monitor – California. Available at: https://droughtmonitor.unl.edu/CurrentMap/StateDroughtMonitor.aspx?CA. Accessed May 2024.

National Oceanic and Atmospheric Administration National Marine Fisheries Service (NOAA Fisheries). 2012. *Recovery plan for the evolutionarily significant unit of Central California Coast coho salmon. Volume 1*. Sacramento, California: National Marine Fisheries Service, California Central Valley Area Office.

———. 2020. *Endangered Species Act Section 7(a)(2) Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the County of San Mateo, Regional General Permit*. Addressed to James Mazza, Chief, Regulatory Division Department of the Army San Francisco District, Corps of Engineers, San Francisco, California. August 21.

———. 2021. *Endangered Species Act Section 7(a)(2) Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for San Mateo State-Route 1 (SR-1) and SR-84 Structures and Scour Mitigation Project (04-2J790)*. Addressed to Cristin Hallisy, California Department of Transportation, Region 4, Oakland, California. April 28.

———. 2024a. Essential Fish Habitat Mapper. Available at: https://www.habitat.noaa.gov/apps/efhmapper/?page=page_4. Accessed March 5, 2024.

———. 2024b. National NMFS ESA Critical Habitat Mapper. Available at: https://noaa.maps.arcgis.com/apps/webappviewer/index.html?id=68d8df16b39c48fe9f60640692d0e318. Accessed March 5, 2024.

National Weather Service. 2024. Past climate data for Sonoma County AP, California. Available at: https://www.weather.gov/. Accessed May 5, 2024.

Natural Resources Conservation Service (NRCS). 2024. Web Soil Survey. U.S. Department of Agriculture, Natural Resources Conservation Service. Available at: https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx. Accessed May 7, 2024.

Nussbaum, R. A., and G. W. Clothier. 1973. Population structure, growth, and size of larval *Dicamptodon ensatus* (*Eschscholtz*). *Northwest Science* 47:218–227.

Philip Williams & Associates, Ltd. 1996. *Pilarcitos Creek Restoration Plan.* Prepared for Regional Water Quality Control Board and California Department of Fish and Game.

San Mateo Resource Conservation District. 2008. *Pilarcitos Integrated Watershed Management Plan*. San Francisco, California: Philip Williams & Associates, Ltd. October 24.

Sawyer, J. O., T. Keeler-Wolf, and J. M. Evens. 2009. *A Manual of California Vegetation*. Second edition. Sacramento, California: California Native Plant Society.

Stebbins, R. C. 1972. *California Amphibians and Reptiles*. Berkeley, California: University of California Press.

———. R. C. 1985. *A Field Guide to Western Reptiles and Amphibians*. Boston, Massachusetts: Houghton Mifflin Co.

SWCA Environmental Consultants. 2023. *Biological Resources Evaluation for the Pilarcitos Avenue/Kehoe Watercourse Outfall Repair Project, Half Moon Bay, San Mateo County, California*. Half Moon Bay, California: SWCA Environmental Consultants. Revised December.

———. 2024. *Preliminary Jurisdictional Delineation Report for the Slip-Out Repair and Bank Stabilization near 1780 Higgins Canyon Road Project, San Mateo County, California*. Half Moon Bay, California: SWCA Environmental Consultants.

Titus, R. G., D. C. Erman, and W. M. Snider. *2002. History and Status of steelhead in California Coastal Drainages South of San Francisco Bay.* In preparation

U.S. Army Corps of Engineers (USACE). 2024. Antecedent Precipitation Tool (APT), Version 1.0. USACE. May 2. Available at: https://github.com/jDeters-USACE/Antecedent-Precipitation-Tool/releases/tag/v1.0. Accessed May 20, 2024.

U.S. Environmental Protection Agency (EPA). 2013. Level III ecoregions of the continental United States: Corvallis, Oregon, U.S. EPA – National Health and Environmental Effects Research Laboratory, map scale 1:7,500,000, Available at: https://gaftp.epa.gov/EPADataCommons/ORD/Ecoregions/us/Eco_Level_III_US.pdf. Accessed June 2024.

———. 2024. Section 404 of the Clean Water Act: Learn About Streams. Available at: https://www.epa.gov/cwa-404/learn-about-streams. Accessed May 5, 2024.

U.S. Fish and Wildlife Service (USFWS). 2002. *Recovery Plan for the California Red-legged Frog (*Rana aurora draytonii*)*. Portland, Oregon: U.S. Fish and Wildlife Service.

———. 2006. *San Francisco Garter Snake (*Thamnophis sirtalis tetrataenia*) 5-year Review: Summary and Evaluation*. Sacramento, California: U.S. Fish and Wildlife Service, Sacramento Field Office.

———. 2007. *Endangered Species Accounts: San Francisco Garter Snake (*Thamnophis sirtalis tetrataenia*)*.

———. 2017. Species Information: San Francisco Garter Snake. Available at: https://www.fws.gov/species/san-francisco-garter-snake-thamnophis-sirtalis-tetrataenia. Accessed May 5, 2024.

———. 2020. Species Status Assessment for the San Francisco garter snake (*Thamnophis sirtalis tetrataenia*), Version 1.0. May 2020. Sacramento, California.

———. 2022. *Formal Consultation on the County of San Mateo Routine Maintenance Program in San Mateo County, California (Corps file number 2017-00213S).* Attn: Sarah Firestone, San Francisco District, U.S. Army Corps of Engineers, San Francisco, California. February 15.

———. 2023a. *Endangered and Threatened Wildlife and Plants; Threatened Species Status With Section 4(d) Rule for the Northwestern Pond Turtle and Southwestern Pond Turtle*. Federal Register 88: 68370-68399.

———. 2023b. *Species status assessment report for the northwestern pond turtle (*Actinemys marmorata*) and southwestern pond turtle (*Actinemys pallida*)*. Version 1.1, April 2023. U.S. Fish and Wildlife Service, Ventura Fish and Wildlife Office, Ventura, California.

———. 2024a. Information for Planning and Consultation. Available at: https://ecos.fws.gov/ipac/. Accessed May 5, 2024.

———. 2024b. Critical Habitat Portal. Available at: http://criticalhabitat.fws.gov/. Accessed May 5, 2024.

———. 2024c. National Wetlands Inventory Data. Available at: https://www.fws.gov/wetlands/data/data-download.html. Accessed May 5, 2024.

U.S. Forest Service. 2023. Bumblebees (*Bombus* spp.). Available at: https://www.fs.usda.gov/wildflowers/pollinators/pollinator-of-the-month/bumblebees.shtml Accessed May 5, 2024.

U.S. Geological Survey (USGS). 2024a. National Hydrography Dataset GIS Data. Available at: http://nhd.usgs.gov/. Accessed May 9, 2024.

———. 2024b. USGS Topographic Maps of California. Available at: https://www.library.ucsb.edu/src/maps/usgs-topo-maps-california. Accessed May 9, 2024.

Western Bat Working Group. 2023. About Bats. Available at: https://wbwg.org/. Accessed May 5, 2024.

Wetlands and Water Resources, Inc. 2010. *Pilarcitos Lagoon Habitat Enhancement Feasibility Study Final Report*. Prepared for San Mateo County Resource Conservation District. May 11, 2010.

Xerces Society for Invertebrate Conservation. 2016. State of the Monarch Butterfly Overwintering Sites in California. Prepared for the U.S. Fish and Wildlife Service. June. Available at: https://xerces.org/sites/default/files/2018-05/16-015_01_XercesSoc_State-of-Monarch-Overwintering-Sites-in-California_web.pdf. Accessed June 1, 2024.

———. 2024. Western Bumble Bee (*Bombus occidentalis*) species profile. Available at: https://xerces.org/endangered-species/species-profiles/at-risk-bumble-bees/western-bumble-bee. Accessed June 1, 2024.

APPENDIX A

Representative Photographs



Photograph A-1. Higgins Canyon Road bridge over Mills Creek just outside of the project area; view facing southeast. Photograph taken May 2, 2024.



Photograph A-2. Mills Creek from atop Higgins Canyon Road bridge; view facing upstream (east). Photograph taken May 2, 2024.



Photograph A-3. Slide along north shoulder of Higgins Canyon Road; view facing southeast. Photograph taken May 2, 2024.



Photograph A-4. Slide along north shoulder of Higgins Canyon Road; view facing west. Photograph taken May 2, 2024.



Photograph A-5. Higgins Canyon Road bridge over Mills Creek; view facing west. Photograph taken May 2, 2024.



Photograph A-6. Mills Creek stream channel near the northern end of the project area; view facing upstream (northeast). Photograph taken May 2, 2024.



Photograph A-7. Mills Creek stream channel along the northwestern edge of the project area; view facing southeast. Photograph taken May 2, 2024.



Photograph A-8. Mills Creek stream channel, sharp bend near the middle of the project area; view facing southeast. Photograph taken May 2, 2024.

APPENDIX B

Project Design Plans

[See Drawing Set and Design Plans in Attachment B of Permit Package]

APPENDIX C

Special-Status Species with Potential to Occur in the BSA

Table C-1. Special-Status Species with Potential to Occur in the BSA

Species Name	General Habitat Description	Legal Status Federal/State/ CNPS Status	Potential for Occurrence and Rationale
Plants			
Coastal marsh milkvetch (*Astragalus pycnostachyus* var. *pycnostachyus*)	Perennial herb that occurs in coastal marshes, seeps, and adjacent sand along the northern and central California coast. Elevation: 0–150 meters. Bloom Period: April–October.	--/--/1B.2	**No potential:** Suitable habitat is absent from the BSA. Species was not observed during the field survey, which was conducted during the appropriate blooming period. No CNDDB occurrences have been recorded within 2 miles of the BSA.
Choris's popcorn-flower (*Plagiobothrys chorisianus* var. *chorisianus*)	Annual herb that occurs in chaparral, coastal prairie, and coastal scrub in wetland and riparian areas. Elevation: 15–160 meters. Bloom Period: March–June.	--/--/1B.2	**Unlikely to occur:** Marginal, low quality habitat is present within the BSA within the coyote brush scrub and riparian habitat. The dense understory and riparian overstory does not provide suitable low-cover grassy swales needed for this species. Species was not observed during the field survey, which was conducted during the appropriate blooming period. Two CNDDB occurrences have been recorded (2015) within 2 miles of the BSA.
Kellogg's horkelia (*Horkelia cuneata* var. *sericea*)	Perennial herb that occurs in closed-cone coniferous forest, chaparral, coastal dunes, and coastal scrub. Elevation: 10–200 meters. Bloom Period: April–September.	--/--/1B.1	**Unlikely to occur:** Suitable habitat is present within the BSA but is absent in the project area. No CNDDB occurrences have been recorded within 2 miles of the BSA.
Perennial goldfields (*Lasthenia californica* ssp. *macrantha*)	Perennial herb that occurs in coastal bluff scrub, coastal dunes, and coastal scrub. Elevation: 6–750 meters. Bloom Period: January–November.	--/--/1B.2	**Unlikely to occur:** Suitable habitat is present in the BSA but is absent in the project area. Species was not observed during the field survey, which was conducted during the appropriate blooming period. No CNDDB occurrences have been recorded within 2 miles of the BSA.
Rose leptosiphon (*Leptosiphon rosaceus*)	Annual herb that occurs in coastal bluff scrub. Elevation: 0–100 meters. Bloom Period: April–July.	--/--/1B.1	**No potential:** Suitable habitat is absent from the BSA. Species was not observed during the field survey, which was conducted during the appropriate blooming period. No CNDDB occurrences have been recorded within 2 miles of the BSA.
San Francisco gumplant (*Grindelia hirsutula var. maritima*)	Perennial herb that occurs on sandy, clay, or serpentine slopes or roadsides. Elevation: <1700 meters. Bloom Period: April–June.	--/--/3.2	**No potential:** Suitable habitat is absent from the BSA. Species was not observed during the field survey, which was conducted during the appropriate blooming period. No CNDDB occurrences have been recorded within 2 miles of the BSA.
Wooly-headed lessingia (*Lessingia hololeuca*)	Annual herb that occurs on costal scrub, chapparal, grasslands, roadsides and occasionally on serpentine or alkali soil. Elevation: 10–600 meters. Bloom Period: June–October.	--/--/3	**No potential:** Suitable habitat is absent from the BSA. Although habitat includes chapparal, the grassland dominated, low-lying chapparal habitat required to support this species is not present within the BSA. The field survey was not conducted during the bloom period. No CNDDB occurrences have been recorded within 2 miles of the BSA.

Species Name	General Habitat Description	Legal Status Federal/State/ CNPS Status	Potential for Occurrence and Rationale
San Mateo tree lupine (*Lupinus arboreus var. eximius*)	Perennial shrub that occurs in northern coastal scrub and chapparal. Elevation: <100 meters. Bloom Period: April–July.	--/--/3.2	**Unlikely to occur:** Suitable habitat is present in the BSA but is absent in the project area. Species was not observed during the field survey, which was conducted during the appropriate bloom period. No CNDDB occurrences have been recorded within 2 miles of the BSA.
Amphibians			
California giant salamander (*Dicamptodon ensatus*)	Occurs in wet coastal forests in or near clear, cold permanent and semi-permanent streams and seepages.	--/SSC	**Likely to occur:** Suitable riparian habitat is present within Mills Creek. One CNDDB occurrence has been recorded approximately 2 miles southeast of the BSA along Purisima Creek. This species has also been observed by CDFW in 2011 in Pilarcitos Creek which lies within the same watershed (CDFW 2013). This species could enter the project area while traveling through Arroyo Leon.
California red-legged frog (*Rana draytonii*)	Inhabits permanent and temporary pools, streams, freshwater seeps, and marshes in lowlands and foothills occurring from sea level to 6,500 feet. Long-distance dispersal occurs during and after rain. Uses adjacent upland habitat for foraging and refuge. Breeds during wet season from December through March.	FT/SSC	**Present:** Suitable breeding, foraging, and dispersal habitat is present within Mills Creek. Seven CNDDB occurrences have been recorded within 2 miles of the BSA between 2001 and 2019. The closest CNDDB occurrence (2019) is approximately 0.3 mile northeast of the BSA. CRE biologists identified three California red-legged frogs (two adults and one subadult) within Mills Creek at Higgins Canyon Road Bridge in August 2022 (CRE 2022). Critical habitat is present approximately 1.5 mile north of the BSA. This species could enter the project area while traveling through Arroyo Leon.
California tiger salamander (*Ambystoma californiense*)	Occurs in fishless vernal pools or similar water bodies and it occurs at elevations up to 1000 meters. The juveniles and adults live in grasslands and oak woodlands, mainly living underground in the burrows of rodents.	FE/ST	**No potential:** Suitable breeding or aestivation habitat is absent within the BSA. No CNDDB occurrences have been recorded within 2 miles of the BSA.
Foothill yellow-legged frog – Central Coast DPS (*Rana boylii*)	Occurs in foothill and mountain streams from Oregon to Los Angeles County, California. This species is often found in or near rocky streams in a variety of habitats, including valley-foothill hardwood, valley-foothill hardwood-conifer, valley-foothill riparian, ponderosa pine, mixed conifer, coastal scrub, mixed chaparral, and wet meadow types (CDFW 2024a).	FT/SE	**No potential:** Suitable riparian habitat is present within Mills Creek. However, no CNDDB occurrences have been recorded within 2 miles of the BSA.

Species Name	General Habitat Description	Legal Status Federal/State/ CNPS Status	Potential for Occurrence and Rationale
Reptiles			
Green sea turtle (*Chelonia mydas*)	Occurs in the Pacific Ocean, usually in tropical waters, but has been cited as far north as Marin County. Basks on the shore in secluded areas occasionally, but usually only comes to shore to breed. Often found in shallow waters with marine grass flats, coral reefs, and algae.	FT/--	**No potential:** Suitable habitat is absent from the BSA. No CNDDB occurrences have been recorded within 2 miles of the BSA.
San Francisco garter snake (*Thamnophis sirtalis tetrataenia)*	Occurs only in San Mateo County and the very northern tip of Santa Cruz County. Requires complex freshwater marsh habitat adjacent to shrubby grassland. Uses small mammal burrows as upland refugia. Most active from March to July. Retreats to hibernacula during the winter months and is mostly inactive but will occasionally emerge to bask. Mating occurs in both the spring and fall and peaks in March. Usually stays within 650 feet of water but has been known to disperse as far as 2,200 feet.	FE/SE, FP	**Unlikely to occur:** Suitable foraging or dispersal habitat for this species is present within the BSA. Five CNDDB occurrences have been recorded within the Half Moon Bay and Woodside quadrangles near the BSA. Historical populations have been documented within Denniston Creek and Pilarcitos Creek mouth (USFWS 2020). Although unlikely, this species could enter the project area while traveling through Arroyo Leon.
Northwestern pond turtle (*Actinemys [Emys] marmorata*)	Occurs in lakes, ponds, rivers, streams, marshes, and reservoirs. Need terrestrial habitats for nesting, foraging, and mating. Prefer habitats with logs or boulders where they can bask. They are found from Washington state to northern Baja California.	FC/SSC	**Unlikely to occur:** The steep, densely vegetated slopes of Mills Creek within the BSA are not ideal for WPT basking, breeding, and estivation. However, given the connectivity of the lower reaches of Arroyo Leon and its associated riparian corridor to the BSA, the BSA may provide marginal dispersal, foraging, and refuge habitat for the species. No CNDDB occurrences have been recorded within 2 miles of the BSA.
Fish			
Coho salmon – central California coast ESU *(Oncorhynchus kisutch)*	Occur in small coastal streams and large rivers in watersheds along the west coast. The central California coast ESU refers to populations that occur between Punta Gorda and San Lorenzo River. Coho Salmon typically inhabit small coastal streams, as well as larger rivers. Within northern California coastal drainages, Coho salmon seem to be associated with low gradient reaches of tributary streams, which provide suitable spawning areas and good juvenile rearing habitat. (Moyle 2002).	FE/SE	**Unlikely to occur:** Marginal suitable habitat is present within Mills Creek. There are historic records of the species spawning in Arroyo Leon (historic spawning). No CNDDB occurrences have been recorded within 2 miles of the BSA. No coho salmon were captured via electrofishing in Arroyo Leon and Pilarcitos Creek in 2011 by CDFW (CDFW 2013). Critical habitat is present BSA. Literature confirms that the lower Pilarcitos Creek lagoon does not provide coho salmon winter and spring off-channel refuge habitat for spawning and returning kelts (Wetlands and Water Resources, Inc. 2010).

Species Name	General Habitat Description	Legal Status Federal/State/ CNPS Status	Potential for Occurrence and Rationale
Steelhead – Central California Coast DPS (*Oncorhynchus mykiss irideus*)	Occurs from Alaska to Baja California in streams below 8,000 feet. Central California coast DPS includes all naturally spawned populations of steelhead (and their progeny) in streams from the Russian River to Aptos Creek, Santa Cruz County, California (inclusive). Also includes the drainages of San Francisco and San Pablo Bays. Steelhead are anadromous and spend a portion of their life cycle in the Pacific Ocean before returning upstream to spawn. Occurs in well-oxygenated clear, cool water habitats with abundant in-stream cover, well-vegetated stream margins, relatively stable water flow, and 1:1 pool-to-riffle ratio. Requires beds of loose, silt-free, coarse gravel for spawning (Moyle 2002).	FT/SSC	**Present:** Suitable habitat is present within Mills Creek. There are historic records of the species spawning in Arroyo Leon (historic spawning). One CNDDB occurrence has been recorded (2000), approximately 2 miles northeast and upstream of the BSA in Arroyo Leon. Steelhead were captured via electrofishing in Arroyo Leon and Pilarcitos Creek both upstream and downstream of the BSA in 2011 by CDFW (CDFW 2013). Critical habitat is present in the BSA. This species could enter the BSA while traveling through Arroyo Leon. CRE biologists observed two steelhead/rainbow trout parr just upstream of the Higgins Canyon Road bridge. Both of these fish were recorded as young-of-year, and approximately 2–3 inches (75 millimeters) (CRE 2022).
Tidewater goby (*Eucyclogobius newberryi*)	Occurs in brackish shallow lagoons and lower stream reaches where water is fairly still, but not stagnant.	FE/SSC	**No potential:** Suitable habitat is absent from the BSA. No CNDDB occurrence have been recorded within 2 miles of the BSA.
Birds			
Burrowing owl (*Athene cunicularia*)	Occur in flat open habitat with sparse vegetation, short grass, and bare soil such as prairies, grasslands, desert, and sagebrush environments. They live in burrows that they dig themselves or take over from other animals.	--/SSC	**No potential:** Suitable habitat is absent from the BSA. No CNDDB occurrences have been recorded within 2 miles of the BSA.
California least tern (*Sternula antillarum browni*)	Migratory species that breeds along California coasts. The Bay Area represents the northern end of its range. Nests on sandy dunes or gravelly beaches and feeds on fish. Once a common species in California; currently nesting colonies are isolated to southern California and scattered Bay Area beaches. Nests are a simple scrape in gravelly substrate.	FE/SE	**No potential:** Suitable habitat is absent from the BSA. No CNDDB occurrences have been recorded within 2 miles of the BSA.
Marbled murrelet (*Brachyramphus marmoratus marmoratus*)	Spends most of the non-breeding season in offshore or nearshore environments near coniferous forests. Only California alcid species to nest inland. Typically nests in upper branches of redwoods or Douglas fir (*Pseudotsuga menziesii*) forests. Builds its nests with lichens and mosses.	FT/SE	**No potential:** Suitable habitat is absent from the BSA. No CNDDB occurrences have been recorded within 2 miles of the BSA.
Saltmarsh common yellowthroat (*Geothlypis trichas sinuosa*)	Frequents low, dense vegetation near water, especially wet meadow, fresh emergent wetland, saline emergent wetland habitats, and valley foothill riparian. Nests usually placed on or within 8 centimeters (3 inches) of ground. May be over water, in emergent aquatic vegetation, dense shrubs, or other dense growth.	--/SSC	**Unlikely to occur:** Suitable marsh or wetland habitat is absent from the BSA. However, dense vegetation near water to support nesting and foraging behaviors is present. No CNDDB occurrences have been recorded within 2 miles of the BSA.

Species Name	General Habitat Description	Legal Status Federal/State/ CNPS Status	Potential for Occurrence and Rationale
Western snowy plover (*Charadrius nivosus nivosus*)	Found in shores, peninsulas, offshore islands, bays, estuaries, and rivers along the Pacific Coast. Most snowy plovers only spend the breeding season in the Bay Area, but some small local populations overwinter in the Bay Area as well. Breeding sites include coastal beaches above the high-tide line, dry pond bottoms, sand spits, dune-backed beaches, and river bars. Does net nest in colonies. Nests are cryptic scrapes with carefully placed substrate around the edge.	FT/SSC	**No potential:** Suitable habitat is absent from the BSA. No CNDDB occurrences have been recorded within 2 miles of the BSA. Designated critical habitat for this species is located approximately 2.7 miles northwest of the BSA.
Mammals			
American badger (*Taxidea taxus*)	Occurs in a variety of habitats throughout California including dry open shrubland, grassland, forest, and herbaceous habitats with friable soils.	--/SSC	**No potential:** Suitable habitat is absent from the BSA. No CNDDB occurrences have been recorded within 2 miles of the BSA.
San Francisco dusky-footed woodrat (*Neotoma fuscipes annectens*)	Found in both the Coast Ranges and interior. Generally, absent from cultivated land and open grasslands. Common to abundant in forest habitats of moderate canopy, year-round greenery, a brushy understory, and suitable nest-building materials. Can be abundant in chaparral habitats. Abundance is probably limited by the availability of nest-building materials. Houses are built of sticks and leaves at the base of, or in a tree, around a shrub, or at the base of a hill. Feeds mainly on woody plants, especially live oak, maple, coffeeberry, alder, and elderberry when available (Linsdale and Tevis 1951). Also eats fungi, flowers, grasses, and acorns. Medium-sized rodents found in grasslands, scrub, and wooded areas throughout the San Francisco Bay Area.	--/SSC	**Present:** Suitable habitat of wooded areas and scrub is present in the BSA. No CNDDB occurrences have been recorded within 2 miles of the BSA. However, a nest (i.e., midden) relocation effort was conducted in the BSA for another project (CNDDB unpublished record) and a midden was observed in the BSA in 2023. No nests were observed within the project area but this species could enter the BSA.
Invertebrates			
Western bumble bee (*Bombus occidentalis*)	In California, populations currently restricted to high elevation sites in Sierra Nevada, though there have been few observations on northern California coast (Xerces Society 2024). Basic habitat requirements include suitable nesting sites for colonies, nectar and pollen from floral resources available throughout duration of colony period (spring, summer and fall), and suitable overwintering sites for queens (U.S. Forest Service 2023).	--/SC	**Unlikely to occur:** The BSA contains marginal suitable habitat and impacts to this species are not expected. One historic CNDDB occurrence has been recorded (1953) in Half Moon Bay, but the exact location is unknown.

Species Name	General Habitat Description	Legal Status Federal/State/ CNPS Status	Potential for Occurrence and Rationale
Monarch butterfly (*Danaus plexippus*)	Occurs along the coast from northern Mendocino to Baja California, Mexico. Winter roosts in wind-protected tree groves (eucalyptus [*Eucalyptus* spp.], Monterey pine [*Pinus radiata*], and Monterey cypress [*Cupressus macrocarpa*]), with nectar plants and water sources nearby (Xerces Society 2016). Forages on nectar from a variety of plant species, including bluedicks (*Dichelostemma capitatum*), black sage (*Salvia mellifera*), blueblossom (*Ceanothus thrysiflorus*), and coyote brush (*Baccharis pilularis*).	FPT/--	**Unlikely to occur:** The BSA contains marginal suitable overwintering habitat. Eucalyptus trees are located along the eastern edge of the BSA but will not be impacted by the project. One CNDDB occurrence has been recorded (1998) approximately 2 miles to the west. Work will not occur during winter when this species is expected to be present.

Sources: Baldwin et al. (2012); CDFW (2024a), CNPS (2024a) USFWS (2024b).

Status Codes:
-- = No status
Federal: FE = Federal Endangered; FT = Federal Threatened; FPT = Federal Proposed Threatened
State: SE = State Endangered; ST = State Threatened; SC = State Candidate; SR = State Rare; SSC = California Species of Special Concern; FP = Fully Protected

California Native Plant Society:
List 1B = Rare, threatened, or endangered in California and elsewhere
List 2 = Rare, threatened, or endangered in California, but more common elsewhere

CNDDB Threat Code:
_.1 = Seriously endangered in California (more than 80% of occurrences threatened / high degree and immediacy of threat)
_.2 = Fairly endangered in California (20–80% occurrences threatened)
_.3 = Not very endangered I California (<20% of occurrences threatened, or no current threats known)

Potential for Occurrence Ratings:

Present: The species has been documented within the project area by a reliable observer during recent surveys and habitat has not significantly been degraded or eliminated since the observation was made (e.g., no habitat removal associated with a development).
Likely to occur: The species has a strong likelihood to be present in the project area as indicated by factors such as habitat quality, proximity to known records, presence of suitable dispersal corridors, etc. The project area contains suitable habitat and is located within the elevational and geographic ranges of the species.
Unlikely to occur: The species is not likely to occur in the project area. Potentially suitable habitat is present, but the project area may be outside of the species' elevational and/or geographic ranges, contain substantially degraded or fragmented habitat, lack recent occurrence records within dispersal distance, be isolated from known populations by barriers to migration/dispersal, and/or contain predators or invasive species that inhibit survival or occupation.
No potential: The species is not expected to occur in the project area due to one or more of the following conditions: suitable habitat is absent from the project area, the project area is located substantially outside of the species' elevational and/or geographic ranges, or the species is restricted to or known to be present only within a specific area outside of the project area.

APPENDIX D

CNDDB, CNPS, and IPaC Database Queries

Selected Elements by Common Name

California Department of Fish and Wildlife

California Natural Diversity Database

Query Criteria: Quad IS (Half Moon Bay (3712244) OR San Mateo (3712253) OR Woodside (3712243) OR San Gregorio (3712234) OR La Honda (3712233) OR Montara Mountain (3712254))

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
Alameda song sparrow *Melospiza melodia pusillula*	ABPBXA301S	None	None	G5T2T3	S2	SSC
American badger *Taxidea taxus*	AMAJF04010	None	None	G5	S3	SSC
American peregrine falcon *Falco peregrinus anatum*	ABNKD06071	Delisted	Delisted	G4T4	S3S4	
Anderson's manzanita *Arctostaphylos andersonii*	PDERI04030	None	None	G2	S2	1B.2
arcuate bush-mallow *Malacothamnus arcuatus*	PDMAL0Q0E0	None	None	G2Q	S2	1B.2
bank swallow *Riparia riparia*	ABPAU08010	None	Threatened	G5	S3	
Bay checkerspot butterfly *Euphydryas editha bayensis*	IILEPK4055	Threatened	None	G5T1	S3	
bent-flowered fiddleneck *Amsinckia lunaris*	PDBOR01070	None	None	G3	S3	1B.2
big free-tailed bat *Nyctinomops macrotis*	AMACD04020	None	None	G5	S3	SSC
Blasdale's bent grass *Agrostis blasdalei*	PMPOA04060	None	None	G2G3	S2	1B.2
bumblebee scarab beetle *Lichnanthe ursina*	IICOL67020	None	None	G2	S2	
burrowing owl *Athene cunicularia*	ABNSB10010	None	None	G4	S2	SSC
California black rail *Laterallus jamaicensis coturniculus*	ABNME03041	None	Threatened	G3T1	S2	FP
California giant salamander *Dicamptodon ensatus*	AAAAH01020	None	None	G2G3	S2S3	SSC
California red-legged frog *Rana draytonii*	AAABH01022	Threatened	None	G2G3	S2S3	SSC
California Ridgway's rail *Rallus obsoletus obsoletus*	ABNME05011	Endangered	Endangered	G3T1	S2	FP
California tiger salamander - central California DPS *Ambystoma californiense pop. 1*	AAAAA01181	Threatened	Threatened	G2G3T3	S3	WL
chaparral ragwort *Senecio aphanactis*	PDAST8H060	None	None	G3	S2	2B.2
Choris' popcornflower *Plagiobothrys chorisianus var. chorisianus*	PDBOR0V061	None	None	G3T1Q	S1	1B.2

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
coast yellow leptosiphon *Leptosiphon croceus*	PDPLM09170	None	Endangered	G1	S1	1B.1
coastal marsh milk-vetch *Astragalus pycnostachyus var. pycnostachyus*	PDFAB0F7B2	None	None	G2T2	S2	1B.2
coastal triquetrella *Triquetrella californica*	NBMUS7S010	None	None	G2	S2	1B.2
Crystal Springs lessingia *Lessingia arachnoidea*	PDAST5S0C0	None	None	G2	S2	1B.2
double-crested cormorant *Nannopterum auritum*	ABNFD01020	None	None	G5	S4	WL
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 - central coast DPS *Rana boylii pop. 4*	AAABH01054	Threatened	Endangered	G3T2	S2	
fountain thistle *Cirsium fontinale var. fontinale*	PDAST2E161	Endangered	Endangered	G2T1	S1	1B.1
fragrant fritillary *Fritillaria liliacea*	PMLIL0V0C0	None	None	G2	S2	1B.2
Franciscan onion *Allium peninsulare var. franciscanum*	PMLIL021R1	None	None	G4G5T2	S2	1B.2
Franciscan thistle *Cirsium andrewsii*	PDAST2E050	None	None	G3	S3	1B.2
fringed myotis *Myotis thysanodes*	AMACC01090	None	None	G4	S3	
great blue heron *Ardea herodias*	ABNGA04010	None	None	G5	S4	
green sturgeon - southern DPS *Acipenser medirostris pop. 1*	AFCAA01031	Threatened	None	G2T1	S1	SSC
Hickman's cinquefoil *Potentilla hickmanii*	PDROS1B370	Endangered	Endangered	G1	S1	1B.1
Hillsborough chocolate lily *Fritillaria biflora var. ineziana*	PMLIL0V0M1	None	None	G3G4T1	S1	1B.1
hoary bat *Lasiurus cinereus*	AMACC05032	None	None	G3G4	S4	
island tube lichen *Hypogymnia schizidiata*	NLT0032640	None	None	G2G3	S2	1B.3
Kellogg's horkelia *Horkelia cuneata var. sericea*	PDROS0W043	None	None	G4T1?	S1?	1B.1
Kings Mountain manzanita *Arctostaphylos regismontana*	PDERI041C0	None	None	G2	S2	1B.2

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
longfin smelt *Spirinchus thaleichthys*	AFCHB03010	Proposed Endangered	Threatened	G5	S1	
marbled murrelet *Brachyramphus marmoratus*	ABNNN06010	Threatened	Endangered	G3	S2	
Marin western flax *Hesperolinon congestum*	PDLIN01060	Threatened	Threatened	G1	S1	1B.1
marsh microseris *Microseris paludosa*	PDAST6E0D0	None	None	G2	S2	1B.2
merlin *Falco columbarius*	ABNKD06030	None	None	G5	S3S4	WL
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?	S2	1B.2
Mission blue butterfly *Icaricia icarioides missionensis*	IILEPG801A	Endangered	None	G5T2	S2	
monarch - California overwintering population *Danaus plexippus plexippus pop. 1*	IILEPP2012	Candidate	None	G4T1T2Q	S2	
Montara manzanita *Arctostaphylos montaraensis*	PDERI042W0	None	None	G1	S1	1B.2
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 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	
Northern Maritime Chaparral *Northern Maritime Chaparral*	CTT37C10CA	None	None	G1	S1.2	
obscure bumble bee *Bombus caliginosus*	IIHYM24380	None	None	G2G3	S1S2	
Oregon polemonium *Polemonium carneum*	PDPLM0E050	None	None	G3G4	S2	2B.2
Ornduff's meadowfoam *Limnanthes douglasii ssp. ornduffii*	PDLIM02039	None	None	G4T1	S1	1B.1
Pacific walker *Pomatiopsis californica*	IMGASJ9020	None	None	G1	S1	
pallid bat *Antrozous pallidus*	AMACC10010	None	None	G4	S3	SSC

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
pappose tarplant *Centromadia parryi ssp. parryi*	PDAST4R0P2	None	None	G3T2	S2	1B.2
perennial goldfields *Lasthenia californica ssp. macrantha*	PDAST5L0C5	None	None	G3T2	S2	1B.2
Point Reyes horkelia *Horkelia marinensis*	PDROS0W0B0	None	None	G2	S2	1B.2
Point Reyes salty bird's-beak *Chloropyron maritimum ssp. palustre*	PDSCR0J0C3	None	None	G4?T2	S2	1B.2
Ricksecker's water scavenger beetle *Hydrochara ricksecker*i	IICOL5V010	None	None	G2?	S2?	
Robbins' broomrape *Aphyllon robbinsii*	PDORO040Q0	None	None	G1	S1	1B.1
rose leptosiphon *Leptosiphon rosaceus*	PDPLM09180	None	None	G1	S1	1B.1
Sacramento-San Joaquin Coastal Lagoon *Sacramento-San Joaquin Coastal Lagoon*	CALA1360CA	None	None	GNR	SNR	
saline clover *Trifolium hydrophilum*	PDFAB400R5	None	None	G2	S2	1B.2
saltmarsh common yellowthroat *Geothlypis trichas sinuosa*	ABPBX1201A	None	None	G5T3	S3	SSC
salt-marsh harvest mouse *Reithrodontomys raviventris*	AMAFF02040	Endangered	Endangered	G1G2	S3	FP
San Bruno elfin butterfly *Callophrys mossii bayensis*	IILEPE2202	Endangered	None	G4T2	S2	
San Francisco Bay spineflower *Chorizanthe cuspidata var. cuspidata*	PDPGN04081	None	None	G2T1	S1	1B.2
San Francisco campion *Silene verecunda ssp. verecunda*	PDCAR0U213	None	None	G5T1	S1	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 forktail damselfly *Ischnura gemina*	IIODO72010	None	None	G2	S2	
San Francisco gartersnake *Thamnophis sirtalis tetrataenia*	ARADB3613B	Endangered	Endangered	G5T2Q	S2	FP
San Francisco gumplant *Grindelia hirsutula var. maritima*	PDAST470D3	None	None	G5T1Q	S1	3.2
San Francisco owl's-clover *Triphysaria floribunda*	PDSCR2T010	None	None	G2?	S2?	1B.2
San Mateo thorn-mint *Acanthomintha duttonii*	PDLAM01040	Endangered	Endangered	G1	S1	1B.1

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
San Mateo woolly sunflower *Eriophyllum latilobum*	PDAST3N060	Endangered	Endangered	G1	S1	1B.1
Santa Cruz black salamander *Aneides niger*	AAAAD01070	None	None	G3	S3	SSC
Santa Cruz kangaroo rat *Dipodomys venustus venustus*	AMAFD03042	None	None	G4T1	S1	
Scouler's catchfly *Silene scouleri ssp. scouleri*	PDCAR0U1MC	None	None	G5T4T5	S2S3	2B.2
Serpentine Bunchgrass *Serpentine Bunchgrass*	CTT42130CA	None	None	G2	S2.2	
short-leaved evax *Hesperevax sparsiflora var. brevifolia*	PDASTE5011	None	None	G4T3	S3	1B.2
steelhead - central California coast DPS *Oncorhynchus mykiss irideus pop. 8*	AFCHA0209G	Threatened	None	G5T3Q	S3	SSC
Steller sea lion *Eumetopias jubatus*	AMAJC03010	Delisted	None	G3	S2	
tidewater goby *Eucyclogobius newberryi*	AFCQN04010	Endangered	None	G3	S3	SSC
Townsend's big-eared bat *Corynorhinus townsendii*	AMACC08010	None	None	G4	S2	SSC
Valley Needlegrass Grassland *Valley Needlegrass Grassland*	CTT42110CA	None	None	G3	S3.1	
western bumble bee *Bombus occidentalis*	IIHYM24252	None	Candidate Endangered	G3	S1	
western leatherwood *Dirca occidentalis*	PDTHY03010	None	None	G2	S2	1B.2
western pond turtle *Emys marmorata*	ARAAD02030	Proposed Threatened	None	G3G4	S3	SSC
western snowy plover *Charadrius nivosus nivosus*	ABNNB03031	Threatened	None	G3T3	S3	SSC
white-rayed pentachaeta *Pentachaeta bellidiflora*	PDAST6X030	Endangered	Endangered	G1	S1	1B.1
woodland woollythreads *Monolopia gracilens*	PDAST6G010	None	None	G3	S3	1B.2

Record Count: 99

CNPS Rare Plant Inventory

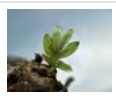
Search Results

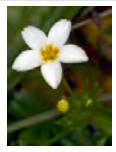
48 matches found. Click on scientific name for details

Search Criteria: CRPR is one of [1A:1B:2A:2B:3] , 9-Quad include [3712244:3712253:3712243:3712234:3712233:3712254]

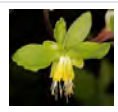
▲ COMMON NAME	SCIENTIFIC NAME	FAMILY	LIFEFORM	FED LIST	STATE LIST	CA RARE PLANT RANK	GENERAL HABITATS	MICROHABITATS	LOWEST ELEVATION (FT)	LOWEST ELEVATION (M)	HIGHEST ELEVATION (FT)	HIGHEST ELEVATION (M)	BLOOMING PERIOD	PHOTO
Anderson's manzanita	*Arctostaphylos andersonii*	Ericaceae	perennial evergreen shrub	None	None	1B.2	Broadleafed upland forest, Chaparral, North Coast coniferous forest	Edges, Openings	195	60	2495	760	Nov-May	 © 2018 Jason Matthias Mills
arcuate bush-mallow	*Malacothamnus arcuatus* var. *arcuatus*	Malvaceae	perennial deciduous shrub	None	None	1B.2	Chaparral, Cismontane woodland		50	15	1165	355	Apr-Sep	 © 2017 Keir Morse
bent-flowered fiddleneck	*Amsinckia lunaris*	Boraginaceae	annual herb	None	None	1B.2	Cismontane woodland, Coastal bluff scrub, Valley and foothill grassland		10	3	1640	500	Mar-Jun	 © 2011 Neal Kramer
Blasdale's bent grass	*Agrostis blasdalei*	Poaceae	perennial rhizomatous herb	None	None	1B.2	Coastal bluff scrub, Coastal dunes, Coastal prairie		0	0	490	150	May-Jul	 © 2001 Doreen L. Smith
chaparral ragwort	*Senecio aphanactis*	Asteraceae	annual herb	None	None	2B.2	Chaparral, Cismontane woodland, Coastal scrub	Alkaline (sometimes)	50	15	2625	800	Jan-Apr(May)	No Photo Available
Choris' popcornflower	*Plagiobothrys chorisianus* var. *chorisianus*	Boraginaceae	annual herb	None	None	1B.2	Chaparral, Coastal prairie, Coastal scrub	Mesic	10	3	525	160	Mar-Jun	No Photo Available
coast yellow leptosiphon	*Leptosiphon croceus*	Polemoniaceae	annual herb	None	CE	1B.1	Coastal bluff scrub, Coastal prairie		35	10	490	150	Apr-Jun	 © 2018 Neal Kramer
coastal marsh milk-vetch	*Astragalus pycnostachyus* var. *pycnostachyus*	Fabaceae	perennial herb	None	None	1B.2	Coastal dunes (mesic), Coastal scrub, Marshes and swamps (coastal salt, streamsides)		0	0	180	55	(Apr-May)Jun-Oct	 ©2009 Neal Kramer

coastal triquetrella	*Triquetrella californica*	Pottiaceae	moss	None	None	1B.2	Coastal bluff scrub, Coastal scrub		35	10	330	100		No Photo Available
Crystal Springs lessingia	*Lessingia arachnoidea*	Asteraceae	annual herb	None	None	1B.2	Cismontane woodland, Coastal scrub, Valley and foothill grassland	Roadsides (often), Serpentine	195	60	655	200	Jul-Oct	 © 2008 Neal Kramer
fountain thistle	*Cirsium fontinale* var. *fontinale*	Asteraceae	perennial herb	FE	CE	1B.1	Chaparral (openings), Cismontane woodland, Meadows and seeps, Valley and foothill grassland	Seeps, Serpentine	150	45	575	175	(Apr)May-Oct	No Photo Available
fragrant fritillary	*Fritillaria liliacea*	Liliaceae	perennial bulbiferous herb	None	None	1B.2	Cismontane woodland, Coastal prairie, Coastal scrub, Valley and foothill grassland	Serpentine (often)	10	3	1345	410	Feb-Apr	 © 2004 Carol W. Witham
Franciscan onion	*Allium peninsulare* var. *franciscanum*	Alliaceae	perennial bulbiferous herb	None	None	1B.2	Cismontane woodland, Valley and foothill grassland	Clay, Serpentine (often), Volcanic	170	52	1000	305	(Apr)May-Jun	 © 2019 Aaron Arthur
Franciscan thistle	*Cirsium andrewsii*	Asteraceae	perennial herb	None	None	1B.2	Broadleafed upland forest, Coastal bluff scrub, Coastal prairie, Coastal scrub	Mesic, Serpentine (sometimes)	0	0	490	150	Mar-Jul	No Photo Available
Hickman's cinquefoil	*Potentilla hickmanii*	Rosaceae	perennial herb	FE	CE	1B.1	Closed-cone coniferous forest, Coastal bluff scrub, Marshes and swamps (freshwater), Meadows and seeps (vernally mesic)		35	10	490	149	Apr-Aug	No Photo Available
Hillsborough chocolate lily	*Fritillaria biflora* var. *ineziana*	Liliaceae	perennial bulbiferous herb	None	None	1B.1	Cismontane woodland, Valley and foothill grassland	Serpentine	490	150	490	150	Mar-Apr	 © 2012 Toni Corelli
island tube lichen	*Hypogymnia schizidiata*	Parmeliaceae	foliose lichen	None	None	1B.3	Chaparral, Closed-cone coniferous forest		1180	360	1330	405		No Photo Available
Jepson's coyote-thistle	*Eryngium jepsonii*	Apiaceae	perennial herb	None	None	1B.2	Valley and foothill grassland, Vernal pools	Clay	10	3	985	300	Apr-Aug	No Photo Available

Kellogg's horkelia	*Horkelia cuneata* var. *sericea*	Rosaceae	perennial herb	None	None	1B.1	Chaparral (maritime), Closed-cone coniferous forest, Coastal dunes, Coastal scrub	Gravelly (sometimes), Openings, Sandy (sometimes)	35	10	655	200	Apr-Sep	 © 2018 Neal Kramer
Kings Mountain manzanita	*Arctostaphylos regismontana*	Ericaceae	perennial evergreen shrub	None	None	1B.2	Broadleafed upland forest, Chaparral, North Coast coniferous forest	Granitic, Sandstone	1000	305	2395	730	Dec-Apr	No Photo Available
Marin checker lily	*Fritillaria lanceolata* var. *tristulis*	Liliaceae	perennial bulbiferous herb	None	None	1B.1	Coastal bluff scrub, Coastal prairie, Coastal scrub		50	15	490	150	Feb-May	 © 2020 Barry Rice
Marin western flax	*Hesperolinon congestum*	Linaceae	annual herb	FT	CT	1B.1	Chaparral, Valley and foothill grassland	Serpentine	15	5	1215	370	Apr-Jul	 © 2009 Neal Kramer
marsh microseris	*Microseris paludosa*	Asteraceae	perennial herb	None	None	1B.2	Cismontane woodland, Closed-cone coniferous forest, Coastal scrub, Valley and foothill grassland		15	5	1165	355	Apr-Jun(Jul)	No Photo Available
minute pocket moss	*Fissidens pauperculus*	Fissidentaceae	moss	None	None	1B.2	North Coast coniferous forest (damp coastal soil)		35	10	3360	1024		 ©2021 Scot Loring
Montara manzanita	*Arctostaphylos montaraensis*	Ericaceae	perennial evergreen shrub	None	None	1B.2	Chaparral (maritime), Coastal scrub		260	80	1640	500	Jan-Mar	 © 2016 Neal Kramer
Oregon polemonium	*Polemonium carneum*	Polemoniaceae	perennial herb	None	None	2B.2	Coastal prairie, Coastal scrub, Lower montane coniferous forest		0	0	6005	1830	Apr-Sep	 ©2018 John Doyen
Ornduff's meadowfoam	*Limnanthes douglasii* ssp. *ornduffii*	Limnanthaceae	annual herb	None	None	1B.1	Meadows and seeps		35	10	65	20	Nov-May	 © 2021 Eva Buxton

pappose tarplant	*Centromadia parryi* ssp. *parryi*	Asteraceae	annual herb	None	None	1B.2	Chaparral, Coastal prairie, Marshes and swamps (coastal salt), Meadows and seeps, Valley and foothill grassland (vernally mesic)	Alkaline (often)	0	0	1380	420	May-Nov	 © 2016 John Doyen
perennial goldfields	*Lasthenia californica* ssp. *macrantha*	Asteraceae	perennial herb	None	None	1B.2	Coastal bluff scrub, Coastal dunes, Coastal scrub		15	5	1705	520	Jan-Nov	 © 2013 John Doyen
Point Reyes horkelia	*Horkelia marinensis*	Rosaceae	perennial herb	None	None	1B.2	Coastal dunes, Coastal prairie, Coastal scrub	Sandy	15	5	2475	755	May-Sep	 © 2017 John Doyen
Point Reyes salty bird's-beak	*Chloropyron maritimum* ssp. *palustre*	Orobanchaceae	annual herb (hemiparasitic)	None	None	1B.2	Marshes and swamps (coastal salt)		0	0	35	10	Jun-Oct	 ©2017 John Doyen
Robbins' broomrape	*Aphyllon robbinsii*	Orobanchaceae	annual herb (achlorophyllous)	None	None	1B.1	Coastal bluff scrub	Rocky, Sandy	0	0	330	100	Apr-Jul	 © 2017 Dylan Neubauer
rose leptosiphon	*Leptosiphon rosaceus*	Polemoniaceae	annual herb	None	None	1B.1	Coastal bluff scrub		0	0	330	100	Apr-Jul	 © 2013 Aaron Schusteff
saline clover	*Trifolium hydrophilum*	Fabaceae	annual herb	None	None	1B.2	Marshes and swamps, Valley and foothill grassland (mesic, alkaline), Vernal pools		0	0	985	300	Apr-Jun	 © 2005 Dean Wm Taylor
San Francisco Bay spineflower	*Chorizanthe cuspidata* var. *cuspidata*	Polygonaceae	annual herb	None	None	1B.2	Coastal bluff scrub, Coastal dunes, Coastal prairie, Coastal scrub	Sandy	10	3	705	215	Apr-Jul(Aug)	No Photo Available
San Francisco campion	*Silene verecunda* ssp. *verecunda*	Caryophyllaceae	perennial herb	None	None	1B.2	Chaparral, Coastal bluff scrub, Coastal prairie, Coastal scrub, Valley and foothill grassland	Sandy	100	30	2115	645	(Feb)Mar-Jul(Aug)	No Photo Available

San Francisco collinsia	*Collinsia multicolor*	Plantaginaceae	annual herb	None	None	1B.2	Closed-cone coniferous forest, Coastal scrub	Serpentine (sometimes)	100	30	900	275	(Feb)Mar-May	No Photo Available
San Francisco gumplant	*Grindelia hirsutula* var. *maritima*	Asteraceae	perennial herb	None	None	3.2	Coastal bluff scrub, Coastal scrub, Valley and foothill grassland	Sandy (sometimes), Serpentine (sometimes)	50	15	1310	400	Jun-Sep	 Robert Potts © 2001 California Academy of Sciences
San Francisco owl's-clover	*Triphysaria floribunda*	Orobanchaceae	annual herb	None	None	1B.2	Coastal prairie, Coastal scrub, Valley and foothill grassland	Serpentine (usually)	35	10	525	160	Apr-Jun	No Photo Available
San Mateo thorn-mint	*Acanthomintha duttonii*	Lamiaceae	annual herb	FE	CE	1B.1	Chaparral, Valley and foothill grassland	Serpentine	165	50	985	300	Apr-Jun	 © 2011 Aaron Schusteff
San Mateo tree lupine	*Lupinus arboreus* var. *eximius*	Fabaceae	perennial evergreen shrub	None	None	3.2	Chaparral, Coastal scrub		295	90	1805	550	Apr-Jul	No Photo Available
San Mateo woolly sunflower	*Eriophyllum latilobum*	Asteraceae	perennial herb	FE	CE	1B.1	Cismontane woodland (often serpentinite, roadcuts), Coastal scrub, Lower montane coniferous forest		150	45	1085	330	May-Jun	No Photo Available
Scouler's catchfly	*Silene scouleri* ssp. *scouleri*	Caryophyllaceae	perennial herb	None	None	2B.2	Coastal bluff scrub, Coastal prairie, Valley and foothill grassland		0	0	1970	600	(Mar-May)Jun-Aug(Sep)	 ©2015 Vernon Smith
short-leaved evax	*Hesperevax sparsiflora* var. *brevifolia*	Asteraceae	annual herb	None	None	1B.2	Coastal bluff scrub (sandy), Coastal dunes, Coastal prairie		0	0	705	215	Mar-Jun	 © 2006 Doreen L. Smith

western leatherwood	*Dirca occidentalis*	Thymelaeaceae	perennial deciduous shrub	None	None	1B.2	Broadleafed upland forest, Chaparral, Cismontane woodland, Closed-cone coniferous forest, North Coast coniferous forest, Riparian forest, Riparian woodland	Mesic	80	25	1395	425	Jan-Mar(Apr)	 © 2017 Steve Matson
white-rayed pentachaeta	*Pentachaeta bellidiflora*	Asteraceae	annual herb	FE	CE	1B.1	Cismontane woodland, Valley and foothill grassland (often serpentinite)		115	35	2035	620	Mar-May	No Photo Available
woodland woollythreads	*Monolopia gracilens*	Asteraceae	annual herb	None	None	1B.2	Broadleafed upland forest (openings), Chaparral (openings), Cismontane woodland, North Coast coniferous forest (openings), Valley and foothill grassland	Serpentine	330	100	3935	1200	(Feb)Mar-Jul	 © 2016 Richard Spellenberg
woolly-headed lessingia	*Lessingia hololeuca*	Asteraceae	annual herb	None	None	3	Broadleafed upland forest, Coastal scrub, Lower montane coniferous forest, Valley and foothill grassland	Clay, Serpentine	50	15	1000	305	Jun-Oct	 © 2015 Aaron Schusteff

Showing 1 to 48 of 48 entries

Suggested Citation:
California Native Plant Society, Rare Plant Program. 2024. Rare Plant Inventory (online edition, v9.5). Website https://www.rareplants.cnps.org [accessed 1 May 2024].

IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

NOT FOR CONSULTATION

Location

San Mateo County, California



Local office

Sacramento Fish And Wildlife Office

(916) 414-6600
(916) 414-6713

Federal Building
2800 Cottage Way, Room W-2605
Sacramento, CA 95825-1846

NOT FOR CONSULTATION

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Draw the project location and click CONTINUE.
2. Click DEFINE PROJECT.
3. Log in (if directed to do so).
4. Provide a name and description for your project.
5. Click REQUEST SPECIES LIST.

Listed species[1] and their critical habitats are managed by the Ecological Services Program of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries[2]).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact NOAA Fisheries for species under their jurisdiction.

---

1. Species listed under the Endangered Species Act are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the listing status page for more information. IPaC only shows species that are regulated by USFWS (see FAQ).

NOT FOR CONSULTATION

2. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

The following species are potentially affected by activities in this location:

Birds

NAME	STATUS
California Least Tern Sternula antillarum browni Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/8104	Endangered
Marbled Murrelet Brachyramphus marmoratus There is **final** critical habitat for this species. Your location does not overlap the critical habitat. https://ecos.fws.gov/ecp/species/4467	Threatened
Western Snowy Plover Charadrius nivosus nivosus There is **final** critical habitat for this species. Your location does not overlap the critical habitat. https://ecos.fws.gov/ecp/species/8035	Threatened

Reptiles

NAME	STATUS
Green Sea Turtle Chelonia mydas No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/6199	Threatened
Northwestern Pond Turtle Actinemys marmorata Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/1111	Proposed Threatened
San Francisco Garter Snake Thamnophis sirtalis tetrataenia Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/5956	Endangered

Amphibians

NAME	STATUS

NOT FOR CONSULTATION

California Red-legged Frog Rana draytonii Wherever found There is **final** critical habitat for this species. Your location does not overlap the critical habitat. https://ecos.fws.gov/ecp/species/2891	Threatened
Foothill Yellow-legged Frog Rana boylii No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/5133	Threatened

Fishes

NAME	STATUS
Tidewater Goby Eucyclogobius newberryi Wherever found There is **final** critical habitat for this species. Your location does not overlap the critical habitat. https://ecos.fws.gov/ecp/species/57	Endangered

Insects

NAME	STATUS
Monarch Butterfly Danaus plexippus Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/9743	Candidate

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

There are no critical habitats at this location.

You are still required to determine if your project(s) may have effects on all above listed species.

NOT FOR CONSULTATION

Bald & Golden Eagles

Bald and golden eagles are protected under the Bald and Golden Eagle Protection Act[1] and the Migratory Bird Treaty Act[2].

Any person or organization who plans or conducts activities that may result in impacts to bald or golden eagles, or their habitats[3], should follow appropriate regulations and consider implementing appropriate conservation measures, as described in the links below. Specifically, please review the "Supplemental Information on Migratory Birds and Eagles".

Additional information can be found using the following links:

- Eagle Management https://www.fws.gov/program/eagle-management
- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds
- Nationwide conservation measures for birds https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf
- Supplemental Information for Migratory Birds and Eagles in IPaC https://www.fws.gov/media/supplemental-information-migratory-birds-and-bald-and-golden-eagles-may-occur-project-action

There are likely bald eagles present in your project area. For additional information on bald eagles, refer to Bald Eagle Nesting and Sensitivity to Human Activity

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, see the PROBABILITY OF PRESENCE SUMMARY below to see when these birds are most likely to be present and breeding in your project area.

NOT FOR CONSULTATION

NAME	BREEDING SEASON
Bald Eagle *Haliaeetus leucocephalus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Jan 1 to Aug 31

Golden Eagle *Aquila chrysaetos* — Breeds Jan 1 to Aug 31

This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.
https://ecos.fws.gov/ecp/species/1680

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read "Supplemental Information on Migratory Birds and Eagles", specifically the FAQ section titled "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

Breeding Season (■)

NOT FOR CONSULTATION

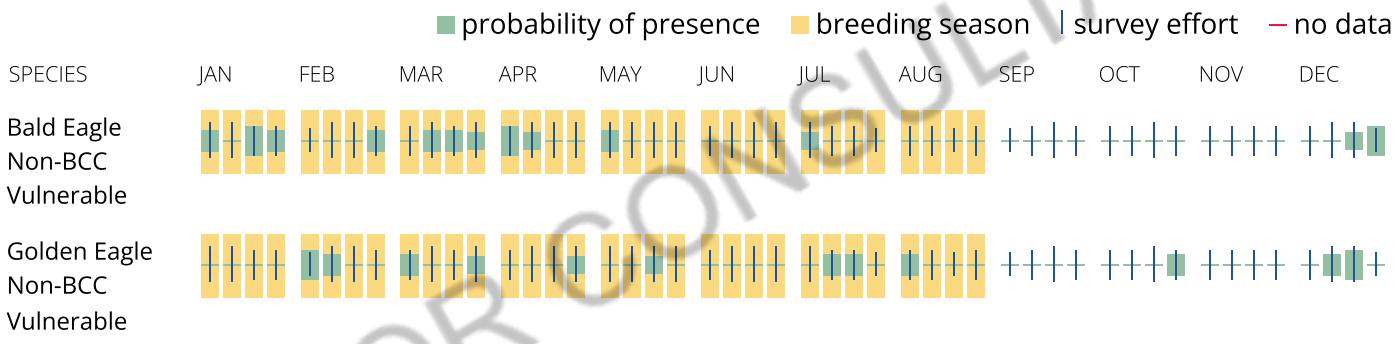
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

To see a bar's survey effort range, simply hover your mouse cursor over the bar.

No Data (–)
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.



NOT FOR CONSULTATION

What does IPaC use to generate the potential presence of bald and golden eagles in my specified location?

The potential for eagle presence is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply). To see a list of all birds potentially present in your project area, please visit the Rapid Avian Information Locator (RAIL) Tool.

What does IPaC use to generate the probability of presence graphs of bald and golden eagles in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid

cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the Rapid Avian Information Locator (RAIL) Tool.

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur. Please contact your local Fish and Wildlife Service Field Office if you have questions.

Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats[3] should follow appropriate regulations and consider implementing appropriate conservation measures, as described in the links below. Specifically, please review the "Supplemental Information on Migratory Birds and Eagles".

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.

Additional information can be found using the following links:

- Eagle Management https://www.fws.gov/program/eagle-management
- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds
- Nationwide conservation measures for birds https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf
- Supplemental Information for Migratory Birds and Eagles in IPaC https://www.fws.gov/media/supplemental-information-migratory-birds-and-bald-and-golden-eagles-may-occur-project-action

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around

NOT FOR CONSULTATION

your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, see the PROBABILITY OF PRESENCE SUMMARY below to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
Allen's Hummingbird *Selasphorus sasin* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9637	Breeds Feb 1 to Jul 15
Bald Eagle *Haliaeetus leucocephalus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Jan 1 to Aug 31
Belding's Savannah Sparrow *Passerculus sandwichensis beldingi* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/8	Breeds Apr 1 to Aug 15
Black Oystercatcher *Haematopus bachmani* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9591	Breeds Apr 15 to Oct 31
Black Swift *Cypseloides niger* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/8878	Breeds Jun 15 to Sep 10
Black Turnstone *Arenaria melanocephala* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds elsewhere

NOT FOR CONSULTATION

Black-chinned Sparrow Spizella atrogularis — Breeds Apr 15 to Jul 31
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9447

Bullock's Oriole Icterus bullockii — Breeds Mar 21 to Jul 25
This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA

California Gull Larus californicus — Breeds Mar 1 to Jul 31
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

California Thrasher Toxostoma redivivum — Breeds Jan 1 to Jul 31
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Clark's Grebe Aechmophorus clarkii — Breeds Jun 1 to Aug 31
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Common Yellowthroat Geothlypis trichas sinuosa — Breeds May 20 to Jul 31
This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA
https://ecos.fws.gov/ecp/species/2084

Elegant Tern Thalasseus elegans — Breeds Apr 5 to Aug 5
This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA
https://ecos.fws.gov/ecp/species/8561

Golden Eagle Aquila chrysaetos — Breeds Jan 1 to Aug 31
This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.
https://ecos.fws.gov/ecp/species/1680

Heermann's Gull Larus heermanni — Breeds Mar 15 to Aug 31
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

NOT FOR CONSULTATION

Lawrence's Goldfinch *Spinus lawrencei* — Breeds Mar 20 to Sep 20

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9464

Northern Harrier *Circus hudsonius* — Breeds Apr 1 to Sep 15

This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA
https://ecos.fws.gov/ecp/species/8350

Nuttall's Woodpecker *Dryobates nuttallii* — Breeds Apr 1 to Jul 20

This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA
https://ecos.fws.gov/ecp/species/9410

Oak Titmouse *Baeolophus inornatus* — Breeds Mar 15 to Jul 15

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9656

Olive-sided Flycatcher *Contopus cooperi* — Breeds May 20 to Aug 31

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/3914

Santa Barbara Song Sparrow *Melospiza melodia graminea* — Breeds Mar 1 to Sep 5

This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA
https://ecos.fws.gov/ecp/species/5513

Short-billed Dowitcher *Limnodromus griseus* — Breeds elsewhere

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9480

Tricolored Blackbird *Agelaius tricolor* — Breeds Mar 15 to Aug 10

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/3910

NOT FOR CONSULTATION

Western Grebe aechmophorus occidentalis This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/6743	Breeds Jun 1 to Aug 31
Western Gull Larus occidentalis This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Apr 21 to Aug 25
Western Screech-owl Megascops kennicottii cardonensis This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA	Breeds Mar 1 to Jun 30
Willet Tringa semipalmata This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds elsewhere
Wrentit Chamaea fasciata This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Mar 15 to Aug 10

NOT FOR CONSULTATION

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read "Supplemental Information on Migratory Birds and Eagles", specifically the FAQ section titled "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted

Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.

2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

Breeding Season (■)
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

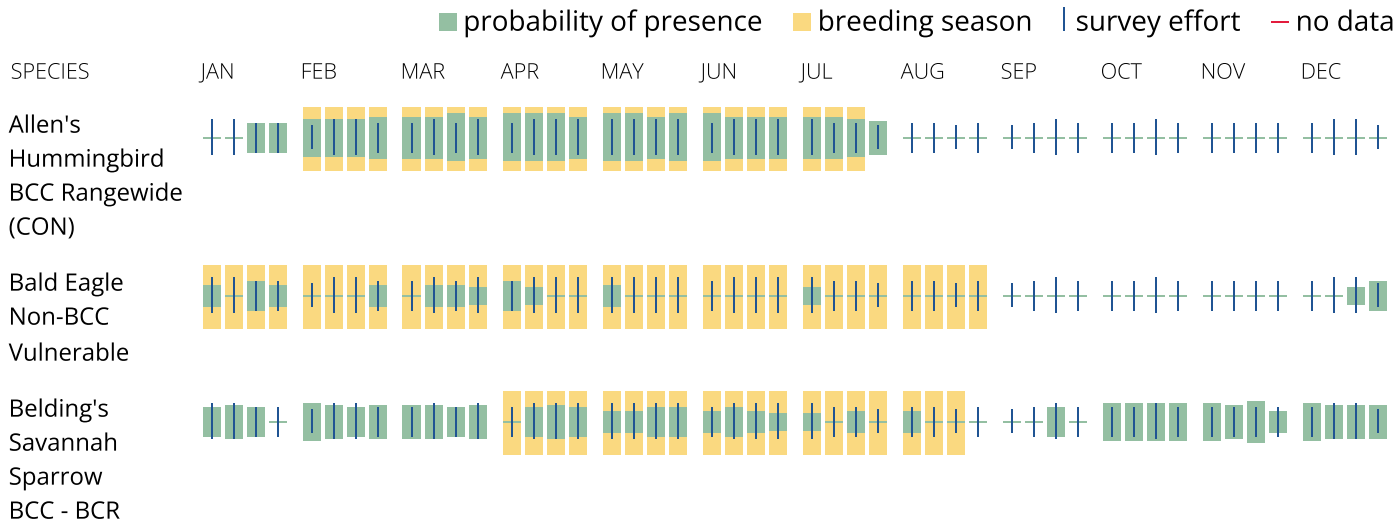
Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

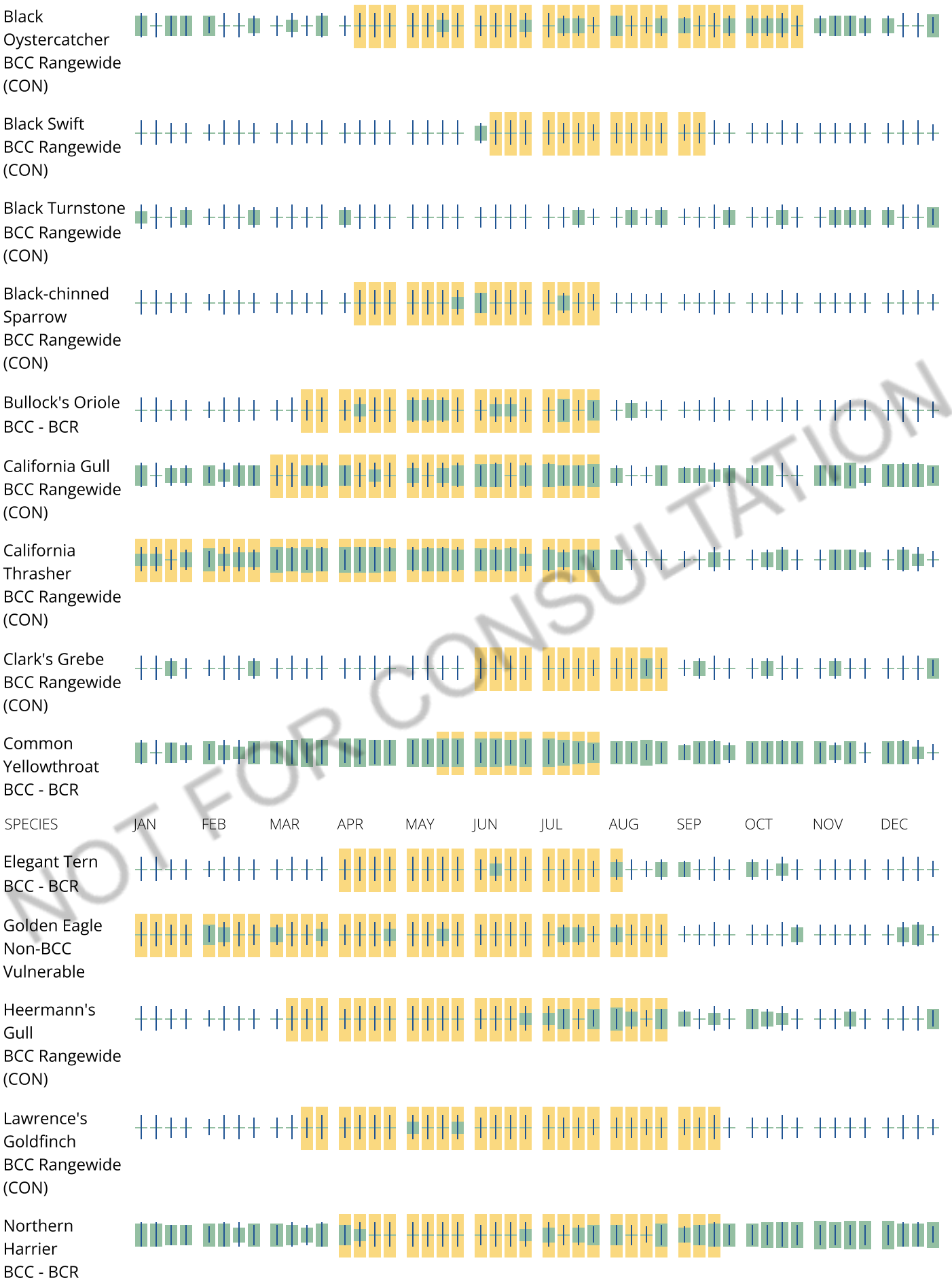
To see a bar's survey effort range, simply hover your mouse cursor over the bar.

No Data (–)
A week is marked as having no data if there were no survey events for that week.

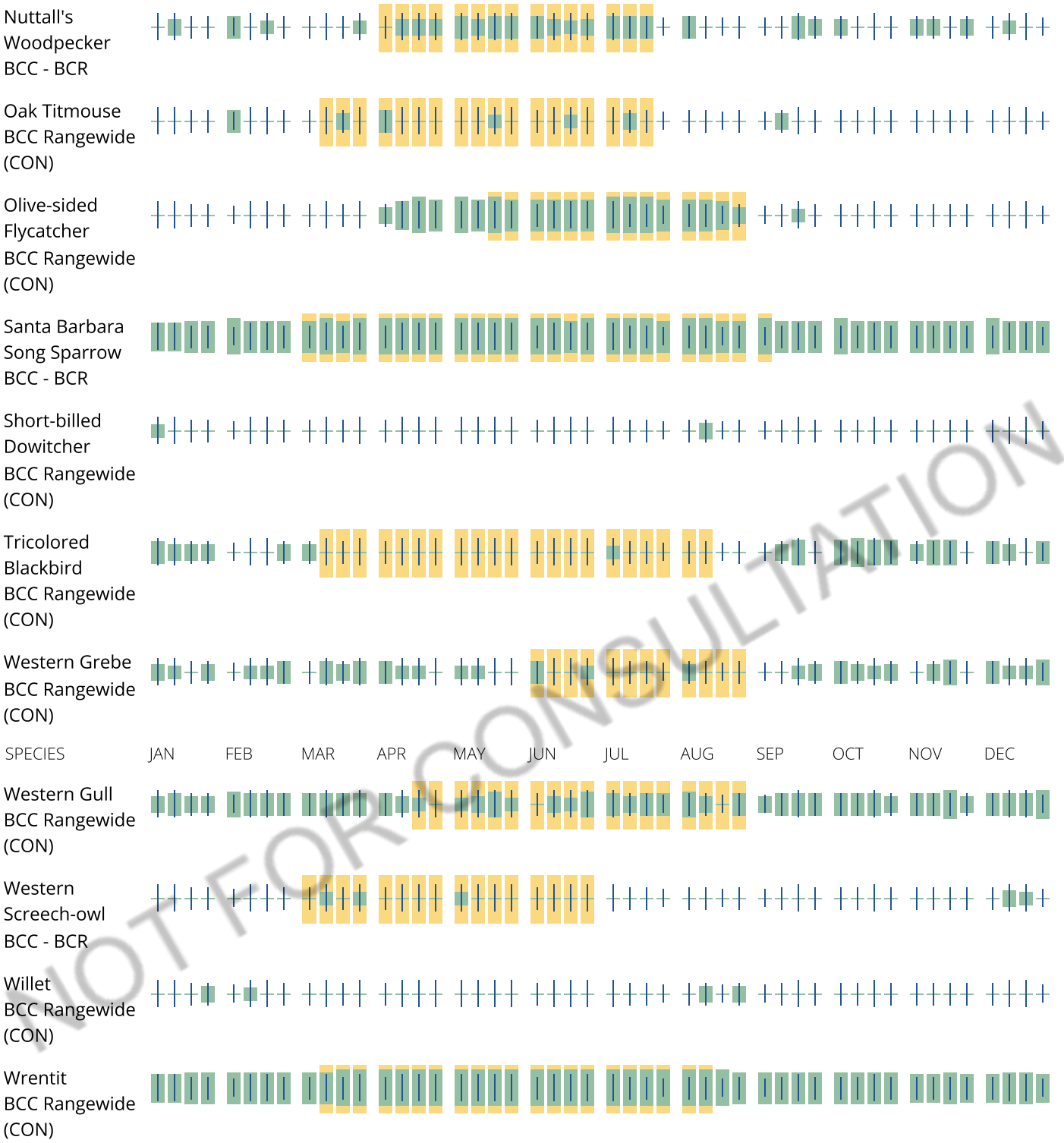
Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.

NOT FOR CONSULTATION





NOT FOR CONSULTATION



NOT FOR CONSULTATION

Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the list of migratory birds that potentially occur in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the Rapid Avian Information Locator (RAIL) Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets.

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering or migrating in my area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may query your location using the RAIL Tool and look at the range maps provided for birds in your area at the bottom of the profiles provided for each bird in your results. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

NOT FOR CONSULTATION

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

NOT FOR CONSULTATION

Facilities

National Wildlife Refuge lands

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

There are no refuge lands at this location.

Fish hatcheries

There are no fish hatcheries at this location.

Wetlands in the National Wetlands Inventory (NWI)

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

This location overlaps the following wetlands:

FRESHWATER FORESTED/SHRUB WETLAND

PFOC

A full description for each wetland code can be found at the National Wetlands Inventory website

NOT FOR CONSULTATION

NOTE: This initial screening does **not** replace an on-site delineation to determine whether wetlands occur. Additional information on the NWI data is provided below.

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate Federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

NOT FOR CONSULTATION

APPENDIX E

Species Observed in the BSA

Table E-1. Plants Species Observed in the BSA

Scientific Name	Common Name	Native/Introduced (invasive)?	Wetland Status[1]
Achillea millefolium	Yarrow	Native	FACU
Adiantum aleuticum	Five finger maidenhair	Native	FAC
Alnus rubra	Red alder	Native	FAC
Artemisia douglasiana	California mugwort	Native	FACW
Avena barbata	Slim oat	Nonnative (invasive)	–
Baccharis pilularis	Coyote brush	Native	–
Brassica rapa	Common mustard	Nonnative (invasive)	FACU
Bromus catharticus	Rescue grass	Nonnative	–
Bromus diandrus	Ripgut brome	Nonnative (invasive)	–
Bromus hordeaceus	Soft chess	Nonnative (invasive)	FACU
Bromus laevipes	Narrow flowered brome	Native	–
Calystegia purpurata	Smooth western morning glory	Native	–
Cardamine sp.	–	–	–
Carduus pycnocephalus ssp. *pycnocephalus*	Italian thistle	Nonnative (invasive)	–
Carex densa	Sedge	Native	OBL
Ceanothus thyrsiflorus	Blueblossom	Native	–
Cirsium vulgare	Bullthistle	Nonnative (invasive)	FACU
Claytonia perfoliata	Miner's lettuce	Native	FAC
Conium maculatum	Poison hemlock	Nonnative (invasive)	FAC
Cornus sericea	American dogwood	Native	FACW
Cortaderia jubata	Andean pampas grass	Nonnative (invasive)	FACU
Cotoneaster pannosus	Woolly cotoneaster	Nonnative (invasive)	–
Delairea odorata	Cape ivy	Nonnative (invasive)	FAC
Diplacus aurantiacus	Sticky monkeyflower	Native	FACU
Dryopteris arguta	Wood fern	Native	–
Epilobium ciliatum	Slender willow herb	Native	FACW
Equisetum arvense	Common horsetail	Native	FAC
Erigeron canadensis	Canada horseweed	Native	FACU
Erodium moschatum	Whitestem filaree	Nonnative	–
Eucalyptus globulus	Blue gum	Nonnative (invasive)	–
Euthamia occidentalis	Western goldenrod	Native	FACW
Festuca microstachys	Small fescue	Native	–
Festuca myuros	Rattail sixweeks grass	Nonnative (invasive)	FACU
Festuca perennis	Italian rye grass	Nonnative (invasive)	FAC
Frangula californica	California coffeeberry	Native	–
Fumaria officinalis	Fumitory	Nonnative	–
Galium aparine	Cleavers	Native	FACU
Genista monspessulana	French broom	Nonnative (invasive)	–
Geranium dissectum	Wild geranium	Nonnative (invasive)	–

Scientific Name	Common Name	Native/Introduced (invasive)?	Wetland Status[1]
Hedera helix	English ivy	Nonnative (invasive)	FACU
Helminthotheca echioides	Bristly ox-tongue	Nonnative (invasive)	FAC
Heracleum maximum	Common cowparsnip	Native	FAC
Hesperocyparis macrocarpa	Monterey cypress	Native	–
Heteromeles arbutifolia	Toyon	Native	–
Hordeum brachyantherum	Meadow barley	Native	FACW
Hordeum murinum	Foxtail barley	Nonnative (invasive)	FAC
Hypochaeris radicata	Hairy cat's ear	Nonnative (invasive)	FACU
Juncus bufonius	Common toad rush	Native	FACW
Juncus patens	Rush	Native	FACW
Linum bienne	Flax	Nonnative	–
Lonicera involucrata	Coast twinberry	Native	FAC
Lotus corniculatus	Bird's foot trefoil	Nonnative	FAC
Lysimachia arvensis	Scarlet pimpernel	Nonnative	FAC
Lythrum hyssopifolia	Hyssop loosestrife	Nonnative (invasive)	OBL
Marah fabacea	California man-root	Native	–
Matricaria discoidea	Pineapple weed	Native	FACU
Medicago polymorpha	California burclover	Nonnative (invasive)	FACU
Myoporum laetum	Ngaio tree	Nonnative (invasive)	UPL
Nasturtium officinale	Watercress	Native	OBL
Pinus radiata	Monterey pine	Native	–
Plantago coronopus	Cut leaf plantain	Nonnative	FACU
Plantago lanceolata	Ribwort	Nonnative (invasive)	FAC
Polystichum californicum	California sword fern	Native	FACU
Pseudognaphalium luteoalbum	Jersey cudweed	Nonnative	FACW
Raphanus sativus	Radish	Nonnative (invasive)	–
Ribes malvaceum	Chaparral currant	Native	–
Rubus armeniacus	Himalayan blackberry	Nonnative (invasive)	FAC
Rubus parviflorus	Thimbleberry	Native	FACU
Rubus spectabilis	Salmon berry	Native	FAC
Rubus ursinus	California blackberry	Native	FACU
Rumex crispus	Curly dock	Nonnative (invasive)	FAC
Salix lasiolepis	Arroyo willow	Native	FACW
Sambucus racemosa	Red elderberry	Native	FACU
Scandix pecten-veneris	Shepherd's needle	Nonnative	–
Scrophularia californica	California bee plant	Native	FAC
Sequoia sempervirens	Coast redwood	Native	–
Sisyrinchium bellum	Blue eyed grass	Native	FACW
Solanum sp.	–	–	–
Sonchus asper ssp. *asper*	Sow thistle	Nonnative	FACU

Scientific Name	Common Name	Native/Introduced (invasive)?	Wetland Status[1]
Sonchus oleraceus	Sow thistle	Nonnative	UPL
Stachys rigida	Rough hedgenettle	Native	FACW
Stellaria media	Chickweed	Nonnative	FACU
Stipa pulchra	Purple needle grass	Native	–
Symphyotrichum chilense	Pacific aster	Native	FAC
Taraxacum officinale	Red seeded dandelion	Nonnative	FACU
Tellima grandiflora	Fringe cups	Native	FACU
Thalictrum occidentale	Western meadow rue	Native	FACU
Toxicodendron diversilobum	Poison oak	Native	FAC
Urtica dioica	Stinging nettle	Native	FAC
Urtica urens	Annual stinging nettle	Nonnative	–
Vicia sativa	Spring vetch	Nonnative	UPL
Vinca major	Vinca	Nonnative (invasive)	–
Washingtonia robusta	Washington fan palm	Nonnative (invasive)	–

[1] NWPL Wetland Status Codes (Lichvar et al. 2020): FAC = Facultative; FACU = Facultative Upland; FACW = Facultative Wetland; OBL – Obligate; UPL = Upland

Table E-2. Wildlife Species Observed in the BSA

Scientific Name	Common Name	Native/Introduced?
Birds		
Psaltriparus minimus	Bushtit	Native
Callipepla californica	California quail	Native
Poecile rufescens	Chestnut-backed chickadee	Native
Junco hyemalis	Dark-eyed junco	Native
Streptopelia decaocto	Eurasian collared dove	Introduced
Sturnus vulgaris	European starling	Introduced
Spinus psaltria	Lesser goldfinch	Native
Contopus cooperi	Olive-sided flycatcher	Native
Leiothlypis celata	Orange-crowned warbler	Native
Troglodytes pacificus	Pacific wren	Native
Haemorhous purpureus	Purple finch	Native
Pipilo maculatus	Spotted towhee	Native
Cyanocitta stelleri	Steller's jay	Native
Tachycineta bicolor	Tree swallow	Native
Contopus sordidulus	Western wood-peewee	Native
Cardellina pusilla	Wilson's warbler	Native
Chamaea fasciata	Wrentit	Native
Insects		
Papilio sp.	Swallow-tail butterfly	Native
Bombus vosnesenskii	Vosnesensky bumble bee	Native

APPENDIX F

County of San Mateo Routine Maintenance Program
Best Management Practices

Table 9-1. Maintenance Program Best Management Practices

BMP Number	BMP Title	BMP Description
General Avoidance and Minimization Measures		
GEN-1	Staging and Access	▪ Staging, access, and parking areas will be located outside of sensitive habitats to the extent feasible. ▪ Staging areas will be located 30 feet from the top of bank (or as far as feasibly possible) or on the outboard side of levees. ▪ Vegetation removal shall be limited to the minimum amount necessary to provide access.
GEN-2	Minimize Area of Disturbance and Site Maintenance	▪ Areas of disturbance will be limited to the smallest footprint necessary and a single access pathway, where feasible. For maintenance activities near waterways or other sensitive habitat, the designated work area shall be clearly identified in the field using highly visible material, and work will not be conducted outside this area. ▪ Keep excavated soil and materials on the site where they will not collect into the street or get transported to storm drains or nearby water bodies by rainfall or runoff in order to avoid deleterious effects to fish, wildlife, and beneficial uses. ▪ Transfer excavated materials to dump trucks on the site, not in the street.
GEN-3	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. ▪ When in-channel work is required, where available use existing ingress or egress points or perform work from the top of the stream banks.
GEN-4	Salvage/Reuse of Plant and Woody Material	▪ Large wood or weed-free topsoil displaced by project activities may be stockpiled for use during site restoration. Native vegetation displaced by project activities will be stockpiled if it would be useful during site restoration. ▪ Stockpiled material shall not be placed over riparian or wetland vegetation. Stockpiled material shall not be placed in areas where it could enter the stream, riparian or wetland areas. ▪ To the extent feasible, all other woody material that is not re-usable should be disposed at a composting facility.
GEN-5	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.
GEN-6	Hazardous Materials Storage/ Disposal	▪ 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 watertight containers, store in appropriate secondary containment, and cover them at the end of every workday or during wet weather or when rain is forecast. ▪ Follow manufacturer's application instructions for hazardous materials and be careful not to use more than necessary. Do not apply chemicals outdoors when rain is forecast within 24 hours. ▪ Arrange for appropriate disposal of all hazardous wastes.

BMP Number	BMP Title	BMP Description
GEN-7	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. On-site monitor should insect beneath all vehicles that have been parked more than 15 minutes before they leave the work area. 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. If water must be used, the Contractor shall collect the water and spilled fluids and dispose of it as hazardous waste. • Clean up spills on dirt areas by digging up and properly disposing of contaminated soil. • Small spills (less than 18 inches in diameter) including small quantities of oil, gasoline, paint or other materials should be controlled by the first responder (maintenance staff) and do not necessarily require an emergency response team. Medium spills (greater than 18 inches but less than 6 feet in diameter) are typically controlled by the first responder (maintenance staff) but police or fire department HAZMAT teams may be called based on conditions. Report significant spills (larger than 6 feet in diameter and any "running" spill) immediately. You are required by law to report all significant releases of hazardous materials, including oil. To report a spill, contact the San Mateo County Environmental Health Services Division, or other emergency office (e.g., local fire or police department) as warranted, immediately and document the spill using the spill documentation form . Alternatively, 1) dial 911, the local emergency response number, 2) the National Response Center at (800) 424-8802; or 2) call the Governor's Office of Emergency Services Warning Center, (800) 852-7550 (24 hours). As appropriate, contact other agencies including California Occupational Safety and Health Administration or the Regional Water Quality Control Board. All chemical spills shall be reported as soon as possible to the emergency site contact.
GEN-8	Waste Management	Cover waste disposal containers securely at the end of every workday 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. ▪ Ensure that portable toilets have a secondary containment plan (e.g., a containment pan). ▪ 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.
GEN-9	Vehicle 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. ▪ Conduct vehicle and equipment cleaning at County corporation yards and ensure that rinse water does not run into gutters, streets, storm drains, or surface waters.

BMP Number	BMP Title	BMP Description
		▪ If refueling or vehicle maintenance must be done on-site, work in a bermed area (e.g., sandbags, gravel bags, compost socks, or other barrier material) at least 150 feet away from creek channels, away from storm drains and over a drip pan big enough to collect fluids. ▪ Refuel vehicles at least 150 feet away from the active stream channel. ▪ Keep an ample supply of spill clean-up materials near fueling, vehicle maintenance and hazardous materials/hazardous waste storage areas. Inventory clean-up materials monthly and restock as needed. ▪ Post proper fueling and spill clean-up instructions at fueling areas. Never leave the area while equipment is being filled. ▪ Recycle or dispose of fluids as hazardous waste. ▪ Do not clean vehicle or equipment on-site using soaps, solvents, degreasers, steam cleaning equipment, etc. ▪ Perform vehicle and mobile equipment steam cleaning, pressure washing or degreasing only over a containment designed to collect any generated wash water. Collect wash water and discharge to sewer via an oil water separator. Do not pour wash water down storm drains or sewers connected to septic systems.
GEN -10	Equipment Maintenance & Fueling	▪ A separate area should be designated for equipment maintenance and fueling, away from any slopes, watercourses, or drainage facilities. ▪ 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, gravel bags, or absorbent booms should be employed to contain any leaks or spills. ▪ Equipment should be inspected daily for leaks or damage and promptly repaired. ▪ Fueling and maintenance of vehicles should take place at least 65 feet away from waterways. ▪ In the event of a spill, follow procedures outlined in BMP GEN-7.
GEN-11	Paving and Asphalt Work	▪ Avoid paving and seal coating in wet weather or when rain is in the forecast, to prevent materials that have not cured from contacting stormwater runoff. ▪ Cover storm drain inlets and manholes when applying seal coat, tack coat, slurry seal or fog seal; and when saw cutting asphalt or concrete. ▪ Collect and recycle or appropriate dispose of excess abrasive gravel or sand. Do not sweep this material into gutters. ▪ Do not use water to wash down fresh asphalt concrete pavement. ▪ Use filter fabric, catch basin inlet filters, or gravel bags to keep slurry out of the storm drain system. ▪ Shovel, absorb or vacuum saw-cut slurry and dispose of all waste as soon as work is complete in one location or at the end of the workday. ▪ If sawcut slurry enters a catch basin, clean it up immediately.
GEN-12	Concrete, Grout and Mortar Application	▪ Store concrete, grout, and mortar away from storm drains or waterways, and on pallets under cover to protect them from rain, runoff and wind. ▪ Wash out concrete equipment/trucks offsite or in a designated washout area, where the water will flow into a temporary waste pit, and in a manner that will prevent leaching into the underlying soil or onto surrounding areas. Let concrete harden and dispose of as garbage.

BMP Number	BMP Title	BMP Description
		▪ When washing exposed aggregate, prevent wash water from entering storm drains. Block any inlets and vacuum gutters, hose wash water onto dirt areas, or drain onto a bermed surface to be pumped and disposed of properly.
GEN-13	Exclude Concrete from Channel	▪ For maintenance activities that involve concrete pouring, the County shall ensure that poured concrete be excluded from the wetted channel for a period of 30 days after it is poured. During that time, the poured concrete shall be kept moist, and runoff from the concrete shall not be allowed to enter a stream. Containment structures should be installed to control the placement of wet concrete and to prevent it from entering the channel outside of those structures. ▪ Commercial sealants may be applied to the poured concrete surface where difficulty in excluding water flow for a long period may occur. If sealant is used, water shall be excluded from the site until the sealant is dry. ▪ No dry concrete shall be placed on the banks or in a location where it could be carried into the channel by wind or runoff.
GEN-14	Concrete Washout Facilities	▪ Concrete washout facilities should be established for maintenance activities that require on-site preparation and use of Portland cement concrete, asphalt concrete or cement mortar, establish concrete washout facilities. These facilities capture wash water, concrete and aggregate flushed from concrete mixers, chutes, etc. Concrete washouts may be contained settling basins dug into the ground, raised and contained structures, trailers, etc. They are also applicable for projects that require equipment washouts. ▪ An appropriate area for the washout must be identified at least 50 feet away from watercourses and storm drains in case of accidental breaching. The storage capacity of the basin must be sized correctly for the job. <u>Construction Guidelines:</u> ▪ The location of the concrete washout should be clearly labeled and all employees should be educated about proper concrete disposal. ▪ Avoid mixing excess amounts of fresh concrete or cement mortar on-site. ▪ Wash out concrete mixers only in designated washout areas where the water will flow into temporary sealed basins or onto stockpiles of aggregate base or sand. Use as little water as possible to reduce hardening and evaporation time of waste products. ▪ Construct a basin large enough to contain all liquid and waste concrete materials generated during washout procedures. A minimum basin size is 9 feet x 9 feet and 2 feet deep. Plastic liner materials shall be a minimum of 60-mil polyethylene sheeting free of holes and defects. ▪ Recycle washout by pumping back into mixers for reuse when possible. <u>BMP Maintenance:</u> ▪ The concrete washout should be checked frequently to ensure proper use and effectiveness. ▪ At 75 percent capacity, the washout must be cleaned or new facilities must be constructed and ready for use. <u>BMP Removal:</u> ▪ The hardened concrete and materials related to the washout must be broken up, removed, and disposed of in accordance to local regulations. ▪ Area disturbed by the concrete washout must be repaired.

BMP Number	BMP Title	BMP Description
GEN-15	Painting and Paint Removal	▪ Never clean brushes or rise paint containers into a street, gutter, storm drain, or stream. ▪ For water-based paints, paint out brushes to the extent possible, and rinse into a drain that goes to the sanitary sewer. Never pour paint down a storm drain. ▪ For oil-based paints, paint out brushes to the extent possible and clean with thinner or solvent in a proper container. Filter and reuse thinners and solvents. Dispose of excess liquids as hazardous waste. ▪ Paint chips and dust from non-hazardous dry stripping and sand blasting may be swept up or collected in plastic drop cloths and disposed of as trash. ▪ Chemical paint stripping residue and chips and dust from marine paints or paints containing lead, mercury, or tributyltin must be disposed of as hazardous waste. Lead based paint removal requires a state-certified contractor.
GEN-16	Timing of Work	▪ In general, routine maintenance and construction activities that take place in sensitive habitat and/or in channels below ordinary high water will be conducted during the dry season (June 15 through October 15). Maintenance activities that are in upland areas and that would not affect streams may occur during low rainfall years at times when there is no predicted rainfall (chance of precipitation is less than 30 percent chance of rain). Activities that are subject to permit requirements will be conducted during the period authorized by the permits.
GEN-17	Maintain Traffic Flow	▪ To the extent feasible, work shall be staged and conducted in a manner that maintains two-way traffic flow on roadways in the vicinity of the work site. ▪ Heavy equipment and haul traffic shall be prohibited in residential areas to the greatest extent feasible. When no other route to and from the site is available, heavy equipment and haul traffic through residential areas shall be restricted to the hours of 8 a.m. to 5:30 p.m., Monday through Friday. ▪ If heavy equipment or hauling is required beyond the hours above, the County or their contractor would provide notice to adjacent property owners 48 hours in advance of such activities.
GEN-18	Traffic Control and Public Safety	▪ In the event that work activities require the temporary closure of any traffic lanes, the County shall implement measures to guide traffic (such as signage and flaggers), safeguard construction workers, provide safe passage of vehicles, and minimize traffic impacts through the duration of work activities. The County also shall notify local emergency service providers regarding any planned lane closures. ▪ For any other work within or near the roadway that could pose a hazard to the public, the County shall install/implement appropriate measures, such as fences, barriers, flagging, guards, and/or signs, to give adequate warning and provide protection from the potentially dangerous condition. ▪ For work activities along or near roadways with sidewalks and bike lanes, the County shall implement measures to ensure the safe passage of pedestrians and bicyclists around the work site. ▪ Where work is proposed at a recreational park or trail, warning signs will be posted several feet beyond the limits of work. Signs will also be posted if trails will be temporarily closed. ▪ Public transit access and routes will be maintained in the vicinity of the work site. If public transit will be affected by temporary road closures and require detours, affected transit authorities will be consulted and kept informed of project activities.

BMP Number	BMP Title	BMP Description
GEN-19	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.
GEN-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.
GEN-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.
GEN-22	Site Stabilization	Earthwork will be completed as quickly as possible, and where practical, site restoration will occur immediately following maintenance. If site restoration involves planting, such activities may commence in late fall or early winter during the onset of rainy season. Bare soil surfaces resulting from maintenance and/or construction activities shall be covered with suitable erosion controls (seed or plant vegetation, 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 October through April). ▪ No later than 7 days following the disturbance during the dry season (approximately May through September).Every effort shall be made to immediately cover bare soil surfaces resulting from maintenance and/or construction activities prior to storms. Revegetation activities will include only local plant materials native to the San Francisco Peninsula region.
GEN-23	Fire Prevention	1. All earthmoving and portable equipment with internal combustion engines will be equipped with spark arrestors. 2. During the high fire danger period (April 1–December 1), work crews will: ▪ Have appropriate fire suppression equipment available at the work site. ▪ Keep flammable materials, including flammable vegetation slash, at least 10 feet away from any equipment that could produce a spark, fire, or flame.

BMP Number	BMP Title	BMP Description
		▪ Not use portable tools powered by gasoline-fueled internal combustion engines within 25 feet of any flammable materials unless a round-point shovel or fire extinguisher is within immediate reach of the work crew (no more 25 feet away from the work area).
GEN-24	Investigation of Utility Line Locations	An evaluation of the locations of utility lines that could be affected by maintenance activities will be conducted annually as part of the preparation of the Annual Notification. Utilities will be avoided as much as possible. For maintenance areas with the potential for effects on utility services, the following measures will be implemented: 1. Utility excavation or encroachment permits will be required from the appropriate agencies. These permits include measures to minimize utility disruption. The County and its contractors will comply with permit conditions. Such conditions will be included in construction contract specifications. 2. Utility locations will be verified through a field survey (potholing) and use of the Underground Service Alert services. 3. Detailed specifications will be prepared as part of the design plans to include procedures for the excavation, support, and/or fill of areas around utility cables and pipelines. All affected utility services will be notified of the County's maintenance plans and schedule. Arrangements will be made with these entities regarding protection, relocation, or temporary disconnection of services. 4. Residents and businesses in the project area will be notified of planned utility service disruption 2 to 4 days in advance, in conformance with state standards. 5. Disconnected cables and lines will be reconnected promptly.
GEN-25	Retention of Tree Stumps / Rootwads	▪ Objects embedded/anchored in the bank, such as tree stumps, shall not be removed if removal could result in release of sediment into the channel. Stumps and rootwads that potentially serve as basking sites or that encourage pool formation should be left in place whenever possible. Protruding objects that could capture additional debris and result in obstruction of the channel (e.g. the branches and trunk of a downed tree) may be trimmed. If an embedded object must be removed to prevent a debris jam, turbidity control practices shall be used, and the bank shall be reseeded, re-vegetated and/or mulched following removal.
GEN-26	Decontamination of Project Equipment and Vehicles	▪ Equipment, boots and waders used for in-water maintenance activities will be decontaminated prior to entering and exiting the maintenance site and/or between each use in different water bodies to avoid the introduction and transfer of organisms between water bodies. Methods to be employed may include: drying, using a hot water soak, or freezing, as appropriate to the type of gear or equipment. The County shall begin the decontamination process by thoroughly scrubbing equipment, paying close attention to small crevices such as boot laces, seams, net corners, etc., with a stiff-bristled brush to remove all organisms. To decontaminate by drying, the County shall allow equipment to dry thoroughly (i.e., until there is a complete absence of water), preferably in the sun, for a minimum of 48 hours. To decontaminate using a hot water soak, the County shall immerse equipment in 140°F or hotter water and soak for a minimum of 5 minutes. To decontaminate by freezing, the County shall place equipment in a freezer 32°F or colder for a minimum of 8 hours. Repeat decontamination is required only if the equipment/clothing is removed from the site, used within a different waterbody, and returned to the project site.

BMP Number	BMP Title	BMP Description
		▪ Vehicles, watercraft, and other maintenance equipment used for in-water maintenance activities that are too large to immerse in a hot water bath shall be decontaminated by pressure washing with hot water (minimum of 140°F at the point of contact or 155°F at the nozzle or by using other effective techniques). Watercraft engines and all areas that could contain standing water (e.g., live wells, bilges, etc.) shall be flushed for a minimum of 10 minutes. Following the hot water wash, vehicles, watercraft and equipment shall be dried as thoroughly as possible. ▪ A bleach solution shall be used to decontaminate vehicles, watercraft and other maintenance gear and equipment at a designated location where runoff can be contained and not allowed to enter streams or other sensitive habitat areas.
GEN-27	Vegetation and Tree Removal	▪ The disturbance or removal of vegetation shall not exceed the minimum necessary to complete maintenance activities. The use of bulldozers, backhoes, or other heavy equipment to remove vegetation along stream banks shall be avoided wherever feasible. ▪ The County may remove up to two non-hazardous trees greater than 12 inches in diameter per year from natural channels below ordinary high water if the trees are restricting the capacity of the channel, causing erosion or flooding, or limiting access to perform maintenance work. Trees will be cut at ground level and the root mass left in place to maintain bank stability. No non-hazardous trees greater than 36 inches in diameter will be removed under this program. This measure does not apply to trees considered a hazard as defined by the International Society of Arboriculture, which may include dead or dying trees, dead parts of live trees, or unstable live trees (due to structural defects or other factors) that are within striking distance of people or property (a target) that have the potential to cause death, injury, or substantial property damage. ▪ Removed vegetation shall be placed directly into a disposal vehicle and removed from the site, and shall not be permitted to remain onsite overnight. However, if removed vegetation will be used onsite for erosion control or slash and will not be moved or disturbed, it may be stockpiled onsite for longer than an overnight. Stockpiled vegetation shall not be piled on the ground unless it is later transferred, piece by piece, under the direct supervision of the biological monitor or qualified biologist.
GEN-28	Herbicide Application	▪ Herbicide application shall only be conducted when the climate is dry and when wind speeds do not exceed 7 miles per hour. Herbicides shall not be used in or adjacent to any fish-bearing stream, lake, pond or other water bodies supporting suitable habitat for California red-legged frog or other listed species.
Erosion Control Measures		
EC-1	Brush Layering	Brush layering is a technique used to stabilize shallow slope failures or rebuild fill slopes with live brush cuttings (usually willows or other types of branches) with soil backfill or soil lifts. Live brush layers act as horizontal drains and improve slope stability by providing tensile strength and natural revegetation. Brush layering may include the use of fabric soil wraps, large vegetated boulder revetments, or other structural toe support. Synthetic geogrids can only be used with prior agency approval. For a more detailed description of this BMP, refer to Appendix A.
EC-2	Brush Packing	Brush packing is a biotechnical gully and slump repair technique. Brush packing utilizes alternating layers of live branch cuttings (from rootable plant species) and soil to repair large rills, gullies, and slumps. The brush packing technique is more

BMP Number	BMP Title	BMP Description
		appropriate for the repair of gullies on slopes, and it can be implemented with hand labor. For a more detailed description of this BMP, refer to Appendix A.
EC-3	Live Staking	Live staking involves the insertion of live, vegetative cuttings into the ground in a manner that allows the cutting (stake) to take root and grow. This BMP is used to reduce the potential for soil to become water borne, to reduce water velocity and erosive forces, and to aid in habitat protection. Poles used in willow walls and vegetated boulder revetments may be a structural application. Sprigs may be used in individual planting spots along a streambank. For a more detailed description of this BMP, refer to Appendix A.
EC-4	Live Pole Drain	Live pole drains are a biotechnical technique intended to drain excess moisture away from an unstable site. Plants (typically willows) are used to construct bundles which will sprout and grow, with the moisture continuing to drain from the lower end. The bundles are placed in shallow trenches in a manner that they intersect and collect excessive slope moisture. See Appendix A for additional description about this BMP.
EC-5	Wattles/ Fascines	Wattles and fascines are live branch cuttings, usually willows, bound together into long, tubular bundles used to stabilize slopes and stream banks. Both wattles and live fascines are true biotechnical practices. The live branches and live stakes provide the biological element while the stems, rope ties and wedge-shaped wooden stakes all combine to provide the structural elements. Fascines differ from wattles in that the branch cuttings all point in the same direction in fascines, where they may point in either direction in wattles. Wattles are typically aligned on contour, where fascines are angled slightly upslope and thus tend to produce more vigorous growth. For a more detailed description of this BMP, refer to Appendix A.
EC-6	Hand Seeding	Hand seeding is broadcasting grass seed on disturbed or bare soil areas by hand or a hand seeding device. This BMP is used to reduce the potential for soil to become water or air borne, reduce erosion after vegetation establishment, provide for vegetative buffers and aid in habitat protection. Seeding with appropriate seed mixes also helps discourage colonization by non-native and invasive plant species. For a more detailed description of this BMP, refer to Appendix A.
EC-7	Hydroseeding	Hydroseeding is broadcasting grass seed, tackifier, wood fiber mulch and water on disturbed areas using a hydroseeding machine. This BMP is used to reduce the potential for soil becoming water or air borne, to reduce erosion after vegetation is established, provide vegetative buffers and to aid in habitat protection. Seeding with appropriate seed mixes will also help discourage colonization by non-native and invasive plant species. Hydroseeding may be used after soil disturbance is completed at construction/maintenance sites and/or on bare slopes. For a more detailed description of this BMP, refer to Appendix A.
EC-8	Mulching	Mulching is the application of rice or sterile straw, wood chips, leaf litter, redwood duff, or other suitable materials on the soil surface applied manually or by machine. This BMP is used to reduce the potential for soil becoming water or air borne, and to encourage vegetation establishment. This BMP is used to protect the soil surface and to protect newly seeded areas. For a more detailed description of this BMP, refer to Appendix A.
EC-9	Vegetative Buffer	A vegetative buffer is a strip of vegetation adjacent to sensitive areas, ditches, pavement and water bodies. This BMP prevents soil from becoming water borne and may help restore shallow slope failures by trapping soil and debris. For a more detailed description of this BMP, refer to Appendix A.
EC-10	Erosion Control Blankets & Mats	Erosion control blankets and mats are installed to protect the prepared soil surface of a steep slope. This BMP may be used at maintenance sites to provide stabilization/protection on steep slopes or stream banks. Erosion control blankets and mats

BMP Number	BMP Title	BMP Description
		are available in a variety of materials including jute, excelsior, blanket material, straw, wood fiber blanket, coconut fiber blanket, coconut fiber mesh, and straw coconut fiber blanket. Material selection should be based on the size of area, slope, surface conditions, revegetation plans, and channel velocity. Coir fabric/netting is a geo-textile product made from coconut fibers loosely woven into a fabric usually packaged in roll form. This fabric can be used to provide a reduction in water velocity/erosive forces and/or habitat protection and topsoil stabilization. Erosion control blankets and mats may be used in combination with seeding and/or vegetation. For a more detailed description of this BMP, refer to Appendix A.
EC-11	Surface Roughening	Surface roughening is a technique for roughening a bare soil surface with furrows running across the slope, stair stepping, or tracking with construction equipment. Surface roughening is intended to aid the establishment of vegetative cover from seed, to reduce runoff velocity and increase infiltration, and to reduce erosion and provide for sediment trapping. This BMP is typically applied on slopes steeper than 3:1. For a more detailed description of this BMP, refer to Appendix A.
EC-12	Rolling Dip	Rolling dips are ridges or ridge-and-channels constructed diagonally across a sloping road or utility right-of-way that is subject to erosion to limit the accumulation of erosive volumes of water on roads by diverting surface runoff at designated intervals. Rolling dips are appropriate to use on low and moderate grades and on both high or low traffic roads. For a more detailed description of this BMP, refer to Appendix A.
EC-13	Slope or Bank Stabilization	Where biotechnical methods are unsuitable for stabilizing streambanks due to site specific conditions such as steep slopes or limited right-of-way width, hardened engineered solutions such as rock slope protection, solider pile walls, retaining walls, or slope soil nailing may be utilized along a failed portion of slope to provide a buttress against additional failure. To the extent feasible, this BMP should be combined with biotechnical solutions through installation of vegetated rock slope protection. Refer to Appendix A for a more detailed description of this BMP.
EC-14	Energy Dissipator	An energy dissipator is a structure designed to control erosion at the outlet of a channel or conduit by reducing the velocity of flow and dissipating the energy. This BMP is recommended at the outlet of any new or replacement drainage culvert, which are points of high erosion potential. Energy dissipators are effective in absorbing the impact of flow and reducing the velocity to non-erosive levels. For a more detailed description of this BMP, refer to Appendix A.
Sediment/Water Quality Control Measures		
SC-1	Gravel Bags	Gravel bags can be used to keep water away from work areas and unstable slopes or for constructing cofferdams and clean water bypasses. This BMP is also typically used at construction or maintenance sites to protect storm drain outlets, gutters, ditches, and drainage courses. For a more detailed description of this BMP, refer to Appendix A.
SC-2	Silt Fence	A silt fence is a temporary sediment barrier consisting of fabric stretched across and attached to supporting posts and entrenched into soil. This BMP is generally used for perimeter protection (around construction/maintenance sites, stockpile areas). It may also be installed perpendicular to the flow direction to slow or stop water and to allow perimeter filtration, settling of soil particles, and to reduce water velocity. For a more detailed description of this BMP, refer to Appendix A.
SC-3	Straw Log, Straw Roll, Coir Log	Straw rolls/logs or coir logs may be used for temporary soil stockpile protection; protection of storm drains, gutters, and drainage courses; temporary check dams; bank or slope stabilization; and streambank toe protection. Alternatives to straw rolls/logs and coir logs include compostable filter socks/berms comprised of natural fibers and other bio-based materials. For a more detailed description of this BMP, refer to Appendix A.

BMP Number	BMP Title	BMP Description
SC-4	Inlet Protection	Storm drain inlets can be protected through installation of temporary barriers such as silt fences, gravel bags, and other proprietary barriers like geotextile inserts, biofilter bags, or compost socks. These barriers are intended to prevent and reduce the sediment discharged into storm drains by ponding runoff and allowing sediment to settle out. For a more detailed description of this BMP, refer to Appendix A.
SC-5	Stormwater Separation Systems	Stormwater separation systems are engineered devices installed in storm drain facilities to remove solids, grease and other pollutants. These may be installed where deep structures allow for their placement and maintenance, or where sufficient quantities of pollutant materials require regular removal in order for the storm drains to operate correctly. For a more detailed description of this BMP, refer to Appendix A.
SC-6	Diversion Berm	A diversion berm is a temporary ridge of compacted soil or aggregate base material, or contiguous bag berm constructed at the top or base of a disturbed slope. It may also consist of asphalt concrete or "cutback" at the top of a disturbed slope. This BMP is intended to direct stormwater runoff away from an unstable slope. For a more detailed description of this BMP, refer to Appendix A.
SC-7	Silt Curtain	The County shall install silt curtains or other appropriate silt filtering devices around excavation sites to prevent heavily silted water from impacting areas around the work site. The silt curtain or silt filtering device shall be maintained throughout all phases of excavation.
SC-8	Turbidity Monitoring	During in-water maintenance activities, the County will monitor turbidity levels up and downstream of the maintenance work area prior to conducting maintenance. The County will maintain a log of turbidity data and ensure that activities do not result in increases in turbidity of the stream of more than 20 percent of upstream sampling locations, as measured visually or by nephelometric turbidity units (NTU). Work will be halted if turbidity/siltation levels exceed 20 percent of upstream sampling levels and CDFW will be contacted for further guidance to ensure activities do not harm aquatic life.
Dewatering Measure		
DW-1	Channel Dewatering	• When in-water construction is unavoidable, streamflow shall be diverted around work areas by either installing cofferdams and/or clean water bypass systems. A cofferdam is a temporary structure built into a waterway to enclose a construction area and reduce sediment pollution from construction work in or adjacent to water. A clean water bypass is typically used for short-term diversion of small amounts of water over short distances to enable dewatering of a maintenance site. Depending on site conditions, these systems may be either gravity driven or require use of a pump to divert water around a construction area. For a more detailed description of this BMP, refer to Appendix A. • No dewatering will be conducted at sites with recent document occurrences of coho salmon within the past 5 years.
Sediment Testing and Disposal Measure		
ST-1	Testing and Disposal of Sediment	Depending on the location of the sediment removal site and upstream and adjacent land uses, the County will test the sediment prior to removal to determine suitability for disposal or reuse based on its chemical qualities. The test results and proposed disposal or reuse locations will be submitted to the RWQCB for review and approval. Samples will be analyzed according to the Beneficial Reuse of Dredged Materials: Sediment Screening and Testing Guidelines (RWQCB 2000), as appropriate for the proposed disposal or reuse site. The results will be compared against federal and state environmental screening levels (ESLs) for protection of human health, groundwater quality, and terrestrial receptors. If hazardous levels of

BMP Number	BMP Title	BMP Description
		contaminants (as defined by federal and state regulations) are present, the material will be taken to a permitted hazardous waste facility.

Sources: San Mateo Countywide Water Pollution Prevention Program, 2014; County of San Mateo, 2004 and 2013.

Table 9-2. Cultural Resources Best Management Practices

BMP Number	BMP Title	BMP Description
CUL-1	Review Cultural Resources Sensitivity Map Data and County Baseline Maps to Determine if the Work Area Has Been Subject to a Previous Cultural Resource Study	During the early phases of Annual Work Plan development, the County will review the Cultural Sensitivity Map Data and County Baseline Maps (Appendix I) for all locations where ground-disturbing activities are proposed where excavation would be required beyond the facility's as-built design or otherwise reach previously undisturbed soils beyond existing engineered depths or extent. If the foregoing conditions are not applicable to the maintenance activity being performed, only BMPs CUL-4 and CUL-5 will be required. Based on the location of projects, and whether or not excavation or ground disturbance will occur beyond existing engineered depths or extent, BMPs CUL-2 through CUL-4 shall be implemented as follows: ▪ High Sensitivity: BMPs CUL-2, CUL-3, and CUL-4 ▪ Moderate Sensitivity: BMP CUL-2 and CUL-3 ▪ Low Sensitivity: BMPs CUL-2 through CUL-4 not required ▪ Unknown Sensitivity: BMP CUL-2 and CUL-3 ▪ BMPs CUL-5 and CUL-6 are applicable to all ground-disturbing activities in natural channels or native soils, regardless of the sensitivity level of the work area.
CUL-2	Record Search and Field Inventory for Highly or Moderately Sensitive Areas (Sensitivity Ratings 3-5), and Areas of Unknown Sensitivity	▪ The County will retain a qualified cultural resources specialist to conduct a review and evaluation of locations that involve soil disturbance/excavation in natural channels or native soils identified as Highly to Moderately Sensitive to determine the potential for these activities to affect significant cultural resources. ▪ The initial evaluation will be based on a review of archival information provided by the Northwest Information Center (NWIC) of the California Historical Resources Information System in regard to the project area based on a 0.25-mile search radius. This initial archival review will be completed by the professional archaeologist who will be able to view confidential site location data and literature to arrive at a preliminary sensitivity determination. ▪ It is recommended that the County conduct a review of the Sacred Lands Inventory of the Native American Heritage Commission (NAHC) and due diligence outreach with individuals identified by the NAHC and/or local historical societies or groups. This outreach would involve sending a letter with a request for pertinent information about cultural resources within the project area and to identify any concerns. This outreach is in addition to notification under PRC 21080.3.1 (i.e., CUL-3), and may be appropriate for projects that would not otherwise require Assembly Bill 52 notification. Such outreach is also encouraged under Section 106 implementing regulations at 36 CFR 800.4(a)(3) for identification of historic properties. ▪ The qualified archaeologist will conduct field inventory of the project area to determine the presence/absence of surface cultural materials. The results, along with any mitigation and/or management recommendations, will be presented to the County in an appropriate report format that includes any necessary maps, figures, and correspondence with interested parties. The report will also include a summary of the records search and archival research data, and pertinent geoarchaeological overviews and studies, and regional research designs, as appropriate. ▪ A summary table indicating appropriate management actions (e.g., monitoring during construction, presence/absence testing for subsurface resources, and data recovery) will be developed for each project work area reviewed.

BMP Number	BMP Title	BMP Description
		▪ The maintenance activities will be implemented to avoid significant impacts to cultural resources, if possible. **EXCEPTIONS**: After the NWIC record search and NAHC sacred lands search have been conducted, the qualified archaeologist may determine that a field review is not necessary under the following circumstances: ▪ Locales that have previously been subject to cultural resource studies where no previously identified cultural resources or historical resources were documented. ▪ Locales that have previously been subject to cultural resources studies, but identified cultural resources have been determined by a qualified archaeologist/resource specialist as not eligible for listing in the California Register of Historical Resources (CRHR) or the National Register of Historic Places (NRHP). ▪ A short report would be required to document the decision not to conduct a field study.
CUL-3	Consult with Native American Tribes	▪ The County, as the lead CEQA agency, has notified Native American tribes about the Maintenance Program according to PRC 21080.3.1 (also referred to as Assembly Bill 52); *only Native American tribes that have previously requested notification from the County pursuant to PRC 21080.3.1(b) require notification*. For tribes that request consultation under PRC 21080.3.1(b)(2), the County will consult with those tribes pursuant to PRC 21080.3.2 for projects in areas of high, moderate, and unknown sensitivity.
CUL-4	Construction Monitoring	▪ The County will retain a qualified archaeologist to be present on-site during ground-disturbing activities within areas identified as highly sensitive for cultural areas, unless the qualified archaeologist determines otherwise after the field inventory conducted under CUL-2. Similarly, after conducting the field study under CUL-2, the qualified archaeologist may determine that areas originally identified as moderately sensitive for cultural resources warrant monitoring during construction. The reasons for conducting monitoring in areas initially considered of moderate sensitivity would be discussed in the inventory report. ▪ The qualified archaeologist will have the authority to stop work if cultural resources are discovered. ▪ If any cultural resources are discovered during construction monitoring, BMP CUL-6 would be implemented as appropriate.
CUL-5	Conduct Pre-Maintenance Educational Training	At the beginning of each maintenance season, and in concert with implementing BMP BIO-1, as well as before conducting activities subject to BMP CUL-2 through CUL-4, all maintenance personnel will participate in an educational training session conducted by a qualified cultural resources specialist. This training will include instruction on how to identify historic and prehistoric resources that may be encountered, and will describe the appropriate protocol to be followed if resources are discovered during maintenance work.
CUL-6	Address Discovery of Cultural Remains or Historic or Paleontological Artifacts Appropriately	Unanticipated discoveries of cultural and paleontological resources may occur during maintenance construction activities. Examples of cultural remains are obsidian and chert flaked-stone tools (e.g., projectile points, knives, scrapers) or significant areas of tool-making debris; culturally darkened soil (“midden”) containing heat-affected rocks, artifacts, or shellfish remains; stone milling equipment (e.g., mortars, pestles, handstones, or milling slabs); and battered stone tools, such as hammerstones and pitted stones. Historic-period artifacts may include stone, concrete, or adobe footings and walls; filled wells or privies; and deposits of metal, glass, and/or ceramic refuse. Paleontological artifacts are fossilized remains of plants and animals. Work will be restricted or stopped in areas where remains or artifacts are found until proper protocols are met.

		Protocol for treatment of prehistoric or historic cultural resources: 1. Work at the location of the find will halt immediately within 50 feet of the find. A "no work" zone will be established utilizing appropriate flagging to delineate the boundary of this zone, which will measure at least 50 feet in all directions from the find. 2. The County will retain the services of a consulting archaeologist, who will visit the discovery site as soon as practicable and perform minor hand excavation to describe the archaeological or paleontological resources present and assess the amount of disturbance. 3. The consulting archaeologist will provide to the County and USACE, at a minimum, written and digital-photographic documentation of all observed materials, utilizing the CRHR and NRHP guidelines for evaluating archaeological resources. Based on the assessment, the County and USACE will identify the CEQA and Section 106 cultural resources compliance procedures to be implemented. 4. If the consulting archaeologist determines that the find appears not to meet the CRHR or NRHP criteria of significance, and a USACE archaeologist concurs with the consulting archaeologist's conclusions, construction may continue while monitored by the consulting archaeologist. The authorized maintenance work will resume at the discovery site only after the County has retained a consulting archaeologist to monitor and the Maintenance Manager has received notification from USACE allowing work to continue. 5. If the find appears significant, avoidance of additional impacts is the preferred alternative. The consulting archaeologist will determine if adverse impacts to the resources can be avoided. 6. Where avoidance is not practical (e.g., maintenance activities cannot be deferred or must be completed to satisfy the Maintenance Program objective), the County will develop an action plan (also known as a data recovery plan) and submit it to USACE within 48 hours of determining that maintenance activities cannot be deferred. The action plan will be submitted by email to the appropriate archeological/cultural resources contact at the USACE. The action plan is equivalent to a data recovery plan. It will be prepared in accordance with the current professional standards and state guidelines for reporting the results of the work, and will describe the services of a Native American consultant and a proposal for curation of cultural materials recovered from a non-grave context. 7. The recovery effort will be documented in a report prepared by the consulting archaeologist in accordance with current archaeological standards. Any non-grave artifacts will be placed with an appropriate repository. 8. In the event of discovery of human remains (or if a find consists of bones suspected to be human), the field crew supervisor will take immediate steps to secure and protect such remains from vandalism during periods when work crews are absent.) 9. The maintenance crew supervisor will immediately notify the San Mateo County Coroner and provide any information that identifies the remains as Native American. If the remains are determined to be those of a prehistoric Native American or a Native American from the ethnographic period, the Coroner will contact NAHC within 24 hours of being notified about the remains. NAHC will designate and notify a Most Likely Descendant (MLD) within 24 hours. The MLD will have 24 hours to consult and provide recommendations for the treatment or disposition, with proper dignity, of the human remains and grave goods. 10. Preservation in situ is the preferred option for human remains. Human remains will be preserved in situ if continuation of the maintenance work, as determined by the consulting archaeologist and MLD, will not cause further damage to the remains. The remains and artifacts will be documented, the find location carefully backfilled (with protective geo-fabric if desirable), and the information recorded in County Maintenance Program files.

BMP Number	BMP Title	BMP Description
		11. If human remains or cultural items are exposed during maintenance that cannot be protected from further damage, they will be exhumed by the consulting archaeologist at the discretion of the MLD and reburied, with the concurrence of the MLD, in a place mutually agreed upon by all parties. <u>Protocol for treatment of paleontological resources:</u> 1. Work at the location of the find will halt immediately within 50 feet of the find. A "no work" zone will be established utilizing appropriate flagging to delineate the boundary of this zone, which will measure at least 50 feet in all directions from the find. 2. The County shall retain the services of a consulting paleontologist. The consulting paleontologist will meet the Society for Vertebrate Paleontology's criteria for a qualified professional paleontologist (Society of Vertebrate Paleontology 2010). 3. The consulting paleontologist shall visit the discovery site as soon as practicable and perform minor hand-excavation to describe the paleontological resources present and assess the amount of disturbance. The consulting paleontologist will follow the Society for Vertebrate Paleontology's guidelines (2010) for treatment of the artifact. Treatment may include preparation and recovery of fossil materials for an appropriate museum or university collection, and may include preparation of a report describing the finds. The County will be responsible for ensuring that the consulting paleontologist's recommendations for treatment are implemented.

Table 9-3. Biological Resources Best Management Practices

BMP Number	BMP Title	BMP Description
BIO-1	Environmental Awareness Training	Prior to commencing maintenance activities in a given year, all participating maintenance personnel will attend a worker environmental awareness training program. The training will include a brief review of special-status species, sensitive habitats, and other sensitive resources that may exist in the project area, including field identification, habitat requirements, and the legal status and protection of each relevant species, as well as locations of sensitive biological resources. The training will include materials concerning the following topics: sensitive resources, resource avoidance, permit conditions, and possible consequences for violations of State or Federal environmental laws. The training will cover the maintenance activity's conservation measures, environmental permits, and regulatory compliance requirements, as well as the roles and authority of the monitors and biologist(s). It will include printed material and an oral training session by a qualified biologist.
BIO-2	Minimize Injury or Mortality of Fish and Amphibian Species during Dewatering	Prior to dewatering a construction site, all reasonable efforts shall be made to capture and relocate native fish and amphibian species if necessary to avoid direct mortality and minimize take. Streams that support a sensitive species (e.g., steelhead, California red-legged frog) will require a relocation effort led by a qualified biologist (see also BMPs BIO- 3 through BIO-5). The following measures are consistent with those defined as *reasonable and prudent* by NMFS for projects concerning several central California Evolutionarily Significant Units for coho salmon and steelhead trout. ▪ Fish relocation activities will be performed only by qualified fisheries biologists that have 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. ▪ Capture methods may include fish landing nets, dip nets, buckets and by hand. ▪ 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). Captured aquatic life shall be released immediately in the closest suitable body of water adjacent to the work site, taking into consideration 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. D. Avoid areas with large concentrations of potential predators in immediate vicinity. ▪ Minimize handling of salmonids. However, when handling is necessary, always wet hands or nets prior to touching fish.

BMP Number	BMP Title	BMP Description
		▪ Temporarily hold fish in cool, shaded, aerated water in a container with a lid or in a live–car (i.e., a net enclosure that can be placed in a pond to temporarily hold the fish). ▪ If fish are held in a container, 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 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. The biological monitor or qualified biologist shall check daily for stranded aquatic life as the water level in the dewatering area drops. ▪ If mortality during relocation exceeds the amount authorized by the applicable permits or, if no amount is specified, 5 percent, stop efforts and immediately contact the appropriate agencies (CDFW and NMFS).
BIO-3	California Red-legged Frog Protection Measures	If suitable habitat for California red-legged frog is determined to exist in or around the work area where maintenance activities are planned to occur, the County will implement applicable protection measures as follows: ▪ No more than twenty-four (24) hours prior to the date of initial ground disturbance or mowing, a pre-activity survey for the California red-legged frog will be conducted by a qualified biologist at the work site. The survey will consist of walking the work area limits to ascertain the possible presence of the species. The qualified 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 qualified 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 qualified biologist is given sufficient time to move the animals from the work site before ground disturbance is initiated. Only qualified biologists will capture, handle, and monitor the California red-legged frog. ▪ To minimize harassment, injury, death, and harm to individual California red-legged frogs, one of the following two measures will be implemented. 1. An approved, qualified biologist(s) will be on-site during all activities that may result in take of the California red-legged frog, as determined by the biologist taking into account all information gathered during the desktop audit of the site as well as the preconstruction survey. Qualified biologists must be approved by the USFWS.

BMP Number	BMP Title	BMP Description
		or 2. Prior to pre-activity surveys, personnel will enclose the work area with an exclusion fence with a minimum height above grade of 42 inches. The bottom of the fence will either be buried a minimum of six inches below ground or otherwise secured in a manner approved by the USFWS and will remain in place during all maintenance activities in order to prevent California red-legged frogs from entering the work area. Escape ramps, funnels, or other features that allow animals to exit the work area, but which will prohibit the entry of such animals, will be provided in the exclusion fencing. A qualified biologist will conduct a pre-activity survey of the fence installation area immediately prior to (i.e., the day of) the commencement of installation and will be on-hand to monitor fence installation. The exclusion fencing will be inspected daily by maintenance personnel and maintained for the duration of maintenance implementation. ▪ The qualified biologist(s) will be given the authority to freely communicate verbally, by telephone, electronic mail, or in writing at any time with maintenance personnel, any other person(s) at the work area, otherwise associated with the maintenance work, the USFWS, the CDFW, or their designated agents. The qualified 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 work activities if they determine any of the associated requirements are not being fulfilled. If the qualified 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 County will minimize adverse impacts to the California red-legged frog by limiting, to the maximum extent possible, the number of access routes, ground disturbance area, equipment staging, storage, parking, and stockpile areas. Prior to initiating maintenance work that involve ground-disturbing activities, 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 qualified biologist, and clearly identified with fencing. The fencing will be inspected by the qualified biologist and maintained daily until the last day that equipment is at the site. ▪ To the extent practicable, ground-disturbing activities will be avoided from October through April because that is the time period when California red-legged frogs are most likely to be moving through upland areas. When ground-disturbing activities must take place between November 1 and March 31, the County will ensure that daily monitoring by the qualified biologist is completed for the California red-legged frog. ▪ If egg masses are present and work cannot be postponed until after hatching, a buffer of vegetation at least 10 feet in diameter shall be left around any egg masses found. Staff will keep a record of any sites where egg masses are found and will conduct vegetation removal at these sites between June 15 and October 15. Staff shall avoid entering the channel to avoid dislodging egg masses. Activities shall be performed from the banks. ▪ To minimize harassment, injury, death, and harm in the form of temporary habitat disturbances, all maintenance-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. Maintenance-

BMP Number	BMP Title	BMP Description
		related vehicles will observe a 20-mile per hour speed limit within work areas, except on County roads, and State and Federal highways. Off-road traffic outside of designated and fenced work areas will be prohibited. ▪ When a California red-legged frog is encountered in the work area, all activities which have the potential to result in the harassment, injury, or death of the individual will be immediately halted. The qualified 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 the individual 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 qualified biologist outside the work area within the same riparian area or watershed. If relocation of the individual outside the work area 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 work 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 qualified 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 USFWS contact for this situation is the Coast Bay Foothills Division Chief of the Endangered Species Program by email and at telephone (916) 414-6600. ▪ A litter control program will be instituted at each activity 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 site at the end of each working day. ▪ The County will comply with all herbicide application requirements mandated by the USEPA and stipulated injunctions pertaining to California red-legged frog. For example, herbicides will be limited for controlling state-designated invasive species and noxious weeds, will not be used within 15 feet of aquatic breeding critical habitat or non-breeding aquatic critical habitat areas or within 15 feet of aquatic features within non-critical habitat sections subject to the 2006 Court-ordered injunction; precipitation is not occurring or forecast to occur within 24 hours; herbicide is limited to localized spot treatment using hand-held devices; and herbicide will be applied by a certified applicator or person working under the direct supervision of a certified applicator. ▪ For on-site storage of pipes, conduits and other materials that could provide shelter for California red-legged frogs, materials will be securely capped prior to storage or 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 maintenance activities will occur during rain events or within 24-hours following a rain event. Prior to maintenance activities resuming, a qualified biologist will inspect the work area and all

BMP Number	BMP Title	BMP Description
		equipment/materials for the presence of California red-legged frogs. The animals will be allowed to move away from the work site of their own volition or moved by the qualified biologist. ▪ To the maximum extent practicable, night-time construction activities will be minimized or avoided by the County. Because dusk and dawn are often the times when the California red-legged frog 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 30 minutes after sunrise. Except when necessary for driver or pedestrian safety, to the maximum extent practicable, artificial lighting at a work 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 qualified biologist, maintenance personnel, or County contractors. Materials utilizing fixed weaves (strands cannot move), polypropylene, polymer or other synthetic materials will not be used. ▪ 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 County 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 qualified 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 qualified 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 qualified biologist will remove and transport it to a safe location, or contact the USFWS for guidance.
BIO-4	California Tiger Salamander Protection Measures	In the limited area in which the California tiger salamander might occur (i.e., in the vicinity of Alpine Trail), the measures described for California red-legged frog above will be implemented for California tiger salamander as well. In addition, the CDFW will be included in any agency coordination, as well as the USFWS, for issues involving the salamander.
BIO-5	San Francisco Garter Snake Protection Measures	In areas within one mile of a documented occurrence of the San Francisco garter snake, onsite habitat shall be evaluated by a qualified biologist or biological monitor for the potential to support this species. If suitable habitat for San Francisco garter snake is determined to exist in or around the work area where ground disturbing activities or mowing are planned to occur, the following measures will be followed: ▪ To the extent feasible, maintenance activities should be conducted from April through October during the dry season when these semi-aquatic species are less likely to be found in a work area. ▪ Prior to implementation of maintenance work, the County will submit to the USFWS and CDFW for its review and approval the qualifications of proposed wildlife biologist(s) who will perform pre-activity surveys and on-site monitoring. ▪ To avoid harassment, injury, death, and harm to individual San Francisco garter snakes, immediately prior to (i.e., the day of) the initiation of maintenance activities that have potential for take of the San Francisco garter snake, a USFWS

BMP Number	BMP Title	BMP Description
		and CDFW-approved biologist will conduct daytime surveys throughout the project site. The approved biologist will be present during initial ground-disturbing activities (i.e., clearing and grubbing) within 250 ft of the work area to monitor for individual garter snakes. The biologist will also be present during any other maintenance activities that could potentially result in take, as determined by the biologist taking into account all information gathered during the desktop audit of the site as well as the preconstruction survey. If a San Francisco garter snake is observed within the maintenance work area, either during the pre-activity survey or at any time, activities that could potentially harm the individual will cease and the USFWS and CDFW will be contacted immediately. Work will not re-commence without written approval from CDFW. 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. ▪ For vegetation removal on berms or other sites with suitable San Francisco garter snake habitat, vegetation shall be cut down to 3 inches by hand tools (weedwhacker, etc.). Once the ground is visible, a visual survey for San Francisco garter snakes shall be conducted. If no sensitive species are found in the area, removal of vegetation may continue by mowing or mechanized equipment very slowly with a biological monitor walking in front of the equipment to observe. ▪ Maintenance-related vehicles will observe a 20 mile per hour speed limit while in the 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 maintenance 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 maintenance crew, if the biologist is not on-site) will watch the individual until it has moved out of the maintenance work area. ▪ A litter control program will be instituted at each activity 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 site at the end of each working day.
BIO-6	Measures to Protect the Foothill Yellow-legged Frog, California Giant Salamander, Santa Cruz Black Salamander, and Western Pond Turtle	In areas within one mile of documented foothill yellow-legged frog, California giant salamander, Santa Cruz black salamander, or western pond turtle occurrences, or where suitable habitat for one or more of these species is determined to exist in or around the work area where ground disturbing activities or mowing are planned to occur, the County will implement applicable protection measures as follows: ▪ The qualified biologist will conduct a special-status species survey on each morning of and within 48 hours prior to the scheduled work commencing. 1. If no foothill yellow-legged frog, California giant Salamander, Santa Cruz black salamander, or western pond turtle is found, the work may proceed. 2. If eggs or larvae of the foothill yellow-legged frog, California giant salamander, Santa Cruz black salamander, are found, the qualified biologist will establish a buffer around the location of the eggs/larvae and work may proceed outside of the buffer zone. No work will occur within the buffer zone. Work within the buffer zone will be rescheduled until the time that eggs have hatched and/or larvae have metamorphosed, or the Permittee shall contact CDFW to develop site appropriate avoidance and minimization measures.

BMP Number	BMP Title	BMP Description
		3. If an active western pond turtle nest is detected within the activity area, a 10-foot buffer zone around the nest will be established and maintained during the breeding and nesting season (April 1 – August 31). The buffer zone will remain in place until the young have left the nest, as determined by a qualified biologist. 4. If adult or non-larval juvenile foothill yellow-legged frogs, California giant salamanders, Santa Cruz black salamanders, or western pond turtles are found, one of the following two procedures will be implemented: a. If, in the opinion of the qualified biologist, capture and removal of the individual to a safe place outside of the work area is less likely to result in adverse effects than leaving the individual in place and rescheduling the work (e.g., if the species could potentially hide and be missed during a follow-up survey), the individual will be captured and relocated by a qualified biologist to suitable habitat at least 100 meters away and work may proceed. b. If, in the opinion of the qualified biologist, the individual is likely to leave the work area on its own, and work can be feasibly rescheduled, a buffer will be established around the location of the individual(s) and work may proceed outside of the buffer zone. No work will occur within the buffer zone until the turtle has left the work area. Work within the buffer zone will be rescheduled if necessary.
BIO-7	Check for Wildlife in Pipes/Construction Materials	For maintenance activities that involve pipes or culverts, the County will visually check all sections of pipe for the presence of wildlife sheltering within them prior to moving any pipe or culvert sections that have been stored on the site overnight, or the pipes will have the ends capped while stored on site so as to prevent wildlife from entering. After attachment of the pipe/culvert sections to one another, the exposed end(s) of the pipe/culvert will be capped at the end of each day during construction to prevent wildlife from entering and being trapped within the pipeline/culvert.
BIO-8	Minimize Impacts on Dusky-footed Woodrat Nests	If suitable habitat for San Francisco dusky-footed woodrat is determined to exist in the work area, the following measure will be followed: ▪ No more than two weeks prior to the beginning of ground disturbance or other routine maintenance activities that could disturb woodrat nests, a qualified biologist will survey the work areas scheduled for maintenance. If any dusky-footed woodrat nests are found, the nests shall be flagged and construction fencing or flagging that will not impede the movement of the SFDW shall be placed around the nest to create a 10-foot buffer (where feasible). If the nest is located adjacent to a road or trail, the nest shall be clearly flagged so equipment/truck drivers accessing sites can see the nest. If a dusky-footed woodrat nest is identified in a work area, the following measure will be implemented by the County. ▪ The County will avoid physical disturbance of the nest if feasible. Ideally, a minimum 10-foot buffer should be maintained between maintenance construction activities and each nest to avoid disturbance. In some situations, a smaller buffer may be allowed if in the opinion of a qualified biologist removing the nest would be a greater impact than that anticipated as a result of maintenance activities. ▪ If a dusky-footed woodrat nest cannot be avoided and the nest is located in urban or bayside areas where woodrat populations are small and isolated from larger populations, the County will consult with CDFW regarding the appropriate measures to minimize impacts.

BMP Number	BMP Title	BMP Description
		▪ If a dusky-footed woodrat nest cannot be avoided and the nest is located in more rural or natural areas and/or where woodrat populations are large and have connectivity to large populations, one of the following two relocation measures will be implemented by the County: 1. If the woodrat nest site and the proposed relocation area are connected by suitable dispersal habitat for the woodrat, as determined by a qualified biologist, the following relocation methodology will be used: Prior to the beginning of construction activities, a qualified biologist will disturb the woodrat nest to the degree that all woodrats leave the nest and seek refuge outside of the maintenance activity area. Relocations efforts will avoid the nesting season (February - July) to the maximum extent feasible. Disturbance of the woodrat nest will be initiated no earlier than one hour before dusk to minimize the exposure of woodrats to diurnal predators. Subsequently, the biologist will dismantle and relocate the nest material by hand. All material from dismantled nests will be placed in a pile, preferably against a log or tree trunk, in suitable habitat located at least 20 feet from, but otherwise as close as possible to, the original nest locations, to provide material for woodrats to construct new nests. During the deconstruction process, the biologist will attempt to assess if there are juveniles in the nest. If immobile juveniles are observed, the deconstruction process will 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 nest until the juveniles are mobile. The nest may be dismantled once the biologist has determined that adverse impacts on the juveniles would not occur. All disturbances to woodrat nests will be documented in a construction monitoring report and submitted to CDFW. 2. If a qualified biologist determines that the woodrat relocation area is separated from the nest site by major impediments, or a complete barrier, to woodrat movement, trapping for woodrats will be conducted prior to relocation of nest material. Prior to the start of nest relocation activities, artificial pine box shelters will be placed at each of the sites selected for relocation of nest materials. The dimensions of the artificial shelters will be approximately 8” long x 8” wide x 6” high. Each shelter will include two interior chambers connected by an opening. At the relocation sites, the artificial pine box shelters will provide basement structures for the relocated woodrat nest materials, allowing woodrats to enter, use, and modify the relocated nests. A qualified biologist will set two traps around each of the woodrat nests to be relocated. Traps will be set within one hour prior to sunset, and baited with a mixture of peanut butter, oats, and apples. Traps will also be equipped with cotton bedding and covered with cardboard. The traps will be checked the following morning, within one-and-a-half hours of sunrise. If a woodrat is captured it will be placed in a quiet area while its nest material is relocated; the animal will then be released at the relocated nest. If no woodrats are captured after the first night, the biologist will set the traps for one additional evening to increase the probability of capturing the animal and ensuring a safe relocation. If no woodrats are captured at a given house after two nights, it will be assumed that the house is not currently occupied. 3. Trapping will only be conducted outside the breeding season, which for woodrats is from February through the end of July. If a litter of young is found or suspected while dismantling a nest for relocation, the nest material will be replaced, any trapped woodrats will be returned to the nest, and the nest will be left alone for 2 to 3 weeks,

BMP Number	BMP Title	BMP Description
		after which time the nest would be rechecked to verify that the young are capable of independent survival, as determined by the lead woodrat biologist, before proceeding with nest dismantling.
BIO-9	Measures to Protect Nesting Migratory Birds	▪ To the extent possible, conduct vegetation removal activities prior to nesting bird season (February 1 through August 31). ▪ For maintenance activities or tree removal that are scheduled to occur between February 1 and August 31, a qualified biologist will survey the work area and a minimum of 300 feet surrounding the work area for raptor nests and 100 feet for nests of non-raptors. This survey will occur no more than three days prior to starting work. If a lapse in maintenance-related work of 7 days or longer occurs, another focused survey will be conducted before maintenance 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. A qualified biologist will identify an appropriate buffer based on a site specific-evaluation. Typical appropriate buffers are 300 feet for raptors, herons, and egrets (though larger for bald and golden eagles, as discussed in BIO-14); 100 feet for non-raptors nesting on trees, shrubs and structures, and 25 feet for ground-nesting non-raptors. ▪ The boundary of each buffer zone will be marked with fencing, flagging, or other easily identifiable marking if work will occur immediately outside the buffer zone. ▪ Install physical barriers to nesting where appropriate (e.g., install netting over entryways to cavities, bridge ledges, culverts) and check regularly for any trapped birds. Work will not commence within the buffer until fledglings are fully mobile and no longer reliant upon the nest or parental care for survival. ▪ No trees or shrubs shall be disturbed that contain active bird nests until all eggs have hatched, and young have fully fledged (are no longer being fed by the adults and have completely left the nest site). To avoid potential impacts to tree or shrub-nesting birds, any project-specific trimming or pruning of trees or shrubs shall be conducted during the time period of September 1 to February 14 unless a preconstruction nesting bird survey has been conducted by a qualified biologist. No habitat removal or modification shall occur within the Ecologically Sensitive Area fenced nest zone even if the nest continues to be active beyond the typical nesting season for the species, until the young have fully fledged and will no longer be adversely affected by the project. ▪ Within areas subject to CDFW regulation under Section 1600 of the Fish and Game Code, nesting bird protection measures required as conditions of the Streambed Alteration Agreement will be implemented.
BIO-10	Measures to Protect Nesting Marbled Murrelet	▪ During marbled murrelet breeding/nesting season (March 24 to September 15), if suitable marbled murrelet nesting trees are present within 300 feet of the project area or if a marbled murrelet nest is detected, Permittee shall consult with CDFW before proceeding. If habitat trees are present within ¼- mile of the project site but are greater than 300 feet from the work area, Permittee may proceed with the following conditions: o Work within the ¼-mile buffer shall be confined to the period of September 15 to October 15. o If activities cannot be performed during this window and would thus occur during the marbled murrelet breeding season (March 25 to September 15), seasonal disturbance minimization buffers as listed the USFWS document, *Estimation of the Effects of Auditory and Visual Disturbance to Northern Spotted Owls and Marbled Murrelets in Northwestern California* (2006) shall be followed. Permittee shall measure ambient noise and estimate construction activity noise to calculate seasonal buffer widths using that reference.

BMP Number	BMP Title	BMP Description
		o Alternatively, if protocol-level surveys are conducted and do not indicate that the habitat is occupied by marbled murrelet, seasonal and distance work restrictions may be lifted with written approval from CDFW. Protocol level survey procedures and information can be found at: http://www.pacificseabirdgroup.org/publications/PSG_TechPub2_MAMU_ISP.pdf
BIO-11	Non-native Aquatic Plant Removal	Any aquatic non-native plants found while performing maintenance activities will be disposed of properly and will not be placed back into the tributaries where work is being conducted or any other drainages, creeks, or streams.
BIO-12	Measures to Protect Special-Status Butterflies	If suitable habitat for Bay checkerspot, Mission blue, San Bruno elfin, or Callippe silverspot butterflies is determined to exist in or around the work area where ground disturbing activities are planned to occur, the County will implement applicable protection measures as follows: ▪ Areas supporting larval host plants for the Bay checkerspot, Mission blue, San Bruno elfin, or Callippe silverspot will be identified by a qualified biologist and protected from disturbance by establishing buffer zones around individual plants or populations. The size of the buffer will be determined by a qualified botanist; the actual distance will depend on the plant species potentially affected and the type of disturbance. If impacts on larval host plants of federally listed butterflies are unavoidable and are within occupied or potentially occupied habitats, then the County will stop work in the vicinity of the host plant(s) and consult with the USFWS. ▪ No herbicide will be applied to the buffer area, and to the extent feasible, maintenance personnel and equipment will not operate within such areas. If, based on a review of current CNDDB records or the latest information available from the Xerces Society (https://xerces.org/state-of-the-monarch-butterfly-overwintering-sites-in-california/) historically or currently occupied overwintering habitat for the monarch butterfly is determined to exist in or adjacent to the work area where ground disturbing activities are planned to occur, the County will implement applicable protection measures as follows: ▪ Areas supporting overwintering habitat for the monarch butterfly will be identified by a qualified biologist and maintenance activities during fall and winter months when monarch butterflies are present will be avoided to the extent practicable. ▪ Historically or currently occupied trees/groves will be protected from disturbance by the establishment of a 100-foot buffer zone around the tree/grove. The buffer will be measured from the outside edge of the dripline of the monarch grove. If maintenance activities within 100 feet of a historically or currently occupied tree/grove are unavoidable, the County will prepare and implement an impact minimization plan in consultation with the USFWS. ▪ No herbicides or pesticides will be applied to the buffer area, and to the extent feasible, maintenance personnel and equipment will not operate within such areas.
BIO-13	Measures to Protect the California Ridgway's Rail	If suitable breeding habitat for California Ridgway's rails is determined to exist in or around the work area where maintenance activities are planned to occur, the County will implement applicable protection measures as follows: ▪ If work will occur during the Ridgway's rail breeding season (February 1 through August 31), the County will conduct

BMP Number	BMP Title	BMP Description
		pre-activity surveys for the Ridgway's rail in the late winter and early spring of the year maintenance activities are scheduled to occur. Surveys will be conducted per the current USFWS protocol. ▪ If the surveys confirm there are no breeding rails within 700 feet of the project area, or the area where heavy equipment, ground disturbance, or vegetation removal would occur, work activities may proceed during the breeding season. ▪ If surveys identify the presence of breeding rails, no maintenance activities will occur within 700 feet of occupied nesting habitat during the breeding season (February 1 to August 31). For work occurring within 300 feet of potential nonbreeding habitat for California Ridgway's rails which provides habitat that occasional nonbreeding California Ridgway's rails may use for foraging or cover, or other identified suitable California Ridgway's rail habitat locations, the County will implement applicable protection measures as follows: ▪ Prior to the initiation of work each day, if suitable habitat occurs within the immediate work area, a qualified biologist will conduct a preconstruction survey of all suitable habitat that may be directly or indirectly impacted by the day's activities (work area, access routes, staging areas). Specific habitat areas are vegetated areas of cordgrass (*Spartina* spp.), marsh gumplant (*Grindelia* spp.), pickleweed (*Salicornia pacifica*), alkali heath, (*Frankenia* sp.), and other high marsh vegetation, brackish marsh reaches of creek with heavy accumulations of bulrush thatch (old stands), and high water refugia habitat that may include annual grasses, and shrubs immediately adjacent to channels. ▪ If during the initial daily survey or during work activities a Ridgway's rail is observed within or immediately adjacent to the work area (50 feet), initiation of work will be delayed until the Ridgway's rail leaves the work area. ▪ Mowing using heavy equipment (e.g., tractors, boom mowers, or rider mowers) will not be conducted in habitat areas or within 50 feet of habitat areas. If mowing with hand equipment is necessary within 50 feet of habitat areas, an on-site monitor will observe the area in front of the mower from a safe vantage point while it is in operation. If Ridgway's rails are detected within the area to be mown, the mowing will stop until the individual(s) have left the work area. ▪ If visual observation cannot confirm the Ridgway's rail(s) left the work area, then it is assumed that the individual(s) remains in the work area and the work will not resume until the area has been thoroughly surveyed (and absence confirmed) or the USFWS has been contacted for guidance.
BIO-14	Measures to Protect Bat Colonies	▪ If high-quality habitat for roosting bats (i.e., large trees with cavities of sufficient size to support roosting bats, or buildings providing suitable roost sites, as determined by a qualified bat biologist) is present within 100 feet of a maintenance site, a qualified bat biologist will conduct a survey to look for evidence of bat use within two weeks prior to the onset of work activities. If evidence of bat occupancy is observed, or if high-quality roost sites are present in areas where evidence of bat use might not be detectable (such as a tree cavity), an evening survey and/or nocturnal acoustic survey may be necessary to determine if a bat colony is present and to identify the specific location of the bat colony. ▪ If no active maternity colony or non-breeding bat roost is located, project work can continue as planned. ▪ If an active maternity colony or non-breeding bat roost is located, the project work will be redesigned to avoid disturbance of the roosts, if feasible.

BMP Number	BMP Title	BMP Description
		▪ If an active maternity colony is located, and the project cannot be redesigned to avoid removal or disturbance of the occupied tree or structure, disturbance will not take place during the maternity season (March 15 – July 31), and a disturbance-free buffer zone (determined by a qualified bat biologist) will be observed during this period. ▪ If an active non-breeding bat roost is located, and the project cannot be redesigned to avoid removal or disturbance of the occupied tree or structure, the individuals will be safely evicted between August 1 and October 15 or between February 15 and March 15 (as determined by a Memorandum of Understanding with CDFW). Bats may be evicted through exclusion after notifying CDFW. Trees with roosts that need to be removed will first be disturbed at dusk, just prior to removal that same evening, to allow bats to escape during the darker hours.
BIO-15	Nesting Bald Eagle and Golden Eagle Avoidance	In areas within 0.5 mile of known bald or golden eagle nesting areas, the following measures will be implemented: ▪ To the extent feasible, conduct vegetation removal activities prior to the nesting season (January 15 through August 1). ▪ For maintenance activities or tree removal that are scheduled to occur between January 15 and August 1, a qualified biologist will survey the work area and a minimum 0.5 mile surrounding the work area for eagle nests. This survey will occur no more than seven days prior to starting work. ▪ No maintenance activities will occur within a 0.5-mile viewshed buffer zone (areas that can be seen by an eagle on the nest), around any active eagle nest during the breeding season, unless a qualified biologist determines late in the season that nesting activity has been completed for the year. No breeding-season maintenance activities will occur within 0.25 mile of the nest site a, regardless of whether or not those activities can be seen from the nest, while nesting activity is occurring.
BIO-16	Avoid Special-Status Plant Species	For projects located in areas where special-status plants have been identified as potentially occurring (see Table 4-1), a qualified biologist will assess habitat suitability for the potential occurrence of special-status plant species within the work area. If determined to be warranted, a qualified botanist will conduct appropriately timed surveys for the focal plant species in accordance with CDFW's special-status plant survey methodology. If a special-status species is observed in or near the project site, the County will follow the measures below as well as any additional measures that might be contained in the forthcoming Biological Opinion issued by the USFWS for the Maintenance Program. ▪ If discovered, the population size and occupied area of special-status plant populations identified during the field survey, and with potential to be impacted, will be estimated. A "population" will be defined as the group of individuals of a species present within a 0.10-mile radius. In addition, the population will be photographed and flagged to maximize avoidance, as well as to estimate the percentage of the population affected. If feasible, the project shall be redesigned or modified to avoid direct and indirect impacts on special-status plant species. ▪ Special-status plants to be avoided will be protected from disturbance by installing environmentally sensitive area fencing (orange construction barrier fencing or a suitable alternative). Protective fencing will be installed under the direction of a qualified biologist as necessary to protect the plant and its habitat; where feasible, the environmentally sensitive area fencing will be installed at least 50 ft from the edge of the population. The location of the fencing will be shown on the maintenance design drawings and marked in the field with stakes and/or flagging. The design specifications will contain clear language that prohibits maintenance-relate activities, vehicle operation, material and equipment storage, and other surface disturbing activities within the fenced environmentally sensitive area. For non-ground disturbing vegetation management activities conducted using only hand-held equipment, the non-disturbance

BMP Number	BMP Title	BMP Description
		buffer may be reduced to a minimum of 3 feet and flagging of the population may be used in place of environmentally sensitive fencing. ▪ Vegetation management activities in sensitive plant areas will be conducted under the guidance of a qualified botanist. These activities will be timed following the blooming periods of potentially occurring listed species. ▪ If any impacts to individual state-listed plants are unavoidable, or if more than 5 percent of a population of a federally listed plant species or species with California Rare Plant Ranks of 1 or 2 would be impacted, then the County will stop work in the vicinity of the plant(s) and consult with the appropriate regulatory agencies. ▪ If impacts to state or federally listed plants are unavoidable and less than 5 percent of a population would be impacted, prior to any ground-disturbing activities the County will preserve the seedbank within the impact area by removing and retaining the topsoil prior to the implementation of maintenance activities. Following completion of the maintenance activity, the County will monitor the impact area for two years. Any non-native invasive plant species occurring within this area during the monitoring period will be removed under the supervision of a qualified biologist. ▪ If appropriately timed focused botanical surveys cannot be conducted prior to maintenance activities in areas identified by a qualified biologist as potentially supporting listed plants, then the County will assume presence of the plant species in question.
BIO-17	Sudden Oak Death Controls	▪ Before entering maintenance sites located in areas infested with *Phytophthora*, field workers will receive training that includes information on *Phytophthora* pathogens and how to prevent the spread of these and other soil-borne organisms by following approved phytosanitary procedures. ▪ The exterior and interior of all vehicles, construction equipment, and tools should be clean and free of debris, soil and mud (including mud on tires, treads, wheel wells and undercarriage) prior to arrival at a new job site, especially during the wet season. ▪ Work shoes should be kept clean by inspecting shoe soles and removing mud, debris and soil off treads before moving to a new job site. ▪ Do not collect or transport host plants from an infested or quarantined area. ▪ Vehicles should stay on established roads whenever possible. ▪ To minimize the potential for spreading potentially contaminated soil and time required for decontamination, if possible, avoid vehicle traffic and field work when soils are wet enough to stick readily to shoes, tools, equipment and tires. ▪ Delivered nursery plants that will be held before planting will be transferred to cleaned and sanitized raised benches and maintained in accordance with the "Guidelines to Minimize *Phytophthora* Pathogens for holding (non-production) nurseries at restoration sites, Section 3." ▪ A portion of purchased nursery plants will be tested for *Phytophthora* using the pear-baiting methodology in which pear baits are placed in soil samples, water samples and root samples of nursery purchased plants. Incubation temperatures with diurnal fluctuations from 21 degrees Celsius to 27 degrees Celsius are generally suitable for detecting *Phytophthora* species using pear baits. If dark lesions appear on pears, the sample likely has *Phytophthora* inoculum. For additional information for the pear-baiting methodology, see: phytosphere.com/BMPsnursery/test3_2bait.htm

BMP Number	BMP Title	BMP Description
		▪ Nursery plants will be transported on or in vehicles or equipment that have been cleaned before loading the stock. ▪ Nursery stock will not be placed on the soil or other potentially contaminated surfaces until they are placed at their specific planting sites. ▪ Minimize unnecessary movement of soil and plant material within a planting area, especially from higher to lower risk areas. ▪ On-site or off-site collection of plant materials, including seed and cuttings for direct planting, will be conducted in a phytosanitary manner. ▪ Only uncontaminated water or water that has been effectively treated to remove or kill *Phytophthora* should be used for rinsing or irrigating plant material.
BIO-18	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. ▪ Prior to implementation of Program activities at a given site, the proposed staging area, as well as any areas to be graded, will be surveyed for the presence of invasive weed species. Invasive weed species occurring within locations of construction clearing and grubbing shall be flagged for removal by the biological monitor or qualified biologist. Any invasive weeds with a Cal-IPC rating of "moderate" or "high" found within the survey area will be removed and disposed of in a sanitary landfill, incinerated off-site, or disposed in a high-temperature composting facility that can compost using methods known to kill weed seeds, taking care to prevent any seed dispersal during the process by bagging material or covering trucks transporting such material from the site. ▪ Suitable onsite disposal areas should be identified to prevent the spread of weed seeds. Invasive plant material should be rendered nonviable (partially decomposed, very slimy or brittle) when being treated onsite. Maintenance staff shall desiccate or decompose invasive plant material until it is nonviable. Depending on the type of plant, disposed plant material can be left out in the open as long as roots are not in contact with moist soil, or can be covered with a tarp to prevent material from blowing or washing away. Permittee shall monitor all sites where invasive plant material is disposed onsite and treat any newly emerged invasive plants. Invasive plant material removed during work activities shall be bagged and appropriately incinerated or disposed of in a landfill or permitted composting facility. ▪ No invasive plants shall be planted at maintenance work areas. Prohibited exotic plant species include those identified in the California Invasive Plant Council's Inventory Database, which is accessible at: https://www.cal-ipc.org/plants/inventory/.
BIO-19	Restore Channel Features	▪ Following completion of bank stabilization activities, any temporary modifications to the low-flow channels will be reversed so that the channel is contoured to facilitate fish passage at least as well following the activity as it did prior to the stabilization activity.
BIO-20	Avoidance of Mammal Pupping Sites	▪ Work within 250 feet of an active harbor seal or sea lion haul out will be conducted outside of the pupping season (i.e., June – February).
BIO-21	General Wildlife Protection Measures	▪ If any wildlife is encountered during project activities, said wildlife shall be allowed to leave the area unharmed and on their own volition, except in cases where relocation by a qualified biologist is permitted by conditions below.

BMP Number	BMP Title	BMP Description
BIO-22	Measures to Protect Nesting Western Snowy Plover	▪ To the extent feasible, maintenance activities within 600 feet of suitable snowy plover breeding habitat will occur outside the plover breeding season of March 1 through September 14. ▪ If maintenance activities are scheduled to occur within 600 feet of suitable snowy plover breeding habitat during the nesting season (March 1 through September 14), a pre-activity survey will be conducted by a qualified biologist within 7 days prior to the start of the activity to determine whether active nests are present. ▪ If an active snowy plover nest is detected within 600 feet of maintenance areas, the qualified biologist, in coordination with USFWS personnel, will determine an appropriate buffer that should remain free from new activities (i.e., those that were not ongoing when the nest was established). The buffer will be determined taking into account visual barriers (such as dunes) between the activities and the nest and the level and proximity of human activity around the nest when it was established. The buffer will remain in place until the nest is no longer active. ▪ If broods of unfledged snowy plover young are present, no maintenance activities will occur within 300 feet (or as otherwise determined by a qualified biologist in coordination with the USFWS) of a brood.
BIO-23	Burn Pile Measures	▪ The County would coordinate burn pile activities with CAL FIRE. ▪ Burning will only occur on days when danger of wildfire is low (e.g., it will not occur on windy days or in very hot, dry conditions). ▪ No burn piles will be located within 200 feet of known occurrences of special-status plants, suitable habitat for special-status butterflies and their hostplants, or high-quality aquatic or wetland habitat for the California red-legged frog, California tiger salamander, or San Francisco garter snake. ▪ Prior to the initiation of burning, the burn pile will be physically disturbed (e.g., with a stick or shovel) to encourage any animals taking refuge within the pile to move out of the pile.
BIO-24	Pathogen Control	▪ In order to minimize the spread of plant and animal pathogens, all equipment (including personal gear such as boots) will be cleaned of soil, seeds, and plant material prior to arriving on a maintenance site. All organic matter will be removed from nets, traps, boots, vehicle tires and all other surfaces that have come into contact with water or potentially contaminated sediments. ▪ Equipment, including maintenance equipment and field gear used to capture and relocate special-status species such as frogs, will be disinfected after exiting one aquatic habitat and before entering the next aquatic habitat, unless the waters are hydrologically connected to one another. Cleaning equipment in the immediate vicinity of aquatic habitats will be avoided (e.g., clean in an area at least 100 feet from aquatic features). ▪ Boots, nets, gloves, and any other equipment used to handle amphibians or aquatic organisms will be scrubbed with a bleach solution (0.5 to 1.0 cup per 1.0 gallon of water), Quat-128™ (1:60), or a 3 to 6 percent sodium hypochlorite solution and thoroughly rinsed clean with water between maintenance sites. Care will be taken so that all traces of the disinfectant are removed before entering the next aquatic habitat. ▪ When working at sites with known or suspected disease problems, disposable gloves will be worn and changed between handling each animal. Gloves will be wetted with water from the site or distilled water prior to handling any

BMP Number	BMP Title	BMP Description
		amphibians. Gloves will be removed by turning inside out with hands cleaned using a hand cleaner and water rinse to minimize cross-contamination.
BIO-25	Eelgrass Surveys at Coyote Point Marina	In the event that the County plans to conduct in-water maintenance activities to the north of the jetty forming the northern boundary of Coyote Point Marina (identified as "potential eel grass patch #1 in Appendix J), the County will retain a biologist to conduct an eelgrass survey in this area. Survey results would be provided to CDFW and other appropriate permitting agencies prior to commencing maintenance work in this area.

BMPs

BEST MANAGEMENT PRACTICES

BMP #	BMP Title
EC-1	Brush Layering
EC-2	Brush Packing
EC-3	Live Staking
EC-4	Live Pole Drain
EC-5	Wattles/Fascines
EC-6	Hand Seeding
EC-7	Hydroseeding
EC-8	Mulching
EC-9	Vegetative Buffer
EC-10	Erosion Control Blankets & Mats
EC-11	Surface Roughening
EC-12	Rolling Dip
EC-13	Slope or Bank Stabilization
EC-14	Energy Dissipator
SC-1	Sandbags and Gravel Bags
SC-2	Silt Fence
SC-3	Straw Log, Straw Roll, Coir Log
SC-4	Inlet Protection
SC-5	Stormwater Separation Systems
SC-6	Diversion Berm
DW-1	Channel Dewatering

BMP: EC-1

BRUSH LAYERING

DESCRIPTION

Brush layering is a technique used in stabilizing shallow slope failures or rebuilding fill slopes with live brush cuttings (usually willows or other types of branches with soil backfill or soil lifts. Live brush layers act as horizontal drains, improve slope stability by providing tensile strength and natural revegetation. Brush layering may include the use of fabric soil wraps, large vegetated boulder revetments, or other structural toe support. Examples of native species from San Mateo County that may potentially be used for brush layering are listed in **Table 1**.

Table 1. Native plant species for use in brush layering.

Scientific Name	**Common Name**
Salix lasiolepis	arroyo willow
Salix exigua	sandbar willow
Salix laevigata	red willow
Salix lasiandra	Pacific willow
Alnus rhombifolia	white alder
Alnus rubra	red alder
Populus fremontii	Fremont cottonwood
Populus trichocarpa	black cottonwood

APPLICATIONS

This technique is used for repairing steep slopes, slumps or stream banks above stream-forming flow conditions. It's useful in restoring eroded stream banks on outside bends where laying back the bank is not feasible and can be placed on slopes up to 1:1 or steeper with additional geotechnical analysis. Brush layering can help dry wet sites with seeps through transpiration. The willow brush helps reduce near bank stream velocities.

Brush layering involves relatively simple construction. Among the ground stabilizing techniques, the brushlayer has an immediate impact, its protective and stabilizing effect extending into lower soil horizons. At extreme sites where erosion, deposition, and rockfall are particular hazards, brush layers and the original vegetation that develops with them gradually eliminate these problems. Fast establishment of a stable soil-root complex is possible. Relatively short and spreading branches of the scrub willows growing in mountainous regions can be used. Simultaneous brush layering construction during fill operations is possible. It is one of the best techniques for revegetating and stabilizing streambanks and slopes. Living and non-living brush layers along

streambanks also provide valuable fish habitat.

LIMITATIONS

- Not suitable for the stabilization of deep, organic topsoil layers.
- Live materials should be harvested and constructed during the dormancy stage of plant growth.
- Drainage areas should be relatively small (generally less than 2,000 acres). If used on larger stream systems, additional toe protection and analysis will be required.
- Stream system should not be degrading (downcutting) or the structure can be undermined.
- The system must be built during low flow conditions. May need to divert water around the site and/or dewater during construction.
- Live cuttings should be taken no earlier than the end of August and kept moist until the rainy season.
- Willows require nearly full sun conditions to be vigorous. Not to be used in heavy shade. Check to see if willows are growing in the area to confirm if this technique can be used.
- In-stream construction requires permits from regulatory agencies.

CONSTRUCTION GUIDELINES

1. Choose a technique such as key trenching, rock toe, retaining wall, root wads, coir logs, or buried toe rock to secure the toe of the slope. Boulder toe protection should be installed if toe scour is a concern. Toe depth should be several feet below the thalweg of the streambed. Width of lifts will vary by site; however, a minimum width of 4 feet should be used for adequate fabric and brush layer depth.

2. Beginning at the bankfull elevation, place 8 to 12 live branch cuttings per linear foot on top of the rock filled fabric lift with growing tips at right angles to the streamflow. Live willow cuttings should be 4 feet in length or longer. Place a few inches of select fill around willow between fabric lifts to ensure good soil contact with willow. Water in willow.

3. Cover this layer of cuttings with fabric leaving an overhang. Place a 12 to 24-inch layer of soil suitable for plant growth (in compacted 6” lifts) on top of the fabric. Wrap the overhanging portion of fabric over the compacted soil to encapsulate the soil in a wrap. Pull and tighten fabric toward slope and stake in place. The thickness of lifts will vary by soil type, stream shear stress, and velocity. Generally, 12-inch thick lifts are more stable than thicker lifts but are more expensive to build. Lifts typically range from 12-inch to 30-inch with 18-inch lifts being most common.

4. Continue this process with alternating layers of cuttings and compacted lifts wrapped in fabric until the bank is restored to its original height or meets desired grade.

5. Several fabric options can be used for creating the wraps. Coir twine mats (outside) with a high tensile strength can be used in conjunction with coir erosion control blanket (inside) with a dense weave to prevent soil migration through the blanket. At sites where capital improvements are in jeopardy or higher shear stresses and velocities are calculated, synthetic geotextile materials (geogrids) may only be used with prior agency approval. Willow roots will grow through the geogrid layers creating a dense matrix of willow roots bonding the structure into a single mass.

BMP MAINTENANCE

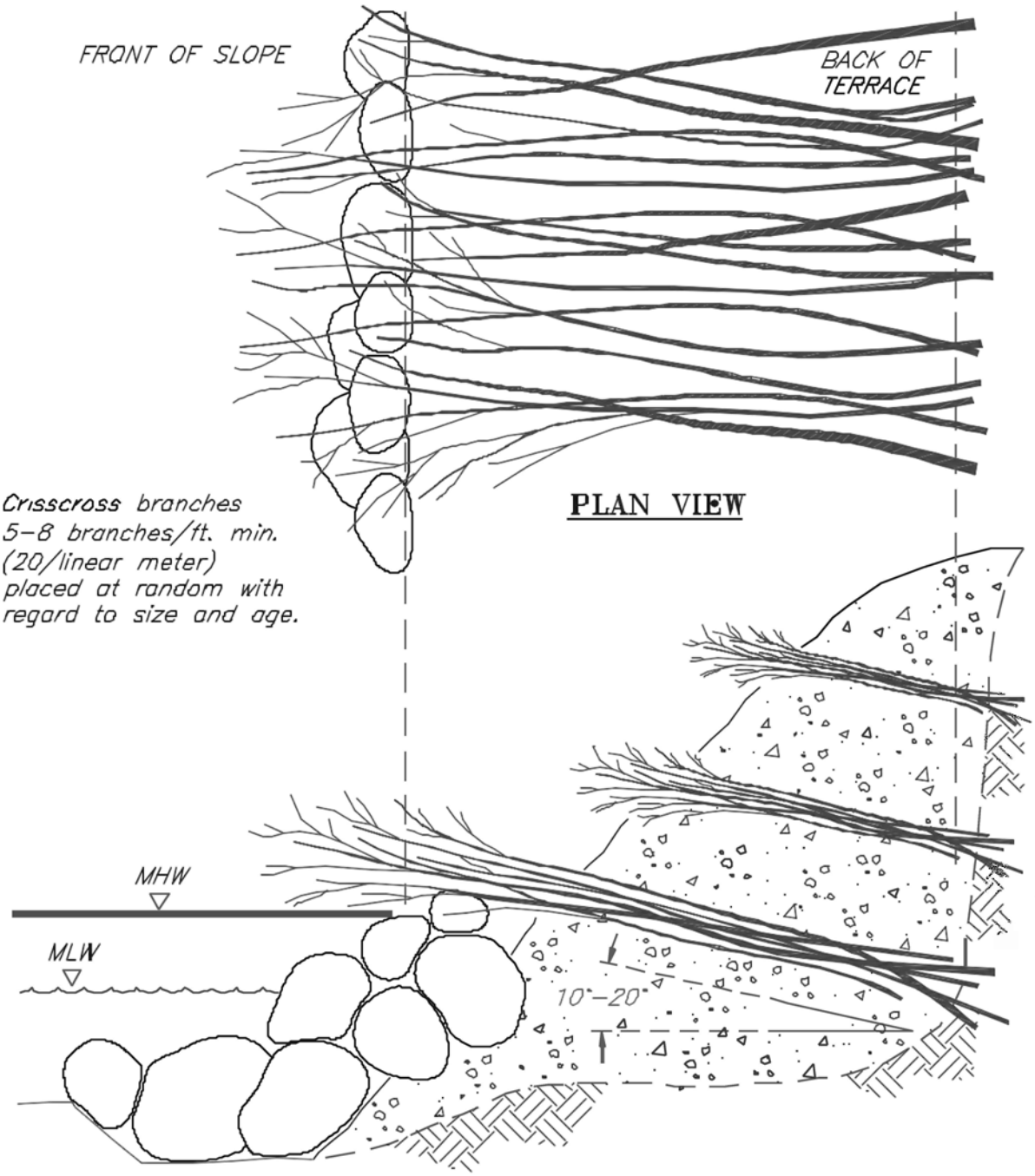
- Keep soil and live cuttings moist by overhead irrigation until the rainy season begins.
- Keep livestock away from the live cuttings. If possible, protect from deer for the first year after installing the live cuttings.
- No maintenance of brushlayers should be required if materials are placed at appropriate depths.
- Fill slopes should be periodically inspected and any failures corrected immediately.

MATERIALS

Materials include branches and cuttings of deciduous woody plants capable of producing adventitious roots, most appropriately willow. Live brushlayer materials can be stored in containers under shade until installation. For best results, soak willow for at least 24 hours, or up to 30 days. Willows may be bundled and soaked in a stream near the project site.

BMP REMOVAL

- Not required.



NOTES:

1. Tilt branches down into the slope 10°–20° min.
2. Brushlayering may be constructed with non-**compacted** or **compacted** backfill without damage to the brush layer.
3. Branches irrespective of length, should **protrude** 8–18in. (0.20–0.50 meters) beyond the face of the slope.

BRUSHLAYERING WITH ROCK TOE PROTECTION

© 1999 JOHN McCULLAH

FILE: BRLAY-RT

BMP: EC-3

LIVE STAKING

DESCRIPTION

Live staking involves the insertion of live, vegetative cuttings into the ground in a manner that allows the cutting (stake) to take root and grow. This BMP is used to reduce the potential for soil to become water borne, to reduce water velocity and erosive forces, and to aid in habitat protection. Poles used in willow walls and vegetated boulder revetments may be a structural application. Sprigs may be used in individual planting spots along a streambank.

Applications

This BMP may be used to repair small slips and slumps, to reinforce or enhance stream banks, and to anchor and enhance the effectiveness of wattles, fascines, straw logs and other erosion control materials. It may also be used in conjunction with approved biostabilization installations such as vegetated boulder revetments.

LIMITATIONS

Do not use this BMP under the following conditions:

- where vegetation growth will interfere with maintenance or facility access.
- where vegetation growth will create safety issues.
- for immediate soil stabilization results.

CONSTRUCTION GUIDELINES

1) Live staking must be implemented during the dormancy period of chosen plant species, late fall to winter (October through January is ideal in Northern Coastal California). If native willows or cottonwood are not found in the vicinity, live staking may not be a good option.
2) Hardwood cuttings are generally divided into three categories: Sprigs (or stakes) that are 0.75 to 1.5 inches in diameter and 36 to 48 inches long; Poles that are 1.5 to 3 inches in diameter and 5 to 8 feet long; and Branch Cuttings or Weavers which are no thinner than ½ inch and 6 to 12 feet long depending on the application (wattles, layering, willow wall revetments).
3) Don’t allow stakes to dry out. Soak all cuttings in water for a minimum of 24 hours. Soaking significantly increases the survival rate of the cuttings; however, they must be planted the same day they are removed from water.
4) Use an iron stake or bar to make a pilot hole in firm soil. Plant the stakes butt-ends into the ground, with the leaf bud scars or emerging buds always pointing up. Be careful not to damage the buds, strip the bark or split the stake during

installation. Plant stakes at random in the most suitable places at a rate of 2-5 cuttings/square yard. Do not plant the stakes in rows or at regular intervals.

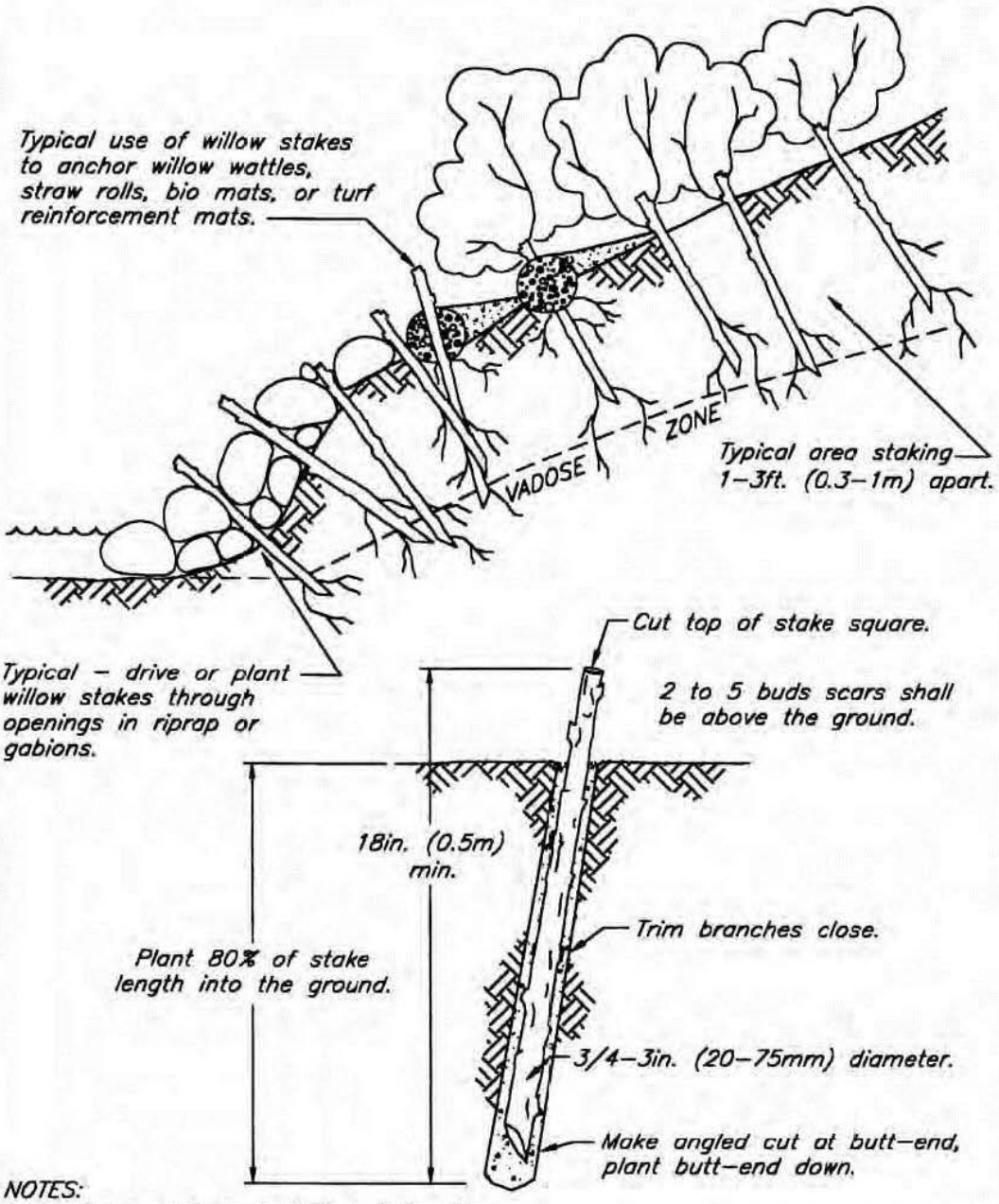
5) Set the stake as deep as possible into the soil, preferably with 80 percent of its length into the soil and in contact with mid-summer moist soils. The stake should protrude only to a maximum of one-quarter its length above the ground level to prevent it from drying. Stakes should be cut so that cutting extends above competing herbaceous vegetation. At least 2 buds and/or bud scars shall be above the ground after planting. It is essential to have good contact between the stake and soil for roots to sprout. Tamp the soil around the cutting. Do not fertilize.

BMP MAINTENANCE

- Periodic inspection, repair and maintenance will be done in accordance with permit requirements. If no permits are required, vegetation will be monitored for the first two years or until the vegetation is established.
- Staked area may need to be watered during summer months.

BMP REMOVAL

- BMP removal is not necessary.



NOTES:

1. Harvest and plant stakes during the dormant season.
2. Use healthy, straight and live wood at least 1 year old.
3. Make clean cuts and do not damage stakes or split ends during installation, use a pilot bar in firm soils.
4. Soak cuttings for 24 hours (min.) prior to installation.
5. Tamp the soil around the stake.

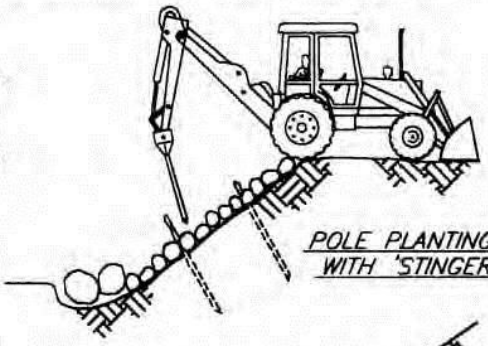
LIVE STAKING AND JOINT PLANTING

© 2000 JOHN McCULLAH

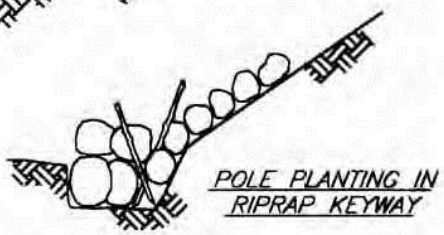
FILE: LVSTJTPL

CONSTRUCTION TECHNIQUES

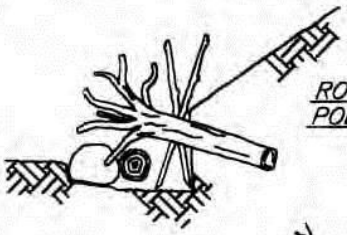
Plant poles deeply during construction of biotechnical streambank work.



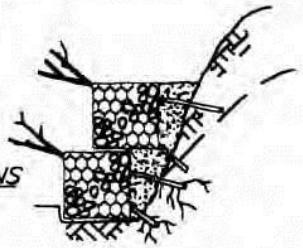
POLE PLANTING WITH 'STINGER'



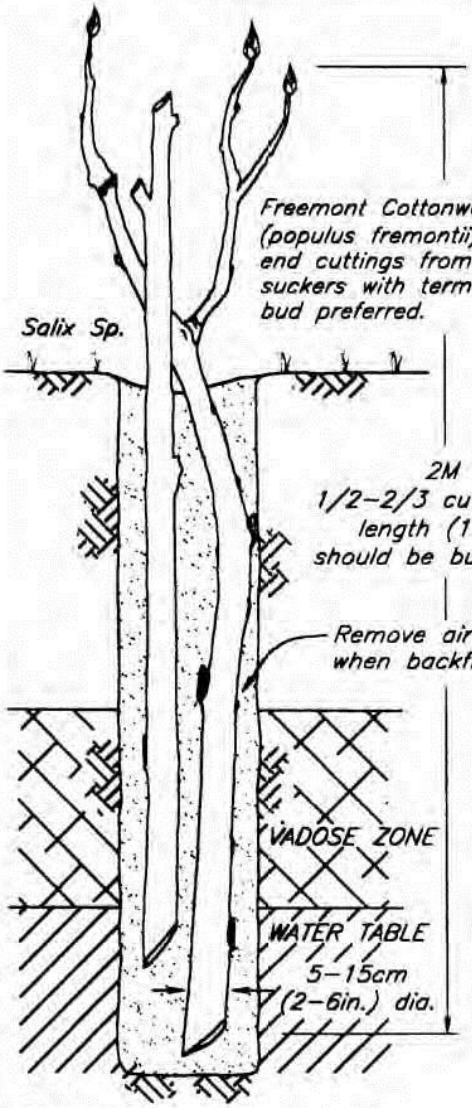
POLE PLANTING IN RIPRAP KEYWAY



ROOTWAD WITH POLE PLANTING



VEGETATED GABIONS WITH POLES



NOTES:

1. *Pole cuttings of willow or cottonwood are longer and have a larger diameter than branch cuttings or live stakes.*
2. *Larger diameter cuttings have a greater supply of stored energy (stored photosynthesis) than smaller diameter cuttings.*
3. *Pole cuttings are better suited for highly erodible areas and sites with fluctuating water levels.*
4. *The pole cuttings should extend through the vadose zone and into the permanent water table. At least 1/2 to 2/3 of the pole should be below the ground, at least 1.0m (3 ft.), and long enough to emerge above adjacent vegetation.*
5. *"Muddying" – filling the hole with water and then soil to make a mud slurry can remove air pockets.*

POLE PLANTING

© 2000 JOHN McCULLAH

POLEPLNT

BMP: EC-5

WATTLES/FASCINES

DESCRIPTION

Wattles and fascines are live branch cuttings, usually willows, bound together into long, tubular bundles used to stabilize slopes and stream banks. Both wattles and live fascines are true biotechnical practices. The live branches and live stakes provide the biological element while the stems, rope ties and wedge shaped wooden stakes all combine to provide the structural elements. Fascines differ from wattles in that the branch cuttings all point in the same direction in fascines, where they may point in either direction in wattles. Wattles are typically aligned on contour, where fascines are angled slightly upslope and thus tend to produce more vigorous growth.

APPLICATIONS

Wattles/fascines may be used for long slopes, road fills, road cuts, gullies or slumped areas, eroded slopes or eroding stream banks. May be used to repair small earth slips and slumps or to protect slopes from shallow slides 1-2 feet deep. Wattles/fascines may be used to stabilize entire cut or fill slopes or localized gully areas of slopes, or may be installed on newly built slopes or as a remedial action on existing slopes. This technique is useful on slopes requiring other planting materials such as woody vegetation, transplants and grasses. Wattles/fascines enhance conditions for natural invasion and the establishment of other plants from the surrounding plant community.

LIMITATIONS

- Always perform plant material harvest and installation during the dormant season, late fall through early spring.
- Where increased infiltration may cause slope failures, use fascines instead of wattles to ensure positive drainage.

CONSTRUCTION GUIDELINES

1) Pre-soak wattles/fascines for 24 hours, or installed on the same day they are harvested and prepared. Wattles/fascines must be stored in the shade and under cover, preferably in water. Use site reconnaissance to identify species and site conditions on adjacent sites and compare their conditions to the construction site. Planting will be more successful as the soil, site conditions, and species selected match stable and vegetated nearby sites.

2) Tie cuttings together to form bundles, tapered at each end, 6-30 feet in length, depending on site conditions or limitations in handling. The completed bundles should be 6-12 inches in diameter. Stagger the cuttings in the bundles so that the tips are evenly distributed throughout the length of the bundle.
3) Compress and tightly tie wattle/fascine bundles with rope or twine of sufficient strength and durability. Bundles shall be tied 12-15 inches apart.
4) General Installation Guidelines:

Slope (H:V)	Slope Length Between Wattles/Fascines (feet)
1:1 to 1.5:1	3-4
1.5:1 to 2:1	4-5
2:1 to 2.5:1	5-6
2.5:1 to 4:1	6-8
3.5:1 to 4:1	8-12
4.5:1 to 5:1	10-20

5) Perform any slope repairs prior to wattle/fascine installation.
6) Beginning at the base of the slope, dig a trench on contour. The trench shall be shallow, about ½ the diameter of the wattle. The trench width will vary from 12-18 inches depending on the slope angle. Place the wattles immediately after trenching to reduce desiccation of the exposed soil. Wattles shall be staked firmly in place with one row of construction stakes on the downhill side of the wattling, not more than 3 feet apart. The second row of stakes shall be placed through the wattles, near the ties, at not more than 5 feet apart. Overlap the tapered ends of adjacent wattles so the overall wattle thickness of the wattle is uniform. Two stakes shall be used at each bundle overlap such that a stake may be driven between the last two ties of each wattle.
7) Live stakes, if specified, are generally installed on the downslope side of the bundle. Drive the live stakes below and against the bundle between the previously installed construction stakes. Backfill wattles with soil from the slope or trench above. The backfill shall be worked into the wattle interstices and compacted behind and below the bundle by walking on and working from its wattling terrace.
8) Repeat the proceeding steps to the top of the slope. Place moist soil along the sides of the live bundle. The top of the bundle should be slightly visible when the installation is completed. Plant the slope as specified.

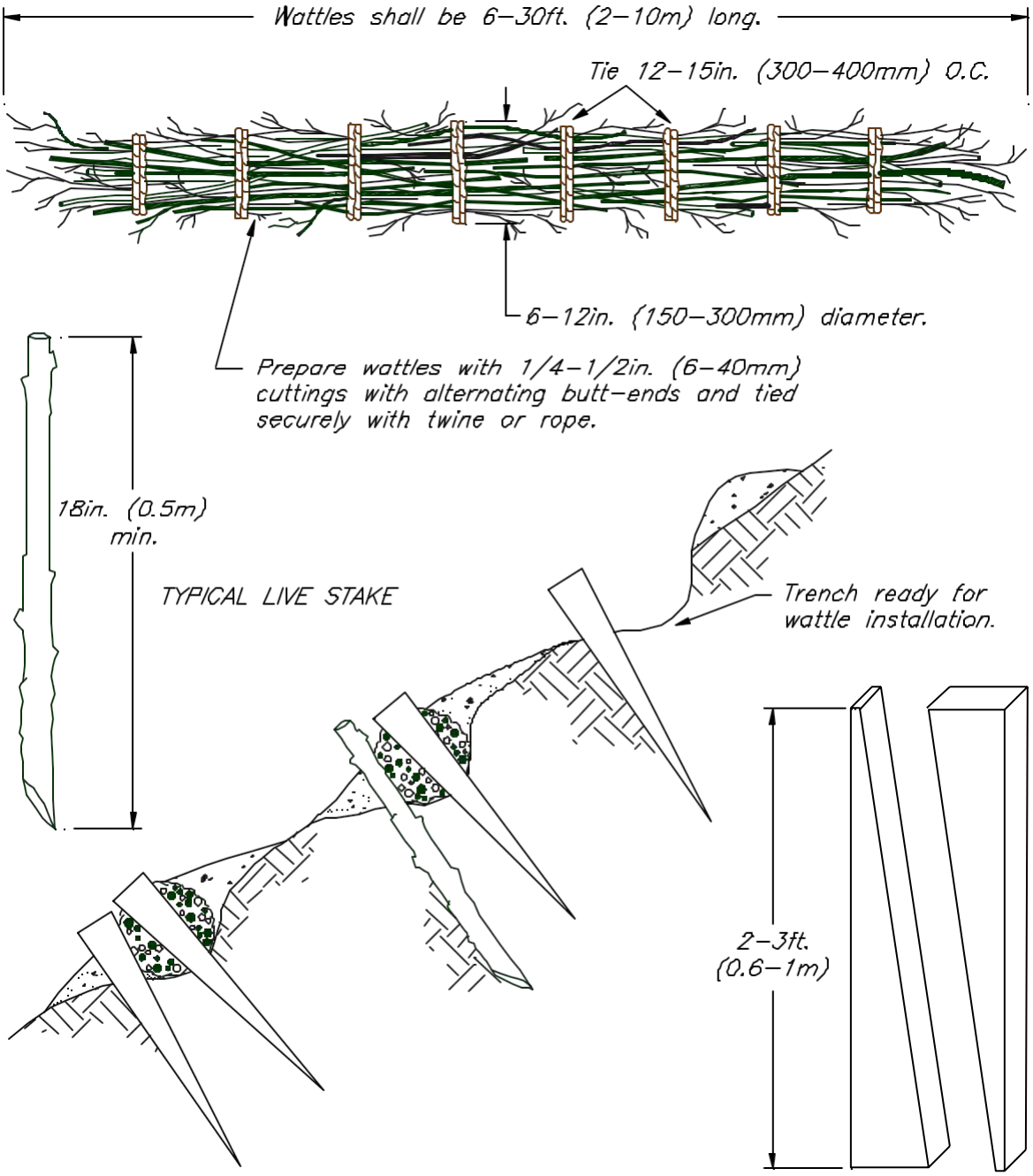
9) Seed and mulch slope, if specified. Shallow slopes, generally 3:1 or flatter may be seeded and mulched by hand. Steeper slopes can have seed applied hydraulically and the mulch should be anchored with tackifier or other approved methods.

BMP MAINTENANCE

- Regular inspection and maintenance of wattle installations should be conducted, particularly during the first year.
- Staked area may need to be watered during summer months.
- Rills and gullies around or under wattles shall be repaired immediately.

BMP REMOVAL

- BMP removal is not necessary.



NOTES:

1. Harvest and install wattles during dormant season or favorable conditions
2. Install wattles on slope contours.
3. All work proceeds from the bottom of the slope to the top.
4. Fill or partially cover wattle with soil from slope or trench above.
5 Compact and work soil into completed wattles.

WATTLE

© 2000 JOHN McCULLAH

FILE: WATTLE2

BMP: EC-6

HAND SEEDING

DESCRIPTION

Hand seeding is broadcasting grass seed on disturbed or bare soil areas by hand or a hand seeding device. This BMP is used to reduce the potential for soil to become water or air borne, reduce erosion after vegetation establishment, provide for vegetative buffers and aid in habitat protection. Seeding with appropriate seed mixes also helps discourage colonization by non-native and invasive plant species.

APPLICATIONS

Hand seeding is encouraged whenever possible to aid in controlling erosion on construction or maintenance sites. Seeding shall be applied to areas intended to be left dormant for a year or more, such as soil berms.

LIMITATIONS

- After hand seeding, mulch the area and/or install erosion control blankets or mats.
- Schedule seeding to fit the germination timing for the specific grasses to be used. Typically, this is October and November for cool season California grasses. If seed is applied earlier, increase the seed and mulch quantities.

CONSTRUCTION GUIDELINES

1) Select seed mixes appropriate to the season and site conditions. Permit conditions and/or sensitive locations may require special seed mixes. Avoid the use of tall growing flashy fuel types or types with known allelopathy such as annual rye grass. When possible, consider use of native perennials. However, in some instances, sterile species such as a wheat grass hybrid or barley may be appropriate to ensure the site is restored in a timely manner.
2) Grade as needed and feasible to permit the use of equipment for seedbed preparation.
3) Grade and scarify the site as needed and feasible to permit good seed to soil contact. See BMP Surface Roughening and Soil Tracking. Commercial fertilizers are seldom recommended as they can leach into the stream and the high nitrogen promotes broadleaf weed growth over native perennial growth. In areas where there is no longer topsoil, consider amending the soil with mycorrhizal inoculants and/or mature screened compost.
4) Install needed erosion control practices, such as sediment basins, diversion dikes and channels, prior to seeding. Divert concentrated flows away from seeded areas.

5) Surface roughening: If the area has been recently loosened or disturbed, no further roughening is required. When the area is compacted, crusted or hardened the soil shall be loosened with raking or harrowing.
6) Spread seed uniformly and according to manufacturer's recommendations.
7) Straw mulch, erosion control blankets or mulch and tackifiers/soil binders should be applied over the seeded areas.

BMP MAINTENANCE

- Inspect during seed establishment period. Re-see, due to mortality, as necessary. Areas which fail to establish cover adequate to prevent sheet and rill erosion will be reseeded as soon as such areas are identified. Spot seeding can be done on small areas to fill in bare spots where grass did not grow properly.

BMP REMOVAL

BMP removal should not be necessary.

BMP: EC-7

HYDROSEEDING

DESCRIPTION

Hydroseeding is broadcasting grass seed, tackifier, wood fiber mulch and water on disturbed areas using a hydroseeding machine. This BMP is used to reduce the potential for soil becoming water or air borne, to reduce erosion after vegetation is established, provide vegetative buffers and to aid in habitat protection. Seeding with appropriate seed mixes will also help discourage colonization by non-native and invasive plant species.

APPLICATIONS

Hydroseeding may be used after soil disturbance is completed at construction sites and/or on bare slopes.

LIMITATIONS

- Hydroseeding should not be used on streambanks or in areas subject to scour.
- Schedule seeding to fit the germination timing for the specific grasses to be used. Typically, this is October and November for cool season California grasses. If seed is applied earlier, increase the seed and mulch quantities.

CONSTRUCTION GUIDELINES

- Select seed mixes appropriate to the season and site conditions. Permit conditions and/or sensitive locations may require special seed mixes. Avoid the use of tall growing flashy fuel types or types with known allelopathy[1] such as annual rye grass. Consider native perennials whenever possible. Commercial fertilizers are seldom recommended as they can leach into the stream, and the high nitrogen promotes broadleaf weed growth over native perennial growth. In areas where there is no longer topsoil, consider amending the soil with mycorrhizal inoculants and/or mature screened compost.
- Install needed erosion control practices, such as sediment basins, diversion dikes and channels, prior to hydroseeding. Divert concentrated flows away from hydroseeded areas.
- Surface roughening: If the area has been recently loosened or disturbed, no further roughening is required. When the area is compacted, crusted or hardened the soil shall be loosened with raking or harrowing.
- Spread hydroseed mix uniformly and according to manufacturer's recommendations.

[1] If a plant type is allelopathic, it exudes chemicals into the surrounding soil that discourage or inhibit other plant types from growing. Eucalyptus is a commonly known allelopathic species.

- Cover hydroseeded areas with other methods as needed.

BMP MAINTENANCE

- Inspect during seed establishment period. Re-seed, due to mortality, as necessary. Areas that fail to establish cover adequate to prevent sheet and rill erosion will be reseeded as soon as such areas are identified. Spot seeding can be done on small areas to fill in bare spots where grass did not grow properly.

BMP REMOVAL

- BMP removal should not be necessary.

BMP: EC-8

MULCHING

DESCRIPTION

Mulching is the application of rice or sterile straw, wood chips, leaf litter, redwood duff, or other suitable materials on the soil surface applied manually or by machine. This BMP is used to reduce the potential for soil becoming water or air borne, and to encourage vegetation establishment.

APPLICATIONS

This BMP may be used to provide protection to the soil surface and to protect newly seeded areas. This BMP may be used in combination with plantings.

LIMITATIONS

- Mulch may not adhere well to slopes steeper than 2:1.
- Mulch should not be placed in water bodies or in ditches where water flow is continuous.

CONSTRUCTION GUIDELINES

- Mulch should be applied so that the soil is covered enough to allow seeds to protect against erosion, but still allow seeds to germinate.
- Native mulches (redwood duff, leaf litter, etc.) are preferred in sensitive areas.
- In areas subject to runoff or wind erosion, mulch shall be secured into the soil by mechanical or manual crimping, anchoring with branches, or other appropriate methods.

BMP MAINTENANCE

- Periodic inspection should be conducted, and mulch reapplied in areas where missing.

BMP REMOVAL

- BMP removal is not necessary.

BMP: EC-9

VEGETATIVE BUFFER

DESCRIPTION

A vegetative buffer is a strip of vegetation adjacent to sensitive areas, ditches, pavement and water bodies. This BMP prevents soil from becoming water borne, and may help restore shallow slope failures by trapping soil and debris.

APPLICATIONS

This BMP may be used adjacent to ditches and/or sensitive areas and water bodies, parallel to roadways, parking lots, etc. It may be used in combination with other BMPs.

LIMITATIONS

This BMP should not be used:

- if it creates a potential public safety hazard.

CONSTRUCTION GUIDELINES

1) Existing vegetation shall be preserved as a buffer to the greatest extent possible.
2) Use live staking, brush layering, wattles/fascines and/or seeding methods to restore vegetative buffers after disturbances.

BMP MAINTENANCE

- Mow, trim or selectively harvest the vegetative buffer in accordance with applicable permits and/or approved vegetation management plans.
- Revegetate as necessary.

BMP REMOVAL

- BMP removal is not necessary.

BMP: EC-10

EROSION CONTROL BLANKETS & MATS

DESCRIPTION

Erosion control blankets and mats are installed to protect the prepared soil surface of a steep slope. This BMP may be used at maintenance sites to provide stabilization on steep slopes or stream banks. Erosion control blankets and mats are available in a variety of biodegradable materials including jute (natural fiber that is made into a yarn and loosely woven into a biodegradable mesh), excelsior (curled wood fiber) blanket material, straw, wood fiber blanket, coconut fiber blanket, coconut fiber mesh, and straw coconut fiber blanket. Coir fabric/netting is a geo-textile product made from coconut fibers loosely woven into a fabric usually packaged in roll form. This fabric can be used to provide a reduction in water velocity/erosive forces and/or habitat protection and topsoil stabilization.

APPLICATIONS

This BMP may be used in areas to provide stabilization/protection to the soil surface of steep slopes or stream banks. It can be used in combination with vegetation and/or seeding to reinforce soil in high flow/high velocity waters and on slopes as steep as 1:1. It may be used as bank stabilization before vegetation efforts have occurred.

Erosion control blankets are used on steep slopes to temporarily stabilize and protect disturbed soil from raindrop impact and surface erosion, to increase infiltration, decrease compaction and soil crusting, and to conserve soil moisture. Erosion control blankets also protect seeds from predators, reduce desiccation and evaporation by insulating the soil and seed environment.

Some types of erosion control blankets and turf reinforcement mats are specifically designed to stabilize channelized flow areas.

LIMITATIONS

This BMP should not be used:

- In the streambed.
- When short-term biodegradability is desired.
- In areas subject to scour from high flows (e.g. streambanks) unless designed by an engineer.
- Permits shall be obtained prior to any streambank or shoreline installation.

Blankets and mats manufactured with plastic netting shall be avoided.

CONSTRUCTION GUIDELINES

- When used near watercourses or streams, coir fabrics/nettings must be used in accordance with permit requirements.
- Proper soil preparation is essential to ensure complete contact of the protection matting with the soil. Prepare the soil on the slope prior to laying out the erosion control blanket or mat.
- Grade and shape area of installation.
- Remove all rocks, clods, vegetative or other obstructions so that the installed blankets, or mats will have direct contact with the soil.
- Prepare seedbed by loosening 2-3 inches of topsoil above final grade.
- Seed area before blanket installation for erosion control and re-vegetation. Seeding after mat installation is often specified for turf reinforcement application. When seeding prior to blanket installation, all areas disturbed during blanket installation should be re-seeded. Where soil filling is specified for turf reinforcement mats, seed the matting and entire disturbed area after installation and prior to filing the mat with soil.
- Fertilize and seed in accordance with seeding specifications or other types of landscaping plans. The protective matting can be laid over areas where grass has been planted and the seedlings have emerged. Where vines or other ground covers are to be planted, lay the protective matting first and then plant through matting according to design of planting.
- Check slots should be installed as specified by the manufacturer.
- Before laying the matting, all check slots should be installed and the seedbed should be friable, made free from clods, rocks, and roots. The surface should be compacted and finished according to the requirements of the manufacturer's recommendations.
- Use mechanical or manual lay down equipment capable of handling full rolls of fabric and laying the fabric smoothly without wrinkles or folds. Equipment should meet fabric manufacturer's recommendations or standards.
- Install mats or blankets in accordance with the manufacturer's recommendations. In general, begin at the top of the slope and anchor blanket/fabric in a 6 inch by 6 inch wide trench and backfill the trench. Unroll the blanket/fabric down slope in the direction of water flow. Overlap the edges of adjacent rolls 2-3 inches and stable every 3 feet. If splicing is needed, place blankets end over end (shingle style) with 6 inches of overlap. Staple through the overlapped area, approximately 12 inches apart.
- If coir fabric is used, lay loosely on the surface so fabric makes contact with the ground and conforms to the ground surface's topography (do not stretch for extra coverage). Overlap fabric edges at least 12 inches. The fabric should be trenched in at least 12 inches deep at the top and bottom ends of the installation to prevent undercutting. If used in conjunction with hand seeding or hydroseeding, place seeding first and cover with fabric.
- U-shaped wire staples, metal geotextile stake pins, or triangular wooden stakes can be used to anchor mats to the ground surface. Wire staples should be a minimum of 11 gauge. Metal stake pins should be 3/16 inch diameter steel with a

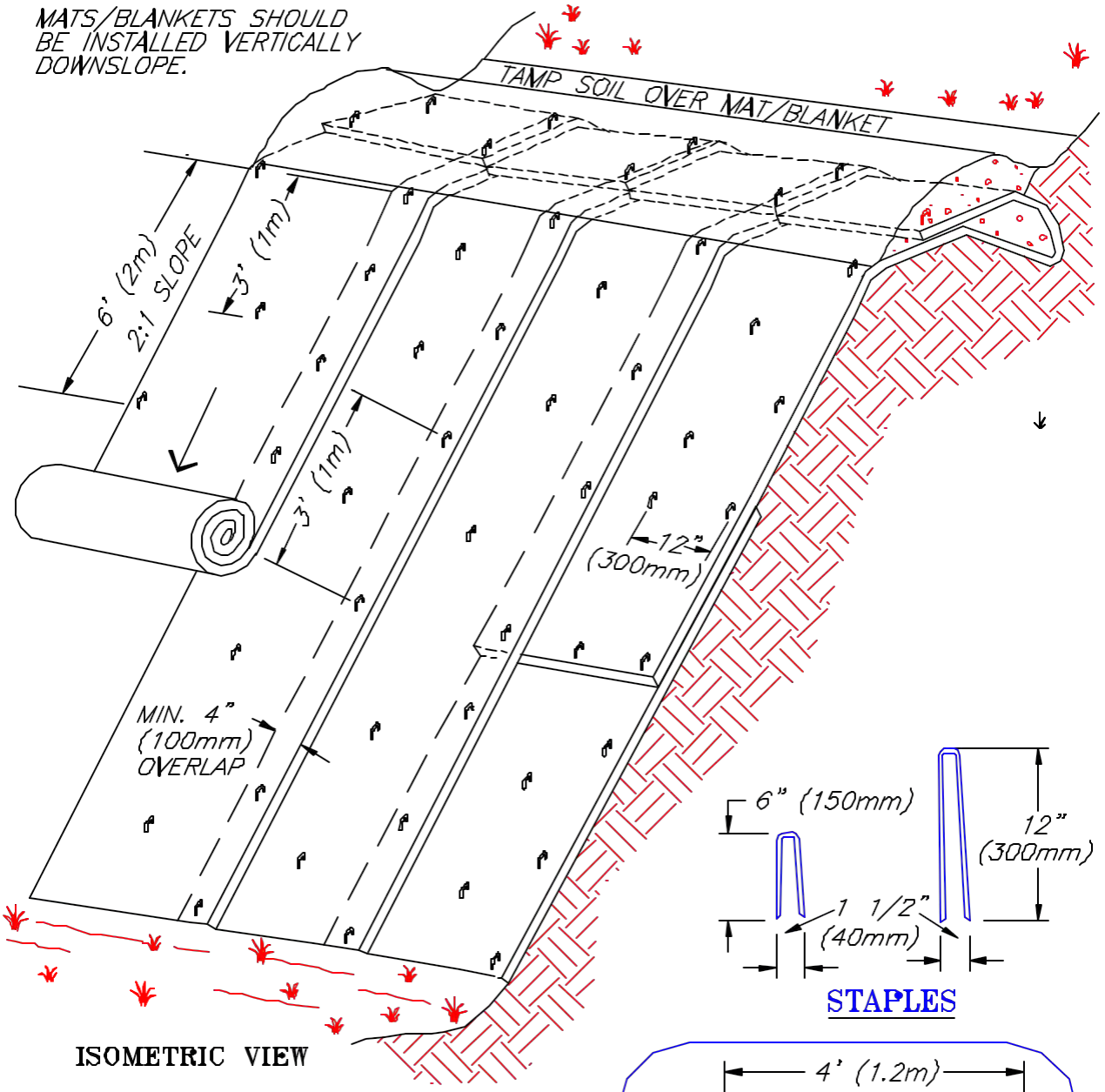
1 1/2 inch steel washer at the head of the pin. Wire staples and metal stakes should be driven flush to the soil surface. All anchors should be 6-8 inches long and have sufficient ground penetration to resist pullout. Longer anchors may be required for loose soils. For coir netting, live staking may be done after the fabric is placed by piercing the fabric.

BMP MAINTENANCE

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

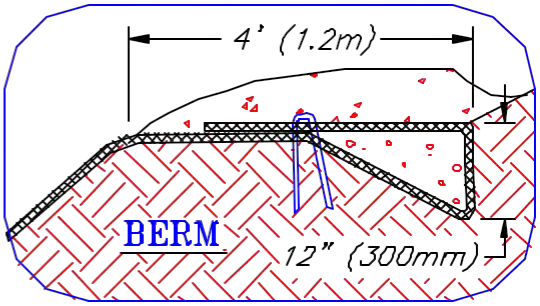
BMP REMOVAL

- BMP removal is not necessary.



ISOMETRIC VIEW

STAPLES



NOT TO SCALE

TYPICAL SLOPE SOIL STABILIZATION

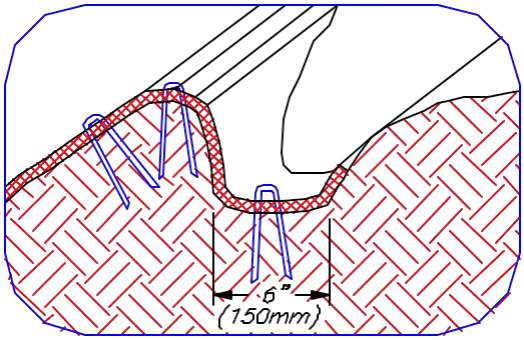
NOTES:

1. SLOPE SURFACE SHALL BE FREE OF ROCKS, CLODS, STICKS AND GRASS. MATS/BLANKETS SHALL HAVE GOOD SOIL CONTACT.
2. APPLY PERMANENT SEEDING BEFORE PLACING BLANKETS.
3. LAY BLANKETS LOOSELY AND STAKE OR STAPLE TO MAINTAIN DIRECT CONTACT WITH THE SOIL. DO NOT STRETCH.

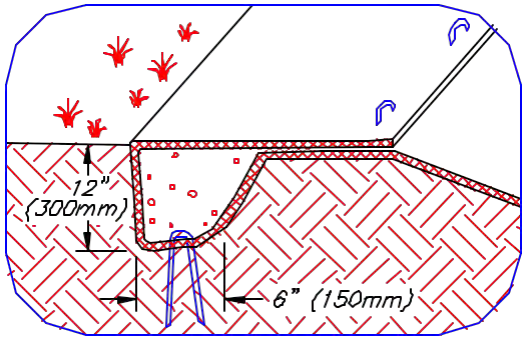
EROSION BLANKETS & TURF REINFORCEMENT MATS SLOPE INSTALLATION

© 1994 JOHN McCULLAH

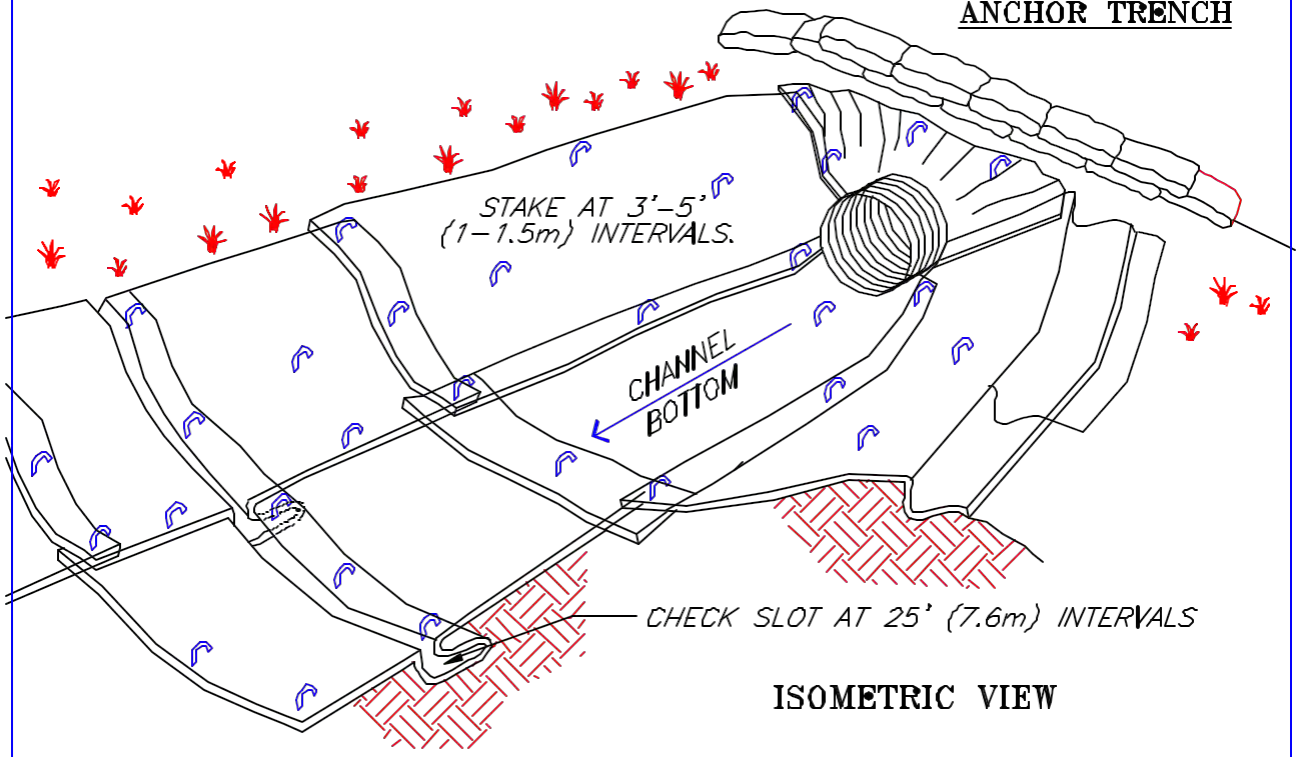
FILE. BLNKTSLP



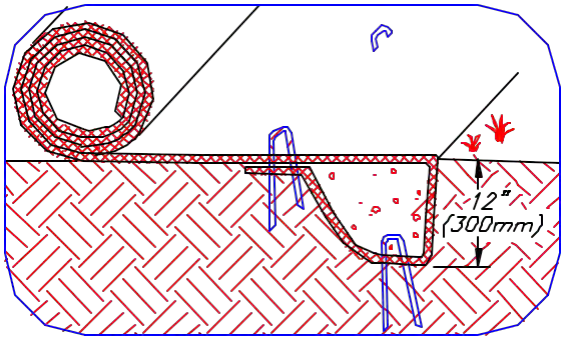
LONGITUDINAL ANCHOR TRENCH



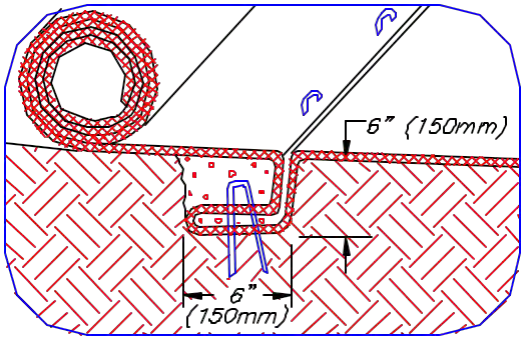
TERMINAL SLOPE AND CHANNEL ANCHOR TRENCH



ISOMETRIC VIEW



INITIAL CHANNEL ANCHOR TRENCH



INTERMITTENT CHECK SLOT

NOTES:

1. CHECK SLOTS TO BE CONSTRUCTED PER MANUFACTURERS SPECIFICATIONS.
2. STAKING OR STAPLING LAYOUT PER MANUFACTURERS SPECIFICATIONS.

EROSION BLANKETS & TURF REINFORCEMENT MATS CHANNEL INSTALLATION

© 1994 JOHN McCULLAH

FILE: BLNKTCHA

BMP: EC-13

SLOPE OR BANK STABILIZATION

DESCRIPTION

The County strives to implement biotechnical methods to stabilize streambanks. Biotechnical stabilization methods utilize native materials such as large woody debris, willows, and other vegetation, to stabilize streambanks. Refer to BMPs EC-1 (Brush Layering), EC-2 (Brush Packing), and EC-4 (Wattles and Fascines) for description of biotechnical methods.

Where biotechnical methods are unsuitable (i.e., in locations with very steep slopes or limited right-of-way width), and where engineered retaining structures are necessary, hardened engineered solutions such as rock slope protection, solider pile walls, retaining walls, or slope soil nailing may be utilized along a failed portion of slope to provide a buttress for against additional failure. To the extent possible, the County shall aim to combine these hardened solutions with biotechnical methods and incorporate habitat features at the base of the structure. Such design approaches may include structural fixes such as solider pile retaining walls with concrete or wood laggings installed above the ordinary high water mark with vegetated rock slope protection or slope soil nailing fronted by a vegetated boulder revetments or habitat features at the toe of the slope. These hardscape solutions are utilized to stabilize steep slopes with seepage problems and/or unstable soils that need armoring to prevent sloughing, as well as along narrow, steep roadways where the right-of-way width is limited.

Vegetated boulder revetments involve placing logs, rootwads, and boulders in selective areas in and on streambanks. This method is effective in higher velocity streams, and trap sediment between components support restoration of slope vegetation and distribute flow velocities.

LIMITATIONS

- Streambank and road embankment stabilization methods shall only be implemented after identifying potential impacts to upstream and downstream banks, structures and facilities.
- Do not use hardscape engineered solutions (e.g., riprap, concrete, shot-crete, soil nailing) as a stand-alone method of streambank stabilization.
- Obtain permits from appropriate agencies before placing any fill below the mean high water line of any water body, or in other sensitive areas. For example, placing rock in pools at the bottom of culverts is a regulated activity.

DESIGN AND CONSTRUCTION GUIDELINES

- For vegetated boulder revetments, the construction guidelines will vary based on existing site conditions, size and shape of woody materials, forces exerted by moving water, etc.
- For bank stabilization methods using hardened materials, consult with a qualified engineer to determine the appropriate size of boulders and hardscape protection needed, the appropriate placement techniques, and the potential application of biotechnical stabilization treatments in conjunction with the hardscape protection. The selected engineer shall conduct a shear stress evaluation to confirm the appropriate sizing of rock to be used.
- Attempt to limit hardscape protection methods below the ordinary high water mark.
- Anchor hardscape walls horizontally and vertically to the slope.
- Incorporate plantings, designed to allow tree growth, into hardscape designs; and key into the bank as appropriate.
- For rock slope protection treatments, angular rock should be used and sized to ensure a thickness of at least 2 courses over the slope failure. Filter or geotextile fabric, which allows water to flow through the material while blocking sediment, silt and other aggregates, may be placed on the slope prior to the rock. If filter/geotextile fabric is used, the edges should be buried to a depth of six inches (6”). Filter or geotextile fabric may not be necessary along portions of the slope where vegetation is incorporated.
- Carefully place rock to avoid damaging the filter fabric.
    - Stone 4-6” may be carefully dumped onto filter fabric from a height not to exceed 12”.
    - Stone 8-12” must be placed by hand onto filter fabric, or the filter fabric may be covered with 4” of gravel and the 8-12” rock may be dumped from a height not to exceed 16”.
    - Stone greater than 12” shall only be dumped onto filter fabric protected with a layer of gravel with a thickness equal to one half the D_{50} (median) rock size, and the dump height limited to twice the depth of the gravel protection layer thickness (CASQA 2015).
- Where vegetation can be incorporated into bank stabilization projects, perform live staking or pole planting during rock placement as appropriate.
- Place rock to its full thickness in one operation.
- The toe of the rock slope should be keyed to a stable foundation at its base.
- Schedule topsoil and revegetation finish work at an appropriate time or year.

BMP MAINTENANCE

- Where biotechnical streambank stabilization methods are implemented, monitor finished streambanks to ensure stability and vegetative growth. Consult as necessary for adjustments and/or modifications to streambank stabilization installations.
- During construction of hardscape methods, inspect daily during the work week.

- Schedule additional inspections of bank stabilization sites during storm events.
- Immediately repair any gaps, holes, scour, or underlying filter fabric observed where hardened solutions have been implemented. Replace dislodged stones immediately.

BMP REMOVAL

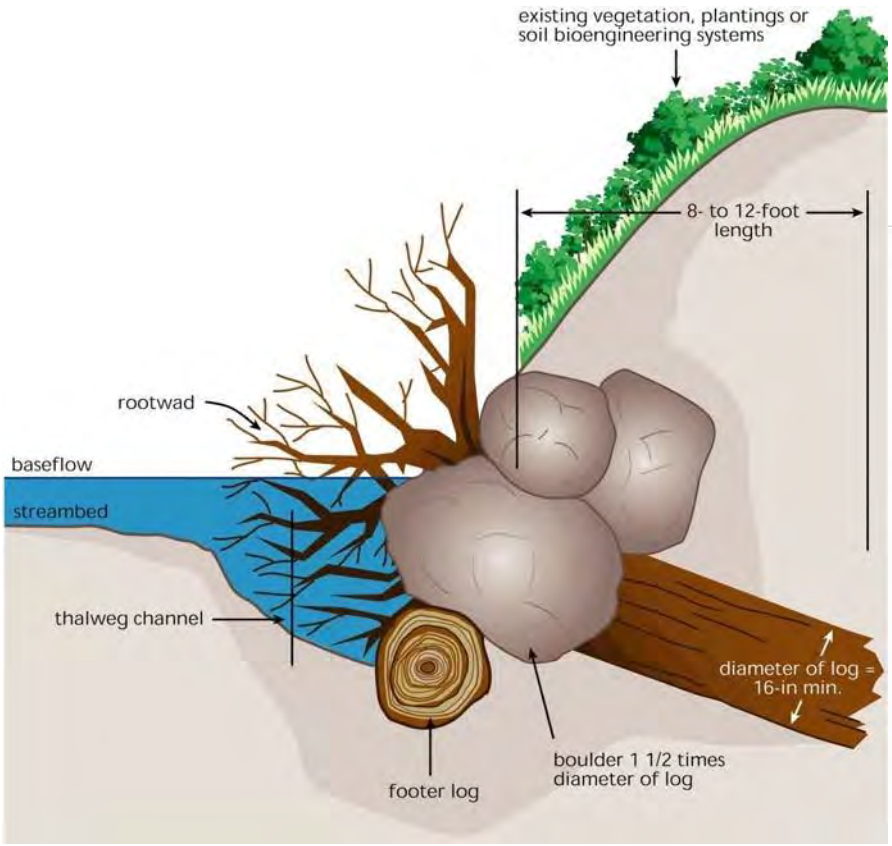
BMP removal should not be necessary.

ADDITIONAL RESOURCES

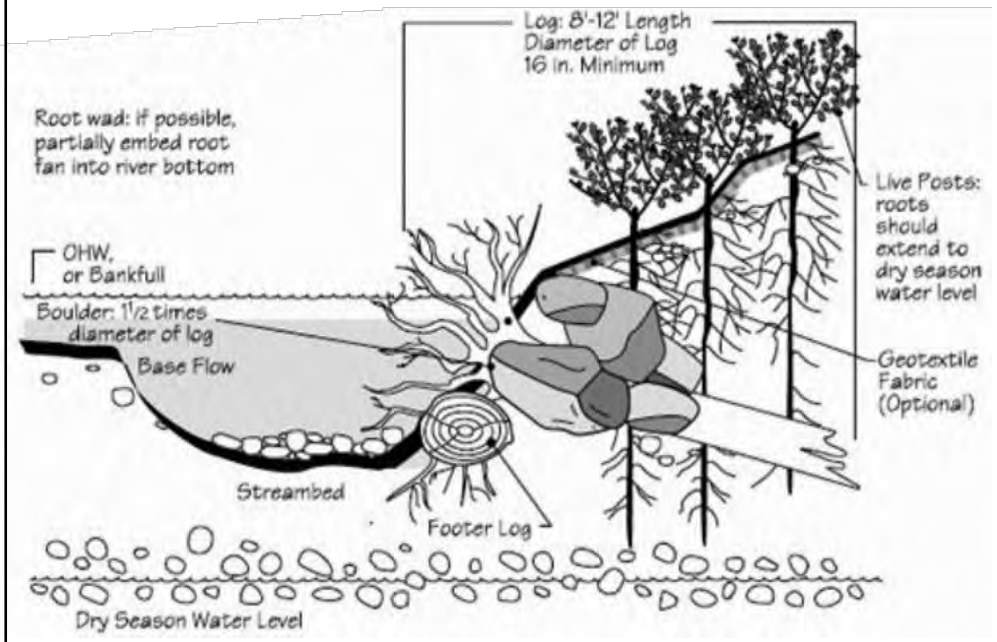
Bio Draw 1.0, Compendium of Biotechnical Soil Stabilization Solutions, Salix Applied Earthcare, 2000.

California Stormwater BMP Handbook. Construction. January 2011.

Guidelines for Bank Stabilization Projects in the Riverine Environments of King County, King County, Washington, Department of Public Works, June 1993.



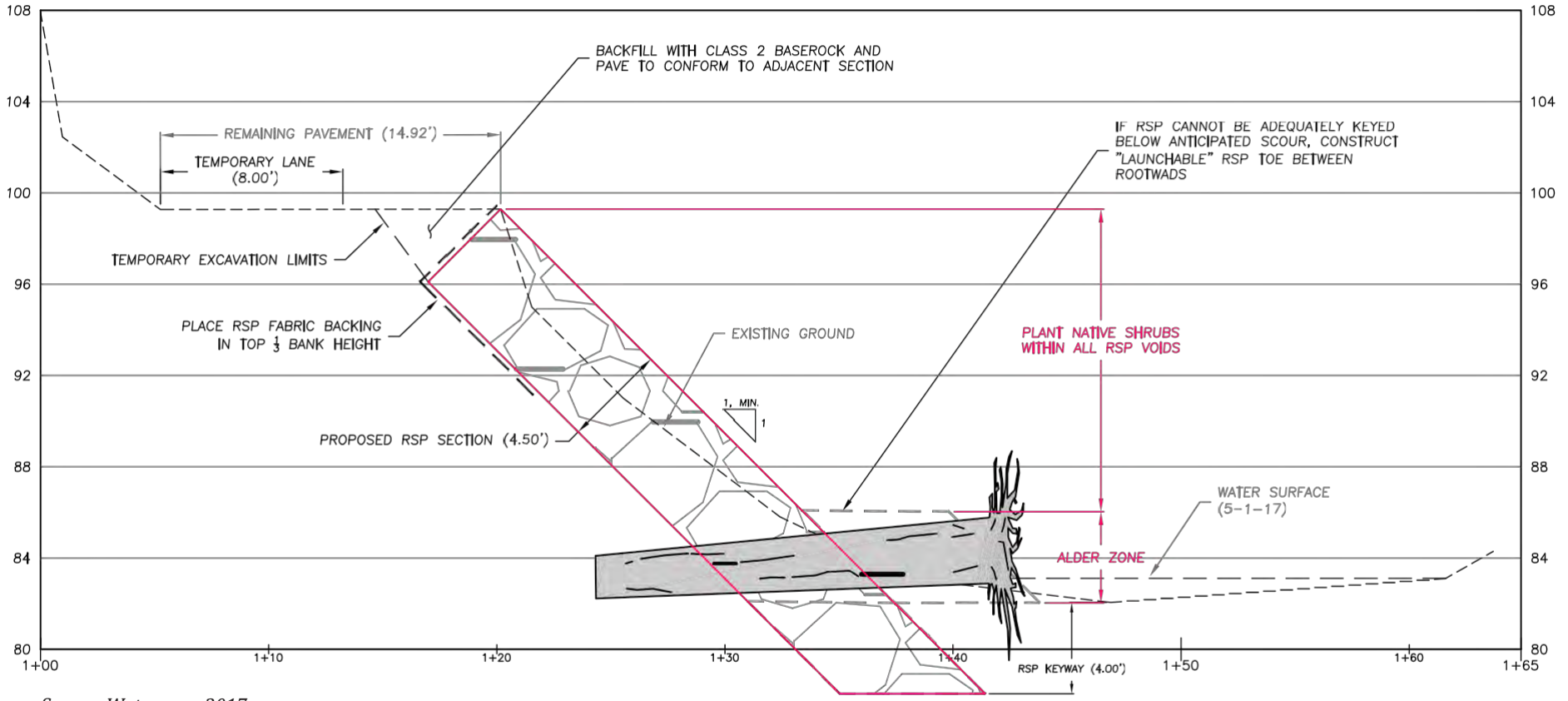
Source: LCSMC and USDA-NRCC 2002



Source: Indiana General Assembly 2012

Horizon WATER and ENVIRONMENT

Example Profile Views of Log, Rootwad and Boulder Revetment Designs
(1 of 3)



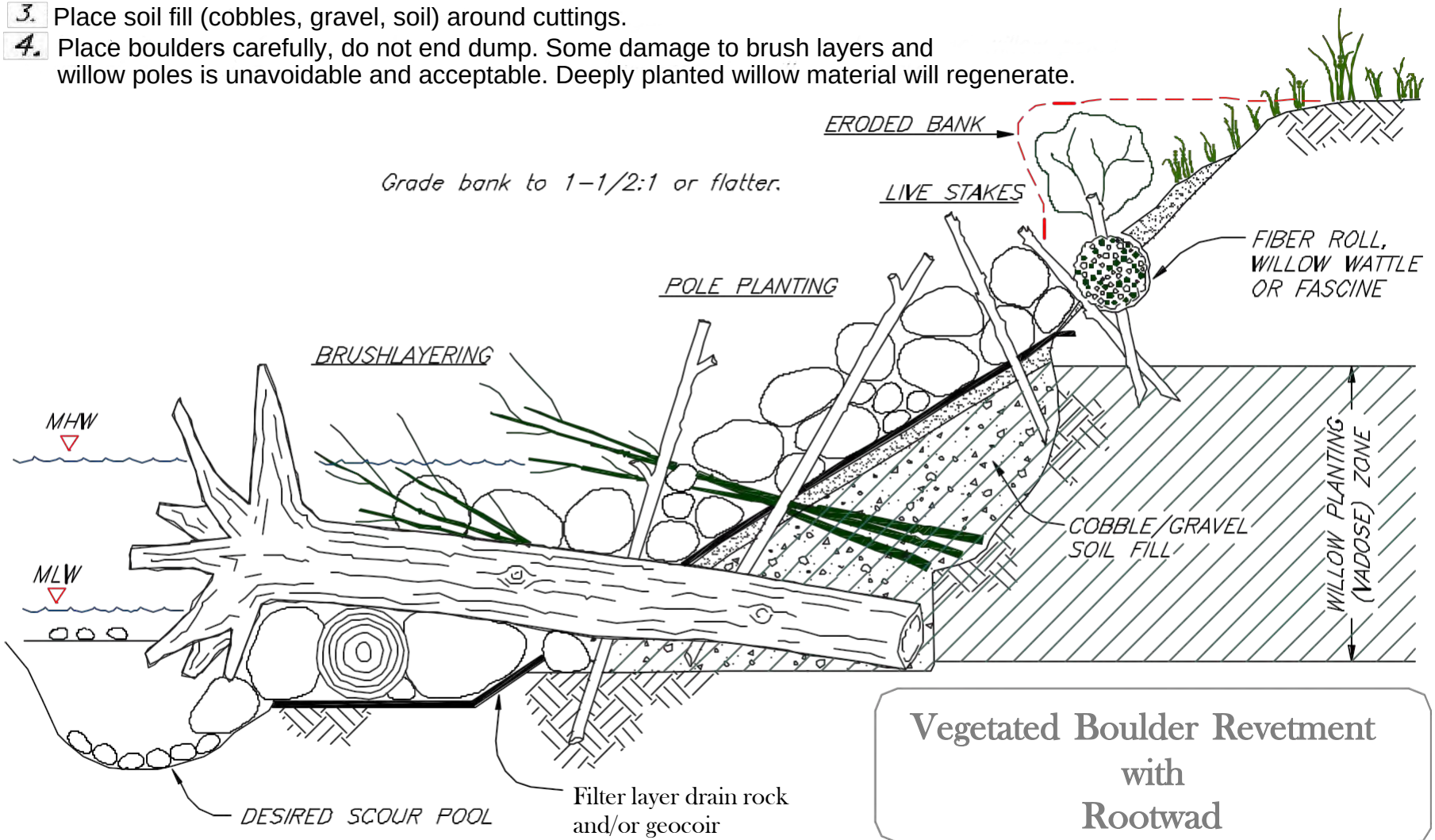
Source: Waterways 2017

Horizon WATER and ENVIRONMENT

Example Profile Views of Log, Rootwad and Boulder Revetment Designs (2 of 3)

NOTES:

1. Willow pole planting and brushlayering shall be installed during bank grading and boulder placement to ensure good contact with 'native ground' and soil fill.
2. Willow poles and brush layers shall extend down into expected soil moisture zones (vadose).
3. Place soil fill (cobbles, gravel, soil) around cuttings.
4. Place boulders carefully, do not end dump. Some damage to brush layers and willow poles is unavoidable and acceptable. Deeply planted willow material will regenerate.

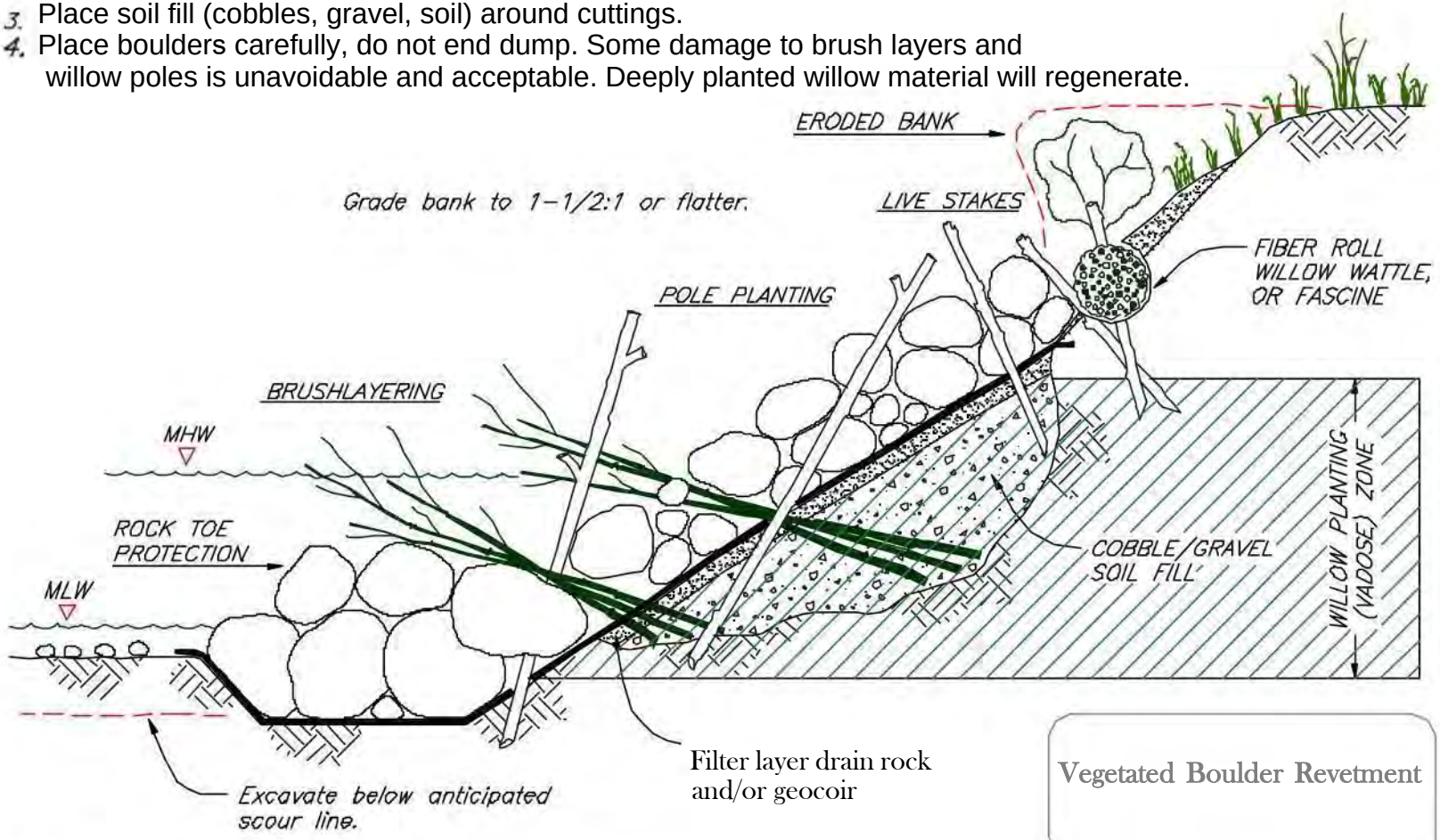


Vegetated Boulder Revetment with Rootwad

Source: John McCullah 1999

NOTES:

1. Willow pole planting and brushlayering shall be installed during bank grading and boulder placement to ensure good contact with 'native ground' and soil fill.
2. Willow poles and brush layers shall extend down into expected soil moisture zones (vadose).
3. Place soil fill (cobbles, gravel, soil) around cuttings.
4. Place boulders carefully, do not end dump. Some damage to brush layers and willow poles is unavoidable and acceptable. Deeply planted willow material will regenerate.

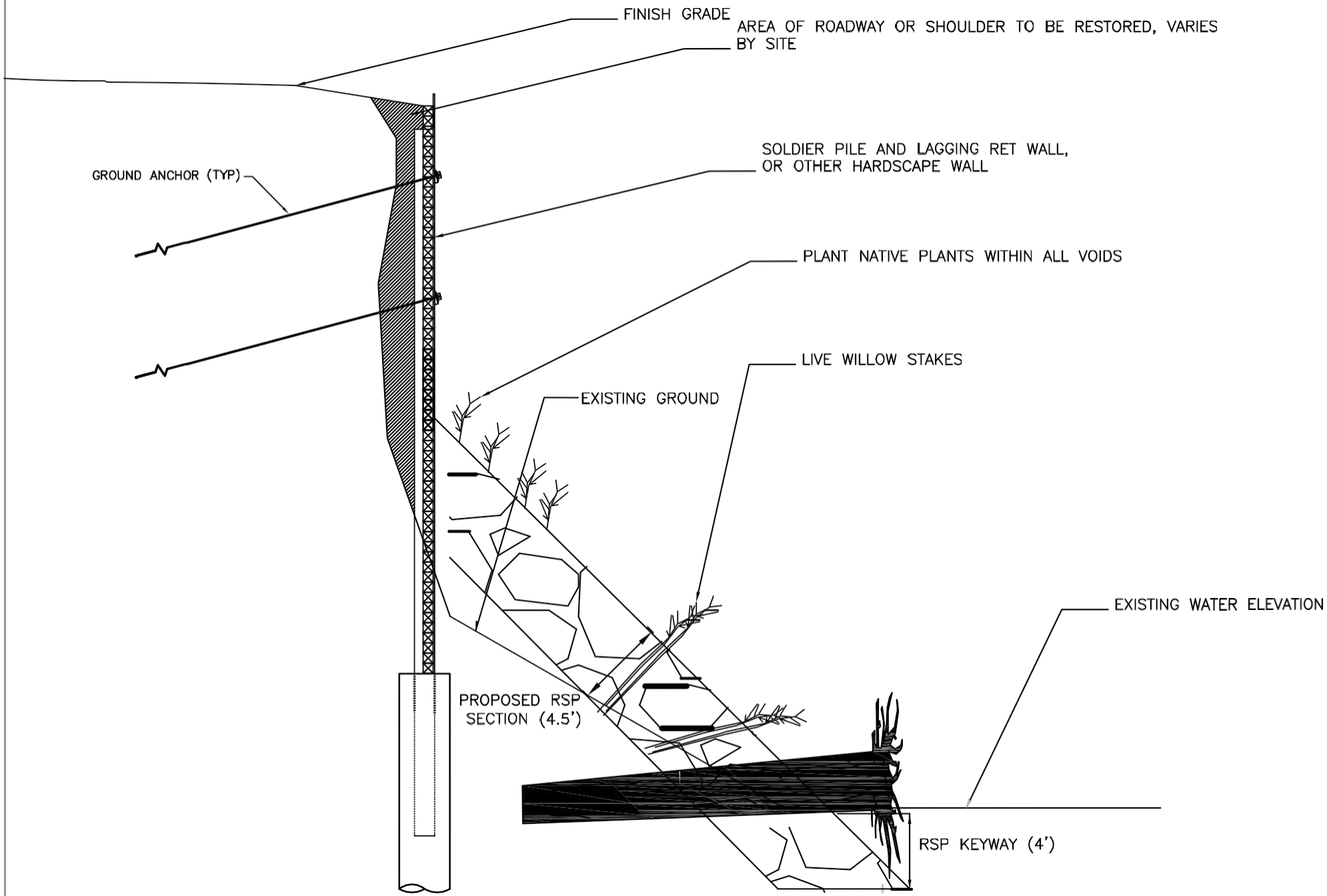


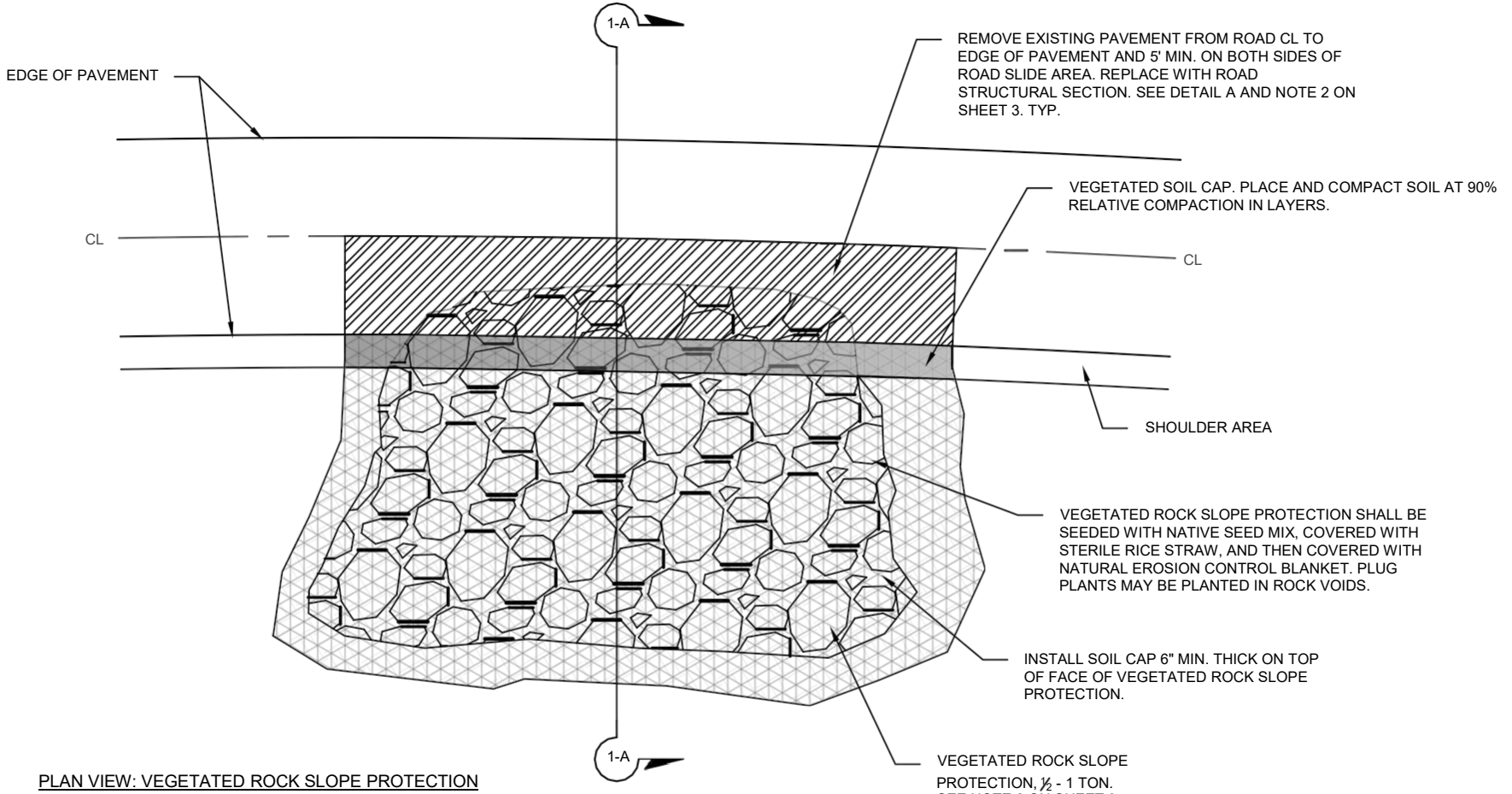
Vegetated Boulder Revetment

© 1999 JOHN McCULLAH

VGRIPRAP

RETAINING WALL WITH VEGETATED REVETMENT





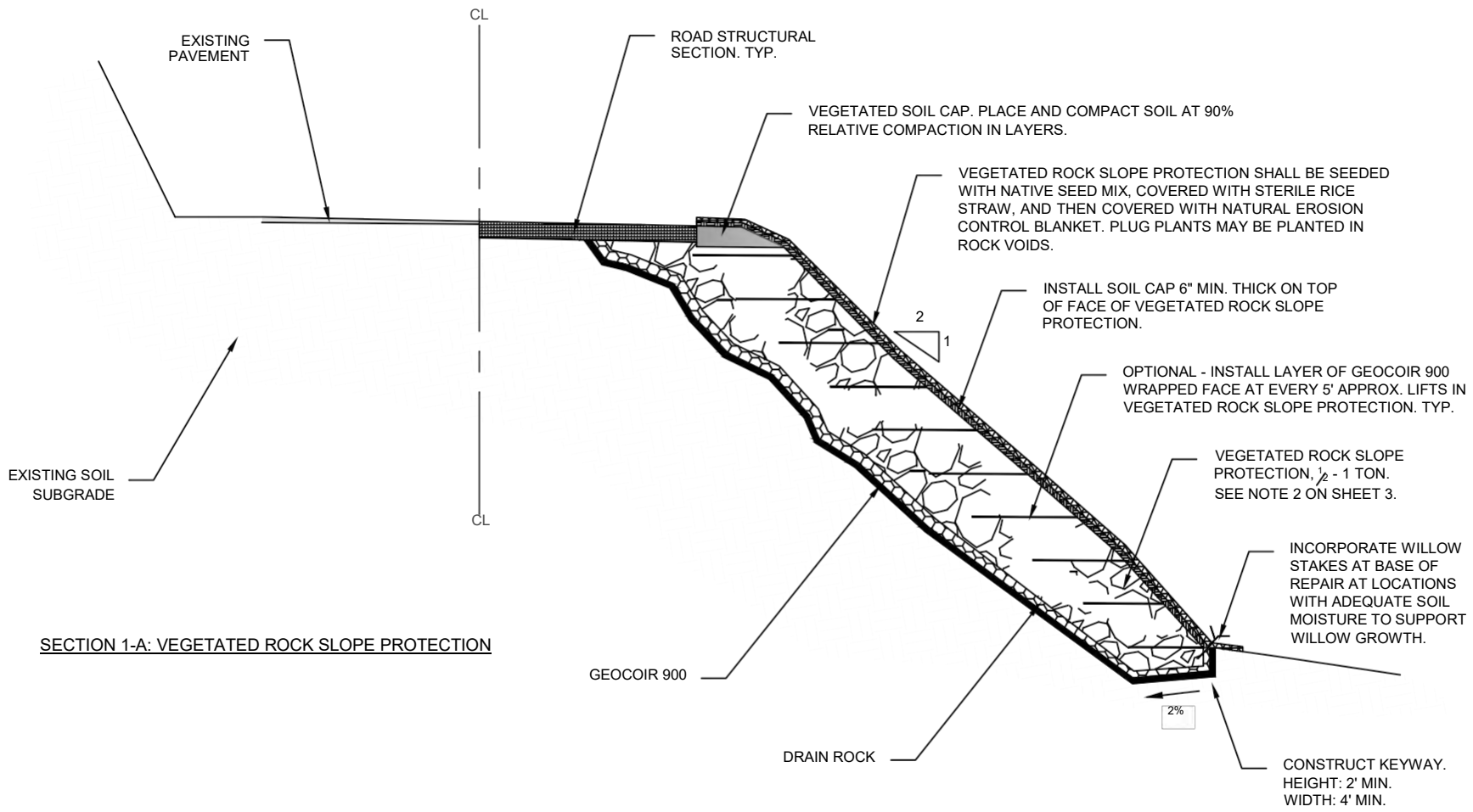
PLAN VIEW: VEGETATED ROCK SLOPE PROTECTION

FILENAME: F:\USERS\DESIGN\C3D\RMP EXHIBITS\DWG\RMP EXHIBITS.DWG

DESIGNED BY: JC	VEGETATED ROCK SLOPE PROTECTION - SHEET 1	SCALE: NONE
CHECKED BY: AL/JC	COUNTY OF SAN MATEO	DATE: 04-14-2023
DRAWN BY: ADG	ROUTINE MAINTENANCE PROGRAM	FILE NO: NONE

ANN M. STILLMAN, DIRECTOR OF PUBLIC WORKS
COUNTY OF SAN MATEO

555 COUNTY CENTER, 5TH FLOOR
REDWOOD CITY, CALIFORNIA 94063-1665



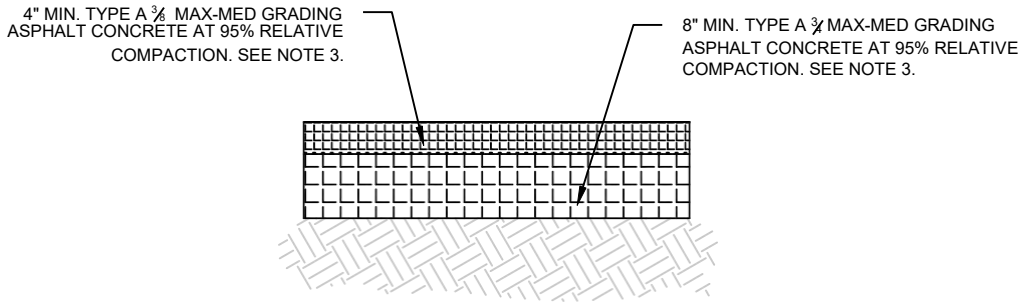
SECTION 1-A: VEGETATED ROCK SLOPE PROTECTION

FILENAME: F:\USERS\DESIGN\C3D\RMP EXHIBITS\DWG\RMP EXHIBITS.DWG

DESIGNED BY: JC	VEGETATED ROCK SLOPE PROTECTION - SHEET 2	SCALE: NONE
CHECKED BY: AL/JC	COUNTY OF SAN MATEO	DATE: 04-14-2023
DRAWN BY: ADG	ROUTINE MAINTENANCE PROGRAM	FILE NO: NONE

ANN M. STILLMAN, DIRECTOR OF PUBLIC WORKS
COUNTY OF SAN MATEO

555 COUNTY CENTER, 5TH FLOOR
REDWOOD CITY, CALIFORNIA 94063-1665



DETAIL A:
ROAD STRUCTURAL SECTION

NOTES:

1. DRAIN ROCK SHALL BE USED TO FILL VOIDS OF ROCK SLOPE PROTECTION BEFORE PLACEMENT OF SOIL.
2. ROAD STRUCTURAL SECTION SHALL CONFORM TO EXISTING PAVEMENT AND EXISTING CROSS SLOPE.
3. LAYING AND COMPACTING OF ASPHALT CONCRETE SHOULD BE DONE IN 3"-4" MAX LIFTS.

ABBREVIATIONS:

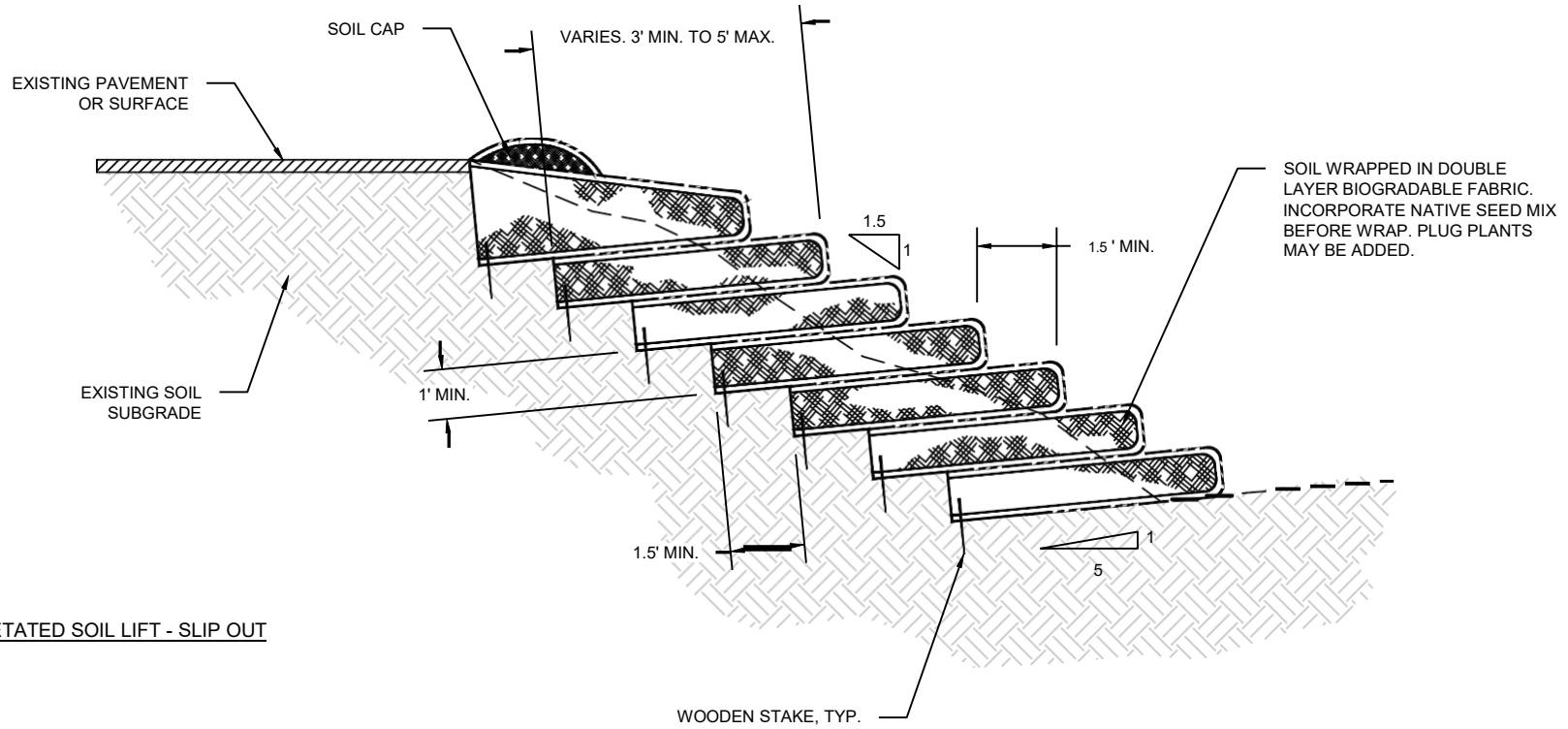
CL	CENTERLINE
MAX	MAXIMUM
MIN	MINIMUM
TYP	TYPICAL

FILENAME: F:\USERS\DESIGN\C3D\RMP EXHIBITS\DWG\RMP EXHIBITS.DWG

DESIGNED BY: JC	VEGETATED ROCK SLOPE PROTECTION - SHEET 3	SCALE: NONE
CHECKED BY: AL/JC	COUNTY OF SAN MATEO	DATE: 04-14-2023
DRAWN BY: ADG	ROUTINE MAINTENANCE PROGRAM	FILE NO: NONE

ANN M. STILLMAN, DIRECTOR OF PUBLIC WORKS
COUNTY OF SAN MATEO

555 COUNTY CENTER, 5TH FLOOR
REDWOOD CITY, CALIFORNIA 94063–1665



VEGETATED SOIL LIFT - SLIP OUT

ABBREVIATIONS:

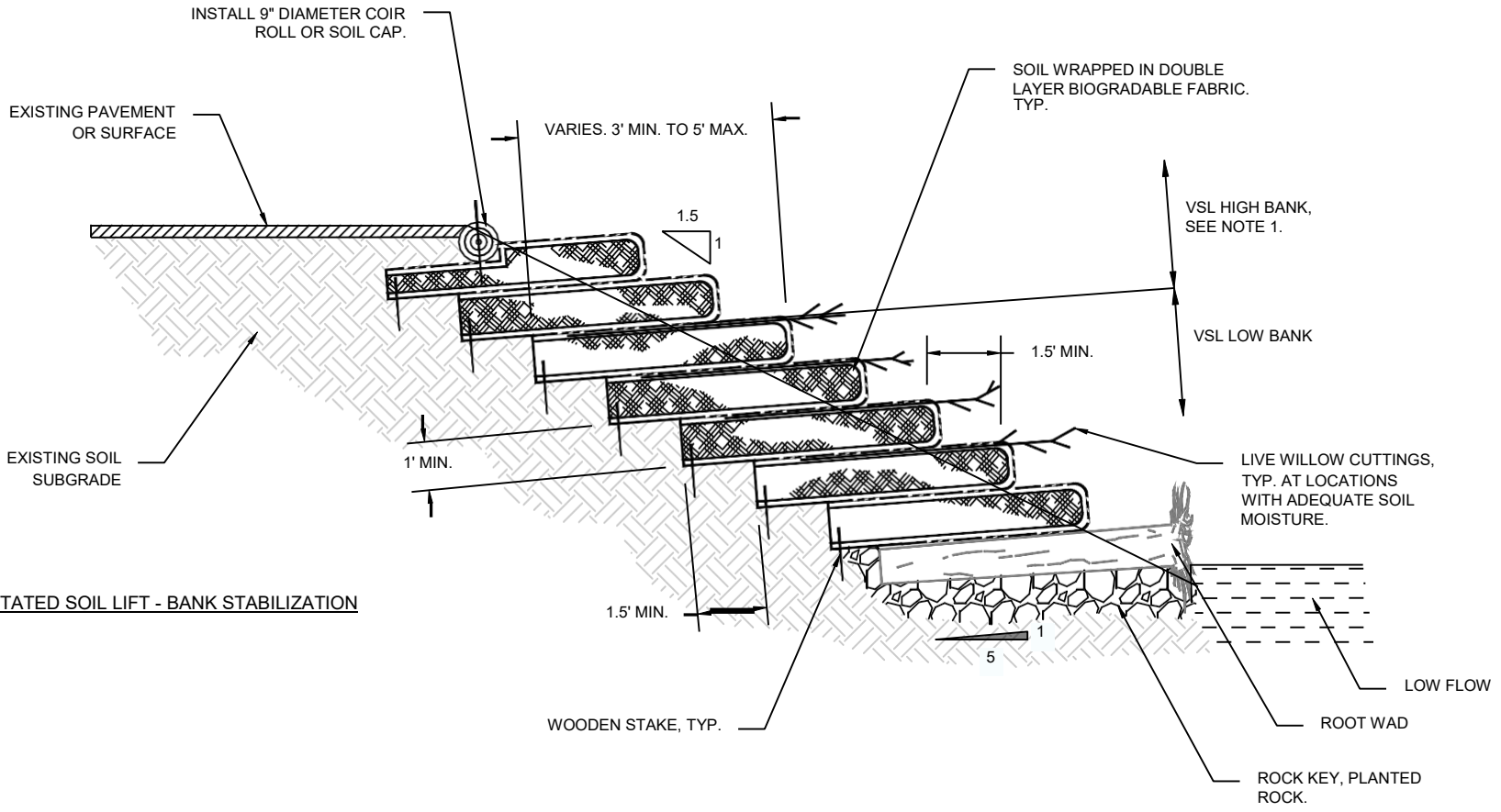
MAX	MAXIMUM
MIN	MINIMUM
TYP	TYPICAL
VSL	VEGETATED SOIL LIFT

FILENAME: F:\USERS\DESIGN\C3D\RMP EXHIBITS\DWG\RMP EXHIBITS.DWG

DESIGNED BY: JC	VEGETATED SOIL LIFT - SLIP OUT	SCALE: NONE
CHECKED BY: AL/JC	COUNTY OF SAN MATEO	DATE: 04-14-2023
DRAWN BY: ADG	ROUTINE MAINTENANCE PROGRAM	FILE NO: NONE

ANN M. STILLMAN, DIRECTOR OF PUBLIC WORKS
COUNTY OF SAN MATEO

555 COUNTY CENTER, 5TH FLOOR
REDWOOD CITY, CALIFORNIA 94063–1665



VEGETATED SOIL LIFT - BANK STABILIZATION

NOTES:

1. INCORPORATE NATIVE SEED MIX BEFORE WRAP ON LAYERS AT VSL HIGH BANK.

ABBREVIATIONS:

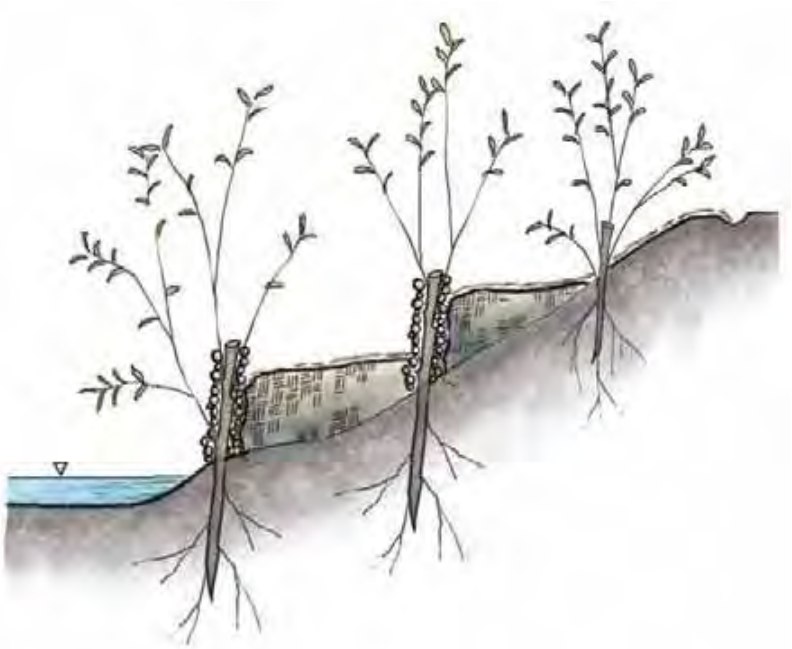
MAX	MAXIMUM
MIN	MINIMUM
TYP	TYPICAL
VSL	VEGETATED SOIL LIFT

FILENAME: F:\USERS\DESIGN\C3D\RMP EXHIBITS\DWG\RMP EXHIBITS.DWG

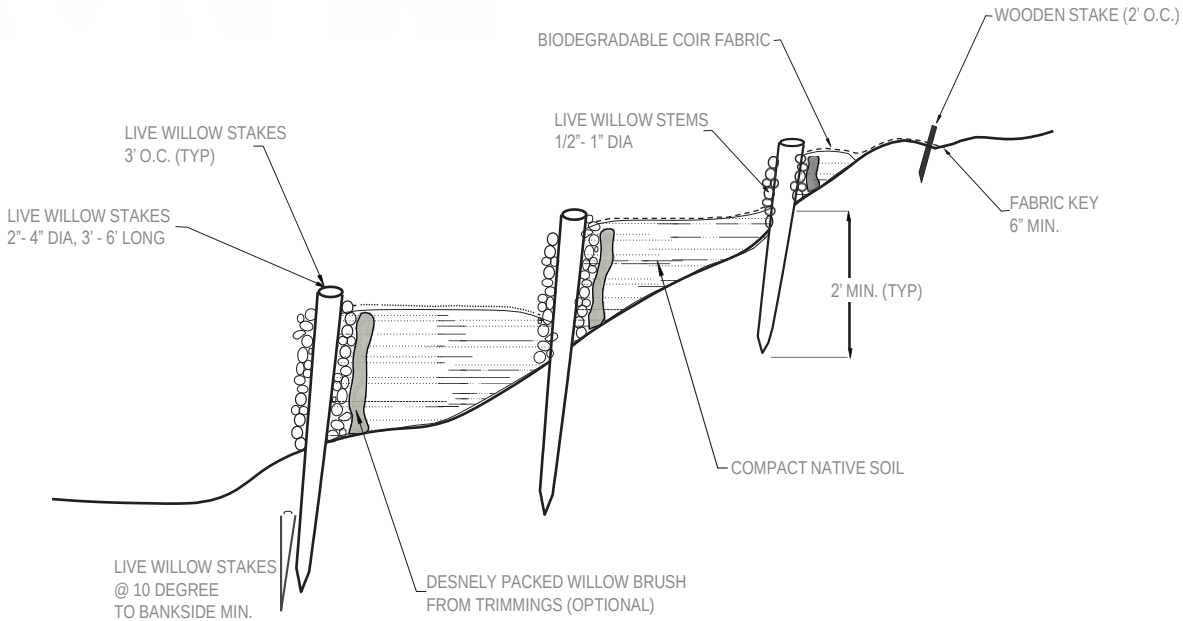
DESIGNED BY: JC	VEGETATED SOIL LIFT - BANK STABILIZATION		SCALE: NONE
CHECKED BY: AL/JC	COUNTY OF SAN MATEO		DATE: 04-14-2023
DRAWN BY: ADG	ROUTINE MAINTENANCE PROGRAM		FILE NO: NONE

ANN M. STILLMAN, DIRECTOR OF PUBLIC WORKS
COUNTY OF SAN MATEO

555 COUNTY CENTER, 5TH FLOOR
REDWOOD CITY, CALIFORNIA 94063-1665





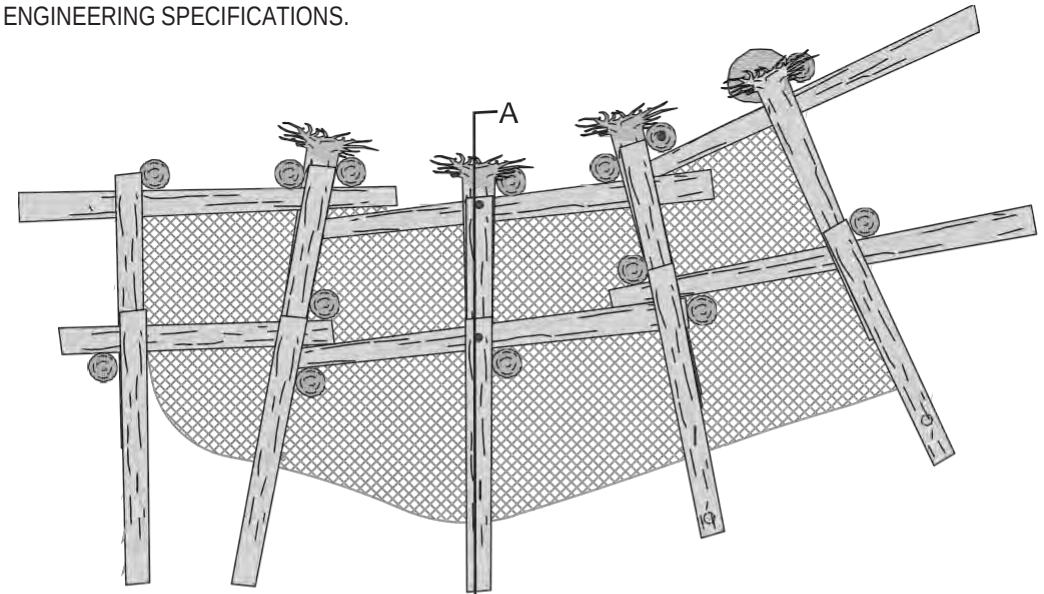


S:\1_Projects\16.007_Napa_SMP_Support_2016-2018\Draft Manual Update\Appendices\Appendix I_Biotech Treatment Designs

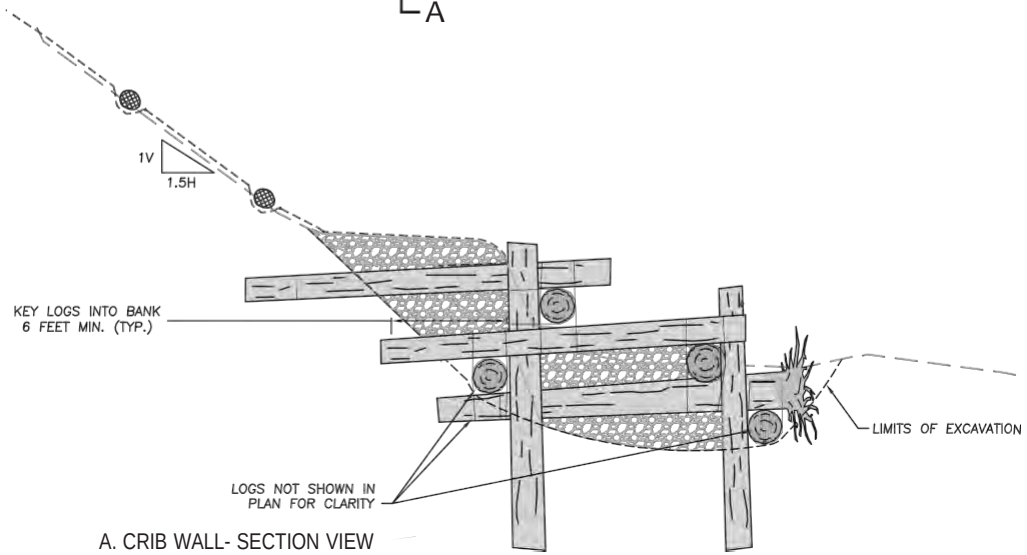
Horizon WATER and ENVIRONMENT

Figure EC-13
Plan Details for Willow Wall

*THESE ARE FOR CONCEPTUAL PURPOSES ONLY. LOG DIAMETER/LENGTH, EMBEDMENT DEPTH, AND NUMBER/TYPE OF CONNECTORS ARE DEPENDENT UPON SITE CONDITIONS AND ENGINEERING SPECIFICATIONS.

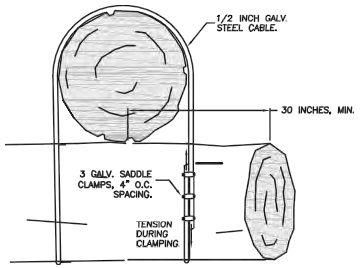


CRIB WALL - PLAN VIEW

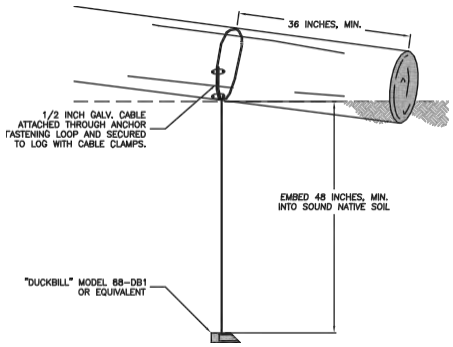


A. CRIB WALL- SECTION VIEW





EXAMPLE: LOG/LOG CONNECTION



EXAMPLE: EARTH ANCHOR DETAIL

S:\1_Projects\16.007_Napa_SMP_Support_2016-2018\Draft Manual Update\Appendices\Appendix I_Biotech Treatment Designs

Horizon
WATER and ENVIRONMENT

Figure EC-13
Plan Details for Log Crib Wall

BMP: SC-1

SANDBAGS AND GRAVEL BAGS

DESCRIPTION

Sandbags and gravel bags are pre-manufactured cloth or plastic bags filled with sand or gravel. These can be used to keep water away from work areas and unstable slopes, and to construct curb inlet sediment barriers. Both are also used as protection against flooding, as ballast.

APPLICATIONS

This BMP may be used during emergencies to control the flow and level of water. It may be used during construction to form dewatered areas such as cofferdams and clean water bypasses. Sandbags and gravel bags may also be used to protect storm drain inlets, gutters, ditches, and drainage courses.

LIMITATIONS

Do not use this BMP where prohibited by permit conditions or as a permanent structure.

CONSTRUCTION GUIDELINES

- When using this BMP in water bodies, fulfill appropriate permit conditions.
- Secure ends of sandbags to ensure material does not scatter.
- Carefully handle sandbags and gravel bags to prevent them from breaking.
- When used as a barrier, stack bags tightly together and in alternative (brick-layer) fashion.
- Fill bags with clean sand or gravel.

BMP MAINTENANCE

- During construction, inspect daily during the workweek. Schedule additional inspections during storm events. Make any required repairs.
- Replace damaged sandbags.
- Remove sediment when deposits reach ½ the height of the sandbag barrier.

BMP REMOVAL

- Evaluate site to determine when BMP is no longer needed.
- Remove sediment buildup in front of BMP.
- Remove BMP, recycle and/or re-use if applicable.
- Revegetate area disturbed by BMP removal.
- Material in sandbags may be spread on slopes and stable areas where allowed by permit conditions.

BMP: SC-2

SILT FENCE

DESCRIPTION

A silt fence is a temporary sediment barrier consisting of fabric stretched across and attached to supporting posts and entrenched into the soil. It is generally installed perpendicular to the flow direction to slow or stop water and to allow perimeter filtration, settling of soil particles, and to reduce water velocity. Alternative materials that could be used as a substitute for silt fencing include newer perimeter control technologies such as Ertec® and Durawattle®.

APPLICATIONS

This BMP may be used for perimeter protection (around construction work sites, slide debris stockpiles, etc.). It may be used in combination with other BMPs.

LIMITATIONS

This BMP should not be used:

- where rock or hard surfaces prevent full and uniform anchoring of the barrier.
- directly in streams or water courses.
- around drop inlets or in front of storm drain inlets.
- as a diversion dam.

CONSTRUCTION GUIDELINES

- Place silt fence or alternative perimeter material fencing along contours.
- Stakes or posts should be to the downhill side of the fence.
- The bottom of the fabric must be continuously and securely anchored for its entire length to prevent undermining.
- Increase the elevation at the ends of the BMP installation to prevent “end runs.”

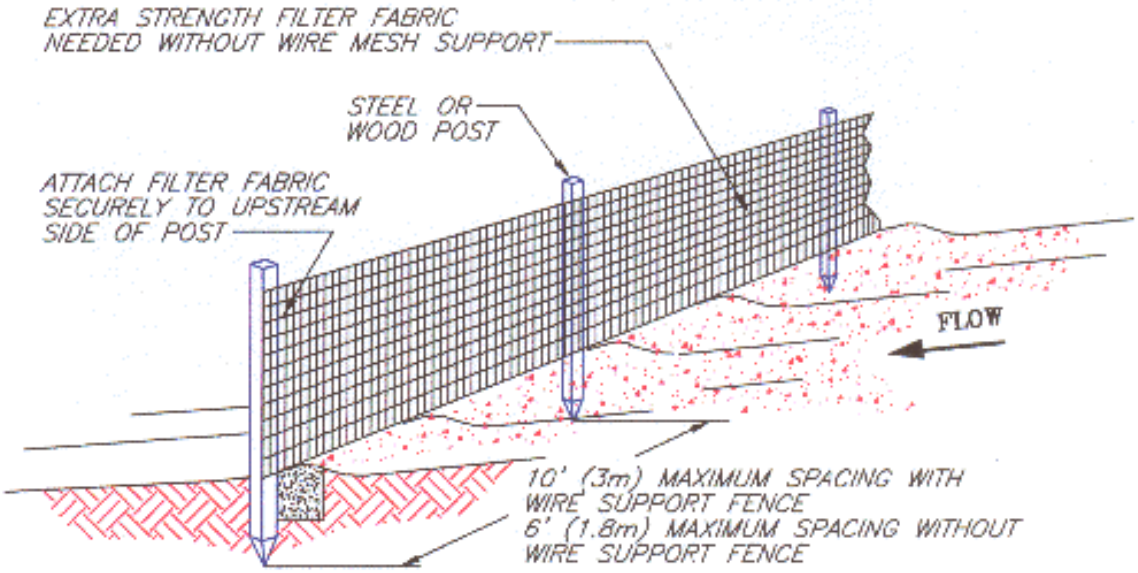
BMP MAINTENANCE

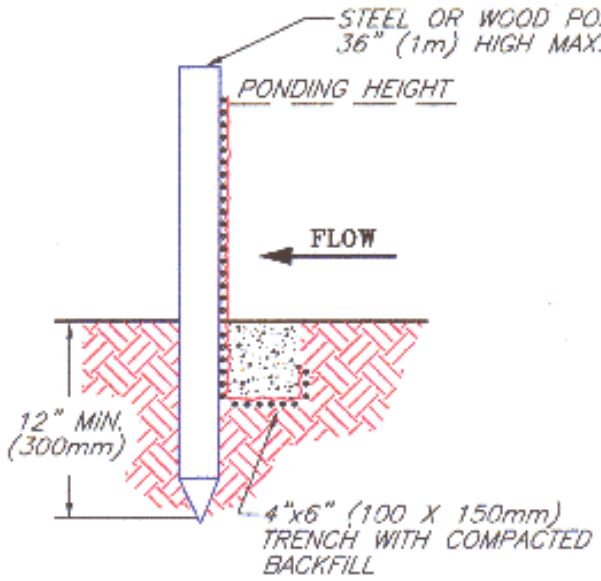
- During construction, inspect daily during the workweek. Schedule additional inspections during storm events. Make any required repairs.
- Replace damaged sections.
- Remove sediment when deposits reach ½ the height of the silt fence.

BMP REMOVAL

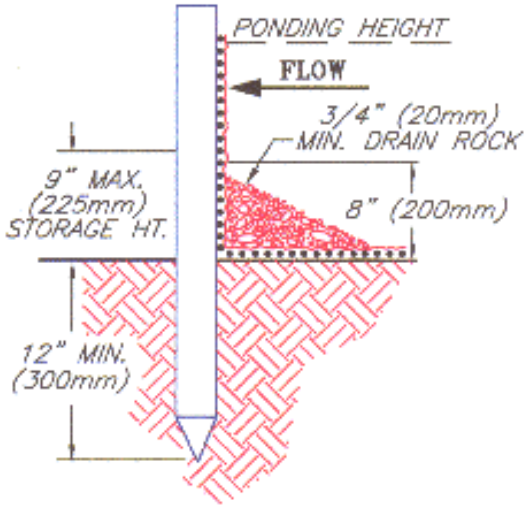
- Evaluate site to determine when BMP is no longer needed.
- Remove sediment buildup in front of BMP.

- Remove BMP, recycle and/or re-use if applicable.
- Revegetate area disturbed by BMP removal.





TRENCH DETAIL



INSTALLATION WITHOUT TRENCHING

NOTES:

1. SILT FENCE SHALL BE PLACED ON SLOPE CONTOURS TO MAXIMIZE PONDING EFFICIENCY.

2. INSPECT AND REPAIR FENCE AFTER EACH STORM EVENT AND REMOVE SEDIMENT WHEN NECESSARY. 9" (225mm) MAXIMUM RECOMMENDED STORAGE HEIGHT.

3. REMOVED SEDIMENT SHALL BE DEPOSITED TO AN AREA THAT WILL NOT CONTRIBUTE SEDIMENT OFF-SITE AND CAN BE PERMANENTLY STABILIZED.

NOT TO SCALE

SILT FENCE

FILE: SILTFENC

© 1994 JOHN McCULLAH

BMP: SC-3

STRAW ROLL, STRAW LOG, COIR LOG

DESCRIPTION

Straw rolls/logs are manufactured from straw wrapped in netting. Coir logs are similar, but are filled with coconut fiber rather than straw. As an alternative, compostable filter socks/berms comprised of natural fibers and other bio-based materials, may be used in lieu of straw rolls/logs or coir logs. The logs or berms are placed and staked in shallow trenches along the contour of newly constructed or disturbed slopes. They can be used to provide perimeter protection, settling, reduction in water velocity/erosive forces and habitat protection.

APPLICATIONS

The BMP may be used for temporary soil stockpile protection; protection of storm drains, gutters, and drainage courses; temporary check dams; bank or slope stabilization; and streambank toe protection. This BMP may be used for perimeter sediment control, and is preferred over silt fencing and straw bales. It may also be used to replace missing sections of earthen berms (example: above new ditch relief culverts).

Straw rolls/logs should be manufactured of rice straw or a sterile (non-seed bearing) straw to prevent the introduction of non-native grasses. Polypropylene or coir netting is preferred over plastic netting. Compostable filter socks/berms should be manufactured of recycled, bio-based, and natural materials.

LIMITATIONS

This BMP should not be used:

- where flow volume or water velocity inhibit its usefulness.

CONSTRUCTION GUIDELINES

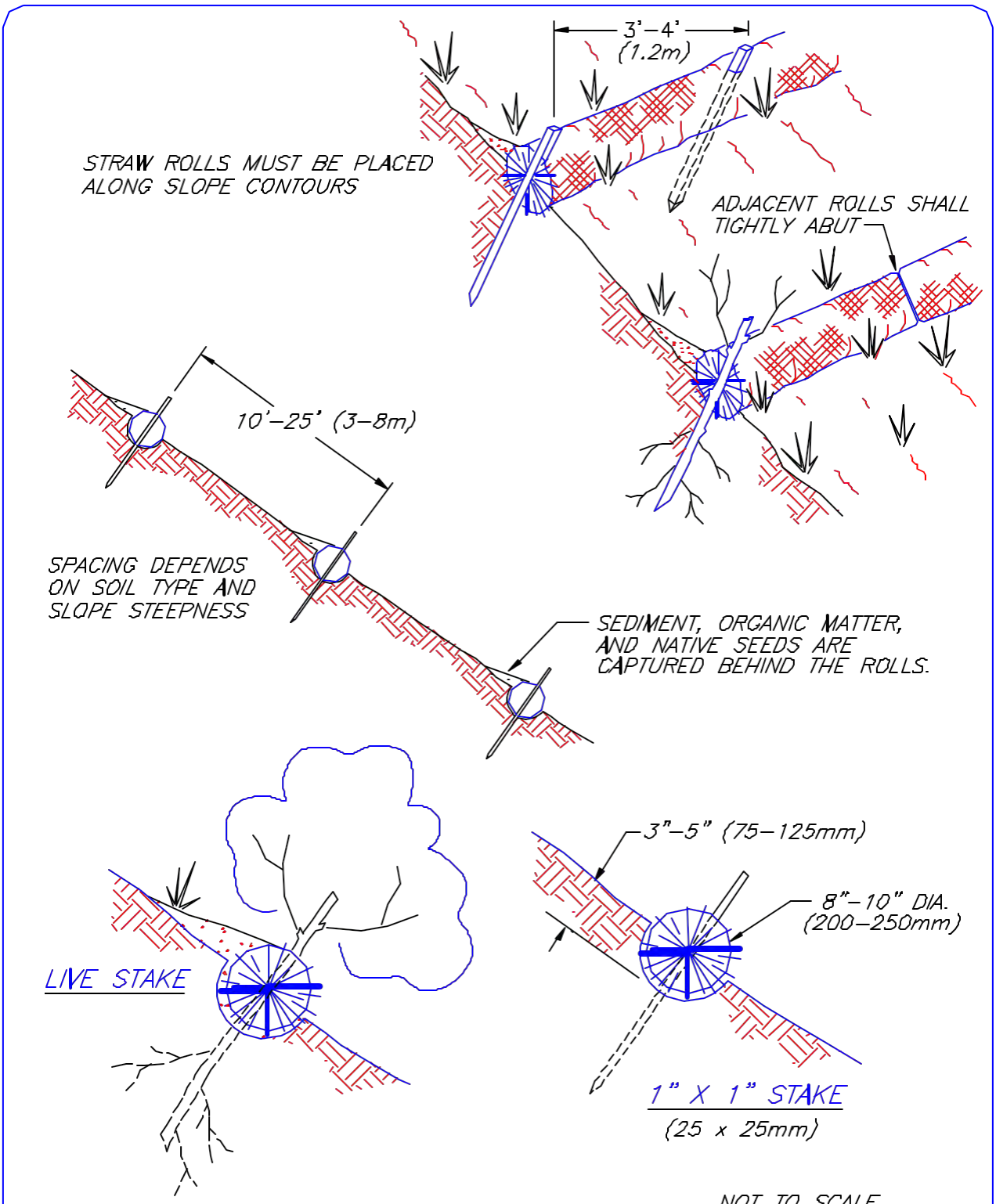
1) Logs are placed in 2- to 3- inch deep trenches and staked along the contours of newly constructed or disturbed slopes.
2) Log spacing depends on soil type and slope steepness.
3) Adjacent logs shall be tightly abutted to prevent water flow and gully formation between logs.
4) Ensure that logs are in contact with the ground in the trenches to prevent water flow under logs.
5) Live staking may be used in conjunction with logs.

BMP MAINTENANCE

- During construction, inspect daily during the work week.
- Schedule additional inspections during storm events.
- Make any required repairs immediately.
- For perimeter control installations (securing spoils, etc.), remove sediment deposits when they reach ½ the height of the log/roll.

BMP REMOVAL

- Remove sediment buildup in front of BMP.
- Revegetation of the site may be necessary.
- Dispose of netting properly. Straw or coir filling may be used as mulch.
- BMP removal may not be necessary.



NOT TO SCALE

NOTE:

1. STRAW ROLL INSTALLATION REQUIRES THE PLACEMENT AND SECURE STAKING OF THE ROLL IN A TRENCH, 3"-5" (75-125mm) DEEP, DUG ON CONTOUR. RUNOFF MUST NOT BE ALLOWED TO RUN UNDER OR AROUND ROLL.

STRAW ROLLS

© 1998 JOHN McCULLAH

FILE: STRWROLL

BMP: SC-4

INLET PROTECTION

DESCRIPTION

Inlet protection may be achieved by using temporary barriers typically constructed from silt fences, gravel filled sandbags, and other proprietary barriers such as geotextile inserts, biofilter bags, or compost socks.

APPLICATIONS

Inlet sediment barriers are intended to prevent and reduce the sediment discharged into storm drains by ponding the runoff and allowing the sediment to settle out. The structures allow for overflow from high runoff events, and some devices allow the ponds to dewater rapidly. Inlet sediment barriers should be used where new construction, maintenance, reconstruction and/or where private development has potential for generating sediment or polluted runoff. Inlet sediment barriers may be comprised of sandbags, straw rolls/logs, or compostable filter socks comprised of natural fibers or other bio-based materials. See BMP-3 (Straw Roll, Straw Log, Coir Log) for additional detail regarding installation guidelines for the straw rolls/logs method. Temporary geotextile storm drain inserts may also be inserted underneath storm drain grates to capture and filter stormwater.

LIMITATIONS

- Do not use this BMP on steep sloping streets.
- Consider this BMP a “backup,” used in addition to controlling potential erosion at the source.
- Drainage area should not exceed 1 acre.
- Do not use straw bales for inlet protection.
- Requires an adequate area for water to pond without encroaching into portions of the roadway subject to traffic.
- Sediment removal may be inadequate to prevent sediment discharges in high flow conditions or if runoff is heavily sediment laden. If high flow conditions are expected, use other onsite sediment trapping techniques in conjunction with inlet protection.

DESIGN AND LAYOUT

The following design and layout considerations are based on guidance provided in the California Stormwater BMP Handbook Construction (CASQA 2015).

1) Identify existing and planned storm drain inlets that have the potential to receive sediment-laden surface runoff. Determine if drain inlet protection is needed and which method to use.

- Determine where runoff that is directed toward the inlet to be protected will pond or be diverted as a result of installing the protection device.
- Determine the extent of potential runoff diversion caused by the storm drain inlet protection device. Runoff ponded by inlet protection devices may flow around the devices and towards the next downstream inlet. In some cases, this is acceptable and in other cases, this could cause erosion or downstream property damage. The possibility of runoff diversions will influence whether or not storm drain inlet protection is suitable; and, if suitable, the type and design of the device.

2) The location and extent of ponding, and the extent of the diversion, can usually be controlled through appropriate placement of the inlet protection device. In some cases, moving the inlet protection device a short distance upstream of the inlet can provide more efficient sediment control, limit ponding to desired areas.
3) Seven types of inlet protection are presented below. However, it is recognized that other effective methods and proprietary devices exist and may be selected.
   - Silt fence: appropriate for drainage basins with less than a 5% slope, sheet flows, and flows under 0.5 cfs.
   - Excavated drop inlet sediment trap: an excavated area around the inlet to trap sediment.
   - Gravel bag barrier: Used to create a small sediment trap upstream of inlets on sloped, paved streets. Appropriate for sheet flow or when concentrated flow may exceed 0.5 cfs, and where overtopping is required to prevent flooding.
   - Block and gravel filter: appropriate for flows greater than 0.5 cfs.
   - Temporary geotextile storm drain inserts: different products provide different features. Refer to manufacturer details for targeted pollutants and additional features.
   - Biofilter bag barrier: Used to create a small retention area upstream of inlets and can be located on pavement or soil. These bags slowly filter runoff allowing sediment to settle out. Appropriate for flows under 0.5 cfs.
   - Compost socks: allow filtered runoff to pass through the compost while retaining sediment and potentially other pollutants. Appropriate for flows under 1.0 cfs.
4) Select the appropriate type of inlet protection and design as referred to or as described below.
5) Provide sufficient area around the inlet for water to pond without flooding structures and property.
6) Grates and spaces around all inlets should be sealed to prevent seepage of sediment-laden water.
7) Excavate sediment sumps (where needed) 1 to 2 feet with 2:1 side slopes around the inlet.

CONSTRUCTION GUIDELINES

The following construction guidelines are based on those provided in the California Stormwater BMP Handbook (CASQA 2015).

Silt Fence (DI Protection Type 1): Do not place fabric underneath the inlet grate since the collected sediment may fall into the drain inlet when the fabric is removed or replaced and water flow through the grate will be blocked resulting in flooding.

1) Excavate a trench approximately 6 inches (in.) wide and 6 in. deep along the line of the silt fence inlet protection device.
2) Place 2 in. by 2 in. wooden stakes around the perimeter of the inlet a maximum of 3 ft apart and drive them at least 18 in. into the ground or 12 in. below the bottom of the trench. The stakes should be at least 48 in.
3) Lay fabric along bottom of trench, up side of trench, and them up stakes. The maximum silt fence height around the inlet should be 24 in.
4) Staple the filter fabric to wooden stakes. Use heavy-duty wire stapes at least 1 in. in length.
5) Backfill the trench with gravel or compacted earth all the way around.

Excavated Drop Inlet Sediment Trap (DI Protection Type 2): Install filter fabric fence in accordance with the guidelines described above for silt fencing. Size excavated trap to provide a minimum storage capacity calculated at the rate 67 yd3/acre of drainage area. See typical Type 2 installation details at the end of this fact sheet.

Gravel Bag (DI Protection Type 3): Flow from a severe storm should not overtop the curb. In areas of high clay and silts, use filter fabric and gravel as additional filter media. Construct gravel bags in accordance with BMP SC-1 (Sandbags and Gravel Bags). Gravel bags should be used due to their high permeability. See typical Type 3 installation details at the end of this fact sheet.

1) Construct on gently sloping street.
2) Leave room upstream of barrier for water to pond and sediment to settle.
3) Place several layers of gravel bags – overlapping the bags and packing them tightly together.
4) Leave gap of one bag on the top row to serve as a spillway. Flow from a severe storm (e.g., 10 year storm) should not overtop the curb.

Block and Gravel Filter (DI Protection Type 4): Block and gravel filters are suitable for curb inlets commonly used in residential, commercial, and industrial construction. See typical Type 4 installation details at the end of this fact sheet.

1) Place hardware cloth or comparable wire mesh with 0.5 in. openings over the drop inlet so that the wire extends a minimum of 1 ft beyond each side of the inlet structure. If more than one strip is necessary, overlap the strips. Place woven geotextile over the wire mesh.
2) Place concrete blocks lengthwise on their sides in a single row around the perimeter of the inlet, so that the open ends face outward, not upward. The ends of adjacent blocks should abut. The height of the barrier can be varied, depending on design needs, by stacking combinations of blocks that are 4 in., 8 in., and 12 in. wide. The row of blocks should be at least 12 in. but no greater than 24 in. high.

3) Place wire mesh over the outside vertical face (open end) of the concrete blocks to prevent stone from being washed through the blocks. Use hardware cloth or comparable wire mesh with 0.5 in. opening.
4) Pile washed stone against the wire mesh to the top of the blocks. Use 0.75 to 3 in.

Temporary Geotextile Insert (DI Protection Type 5): Many types of temporary inserts are available. Most inserts fit underneath the grate of a drop inlet or inside of a curb inlet and are fastened to the outside of the grate or curb. These inserts are removable and many can be cleaned and reused. Installation of these inserts differs between manufacturers. Please refer to manufacturer instruction for installation of proprietary devices.

Biofilter bags (DI Protection Type 6): Biofilter bags may be used as a substitute for gravel bags in low-flow situations. These consist of a plastic mesh bag filled with recycled wood product waste and are generally an effective short-term solution for preventing runoff from flowing into inlets.

1) Construct in a gently sloping area.
2) Biofilter bags should be placed around inlets to intercept runoff flows.
3) All bag joints should overlap by 6 in.
4) Leave room upstream for water to pond and for sediment to settle out.
5) Stake bags to the ground as described in the following detail. Stakes may be omitted if bags are placed on a paved surface.

Compost Socks (DI Protection Type 7): A compost sock can be assembled on site by filling a mesh sock (e.g., with a pneumatic blower). Compost socks do not require special trenching compared to other sediment control methods (e.g., silt fence).

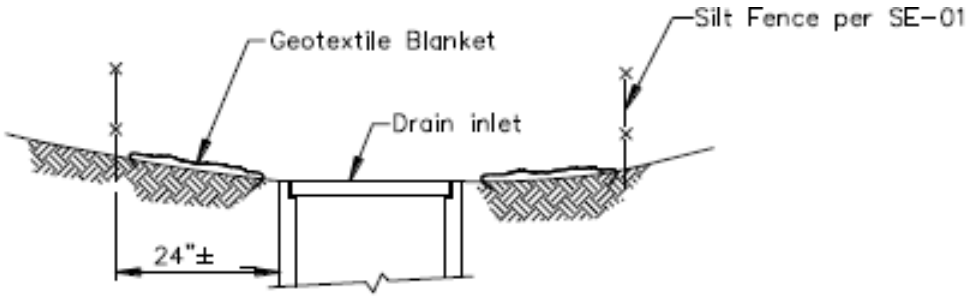
BMP MAINTENANCE

- Inspect and clean barrier during and after each significant storm and remove sediment from behind sandbag structure after every storm.
- Silt fences: If the fabric becomes clogged, torn or degrades, it should be replaced. Make sure the stakes are securely driven in the ground and are in good shape (i.e., not bent, cracked, or splintered, and are reasonably perpendicular to the ground). Replace damaged stakes. At a minimum, remove the sediment behind the fabric fence when accumulation reaches one-third the height of the fence or barrier height.
- Gravel Filters. If the gravel becomes clogged with sediment, it should be carefully removed from the inlet and either cleaned or replaced. Since cleaning gravel at a construction site may be difficult, consider using the sediment-laden stone as fill material and put fresh stone around the inlet. Inspect bags for holes, gashes, and snags, and replace bags as needed. Check gravel bags for proper arrangement and displacement.

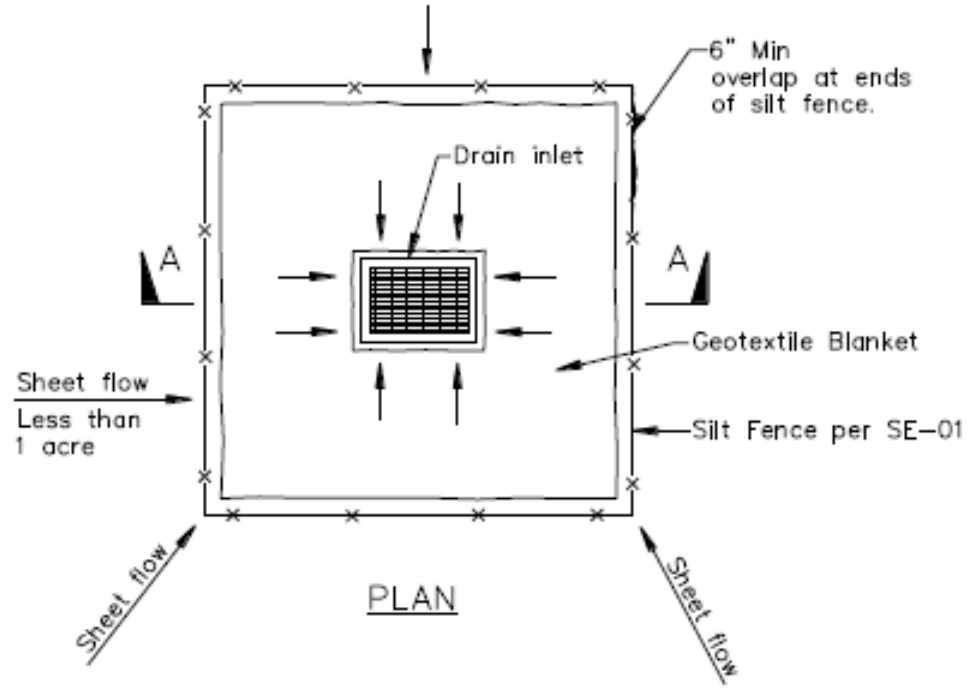
- Any sediment and gravel shall be immediately removed from the traveled way of roads.
- The removed sediment shall be placed where it cannot enter a storm drain, stream, or be transported off site.
- If the gravel becomes clogged with sediment, it must be carefully removed from the inlet and either cleared or replaced.
- Geotextile Insert Devices: Inspect and maintain temporary geotextile insert devices according to manufacturer's specifications.

BMP REMOVAL

- Remove storm drain inlet protection once the drain area is stabilized. Clean and regrade area around the inlet and clean the inside of the storm drain inlet, as it should be free of sediment and debris at the time of final inspection.



SECTION A–A

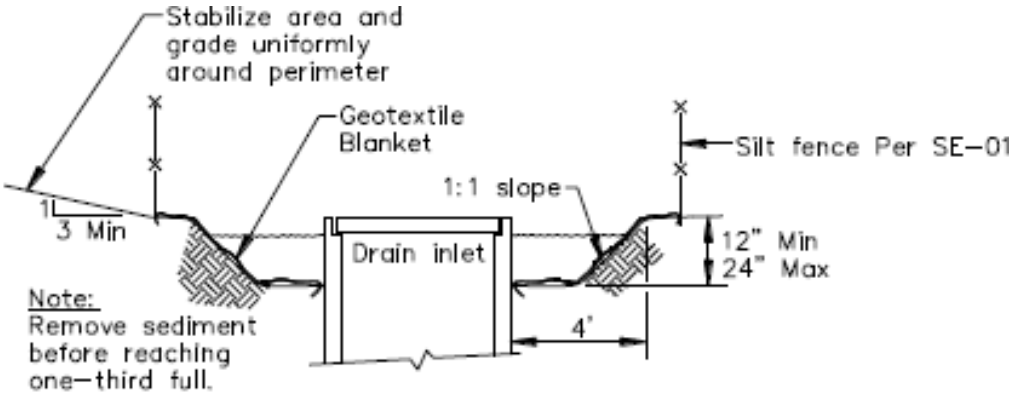


PLAN

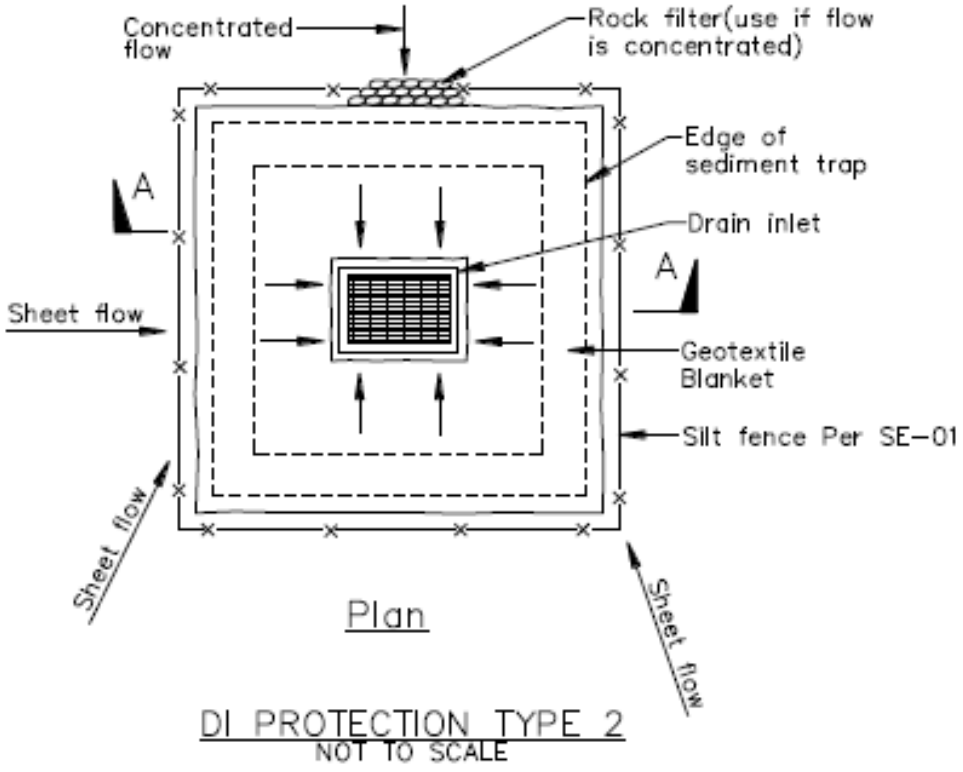
DI PROTECTION TYPE 1
NOT TO SCALE

NOTES:

1. For use in areas where grading has been completed and final soil stabilization and seeding are pending.
2. Not applicable in paved areas.
3. Not applicable with concentrated flows.



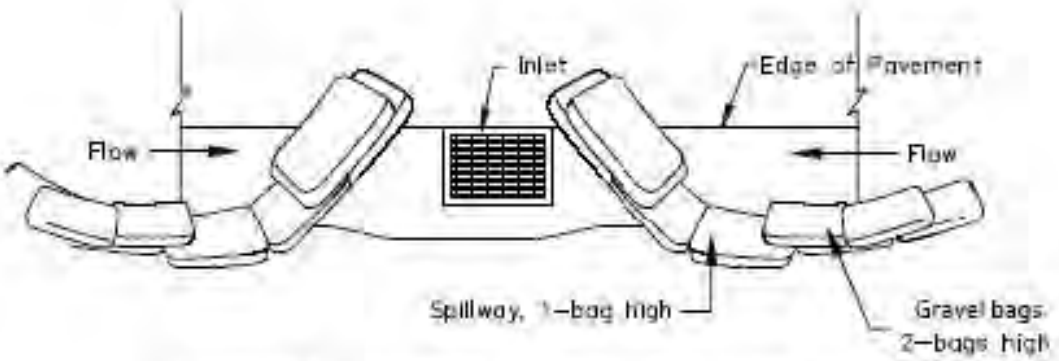
Section A–A



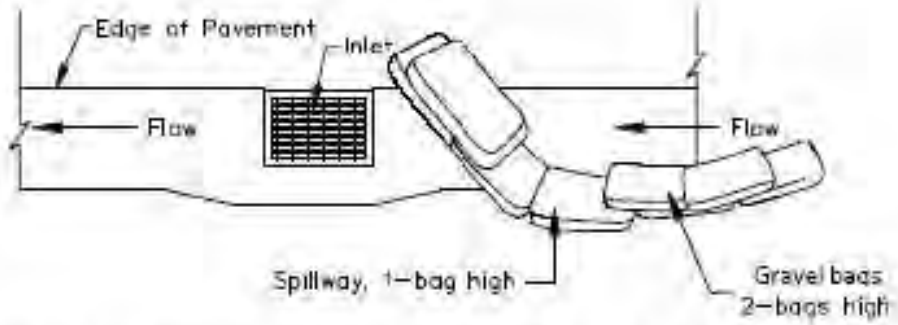
Plan

DI PROTECTION TYPE 2
NOT TO SCALE

Notes
1. For use in cleared and grubbed and in graded areas.
2. Shape basin so that longest inflow area faces longest length of trap.
3. For concentrated flows, shape basin in 2:1 ratio with length oriented towards direction of flow.



TYPICAL PROTECTION FOR INLET ON SUMP



TYPICAL PROTECTION FOR INLET ON GRADE

NOTES:

1. Intended for short-term use.
2. Use to inhibit non-storm water flow.
3. Allow for proper maintenance and cleanup.
4. Bags must be removed after adjacent operation is completed.
5. Not applicable in areas with high silts and clays without filter fabric.
6. Protection can be effective even if it is not immediately adjacent to the inlet provided that the inlet is protected from potential sources of pollution.

DI PROTECTION TYPE 3
NOT TO SCALE

BMP: SC-6

DIVERSION BERM

DESCRIPTION

A diversion berm is a temporary ridge of compacted soil or aggregate base material, sandbags or continuous bag berm constructed at the top or base of a disturbed slope. A diversion berm may also consist of a ridge of asphalt concrete or “cutback” constructed at the top of a disturbed slope. The purpose of the BMP is direct stormwater runoff away from an unstable slope.

APPLICATIONS

This BMP may be used wherever stormwater runoff must be temporarily diverted away from a disturbed slope and toward a sediment containment facility or stable runoff.

LIMITATIONS

This is not a routine maintenance BMP. This BMP should not be used:

- in fast flowing water.
- as a replacement for failing roadway shoulders.
- as slide debris storage within 150’ of any water body.

Asphalt berms shall not be used:

- to concentrate runoff onto unstable, eroded areas.
- near edges of slides or streambanks where cutback berms could slip into a stream.

CONSTRUCTION GUIDELINES

- Berm material should be adequately compacted to prevent failure.
- Temporary seeding and mulch shall be applied to all surfaces of a soil diversion berm according to the “Timing of Work” BMP.
- For asphalt berms, construct the berm to the minimum height and width needed to divert runoff without adding unnecessary weight.
- Asphalt berms may be striped or marked for traffic safety.
- Asphalt berms may be used to anchor temporary plastic sheeting.

BMP MAINTENANCE

- Periodic inspection should be conducted, and berms repaired as necessary.

BMP REMOVAL

- Evaluate site to determine BMP is no longer needed (the area has stabilized – potential of sediment laden water exiting the area has passed).
- Remove sediment buildup.
- Remove BMP – recycle and/or re-use if applicable.
- Revegetate area disturbed by BMP removal if applicable.
- Asphalt berm removal may not be necessary, or may be conducted during permanent slope or streambank repair activities.
- Recycle or reuse asphalt berm material.

BMP: DW-1

COFFERDAM OR CLEAN WATER BYPASS INSTALLATION METHODS FOR CHANNEL DEWATERING

DESCRIPTION

When work in flowing streams is unavoidable, streamflow shall be diverted around work areas by either installing cofferdams and/or clean water bypass systems.

A cofferdam is a temporary structure built into a waterway to enclose a construction area and reduce sediment pollution from construction work in or adjacent to water. Cofferdams may be made of rock, gravel bags, wood or aqua barriers. They may also be composed of inflatable rubber material.

A clean water bypass enables operators or maintenance workers to transport surface or subsurface flows around a construction area without adding significant amounts of turbidity or sediment. Clean water bypasses are typically used for short-term diversion of small amounts of water over short distances to enable dewatering of minor construction or repair sites. Depending on site conditions of the work area, clean water bypasses may be either gravity driven or require use of a pump to divert water around a construction area.

APPLICATIONS AND DESIGN CONSIDERATIONS

Clean water bypasses may be used to divert low flow volumes away from culvert replacements/installations, bridge and headwall repairs, bank stabilization projects, or other in-stream maintenance activities. Clean water bypasses may not be used in active streams or tributaries inhabited by anadromous fishes (i.e., Gazos, Pescadero, Butano, Alpine, etc.) at migration times. Cofferdams may be used on similar projects listed above and may be used in combination with clean water bypasses and/or pumps.

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. Dewatering will be conducted per the detailed concept included below or per the site-specific dewatering plan reviewed by the appropriate regulatory agencies. The area to be dewatered shall encompass the minimum area necessary to avoid impacts to waters of the U.S./state in order to perform the maintenance activity. The period of dewatering should 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.

LIMITATIONS

Do not use this BMP:

- in deep water unless designed or reviewed by the Project Engineer, or
- to completely dam stream flows.

CONSTRUCTION GUIDELINES

1) When used in watercourses or streams, cofferdams and clean water bypasses must be used in accordance with permit requirements. Materials for cofferdams should be selected based on ease of maintenance and complete removal following construction activities.
2) Where feasible and appropriate, dewatering shall occur via gravity driven systems.
3) Cofferdams shall be installed both upstream and downstream not more than 100 feet from the extent of the work areas.
4) Instream cofferdams shall only be built from materials such as clean gravel or rubber bladders which cause little or no siltation or turbidity. No earthen fill shall be used to construct the cofferdam. Plastic sheeting (e.g., visqueen) shall be placed over bags filled with clean gravel to minimize water seepage into the maintenance areas. The plastic sheets shall be firmly anchored to the streambed to minimize water seepage. If necessary, the footing of the cofferdam shall be keyed into the channel bed at an appropriate depth to capture the majority of subsurface flow needed to dewater the streambed.
5) Stream flows shall be allowed to gravity flow around or through the work site using temporary bypass pipes. Bypass pipe diameter shall be sized to convey, at a minimum, the 2-year, 24-hour design storm, or anticipated high-flow conditions if applicable. This is shown as ‘Diversion A (through work area)’ on the Dewatering Plan – Sheet 1.
6) When gravity-based dewatering is not feasible, stream flow shall be pumped around the work site. This is shown as ‘Diversion B (around work area)’ on the Dewatering Plan – Sheet 1.
7) All dewatering/diversion methods shall be installed such that natural flow is maintained upstream and downstream of the Project area.
8) Any temporary dams or diversions shall be installed such that the diversion does not cause sedimentation, siltation, or erosion upstream or downstream of the project area.

IMPLEMENTATION PROCEDURES

1) A qualified biologist shall 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 shall be surveyed by a qualified biologist. If sensitive species are observed: a

relocation effort will be led by a qualified biologist, the stream channel will be blocked with fish mesh above and below the work area (mesh will be no greater than 3.1 mm), and pumps will be screened. During cofferdam installation, the downstream cofferdam shall be installed first. Most of the upstream cofferdam, with the exception of an opening large enough for fish passage, shall then be constructed. Then, qualified biologists shall 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 shall 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 work area to support fish, but sufficient water is present downstream from the work area, then the process shall 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 work area, the biologist shall capture fish within the project area, using seines, dip nets, or electrofishing, and relocate the fish to suitable habitat within another reach of a particular creek (the relocation site to be determined in consultation with NMFS, USFWS, and/or CDFW as applicable).

2) Diverted water shall be protected from maintenance activity-related pollutants, such as soils or equipment lubricants or fuels.
3) If a pump is required to route water around the work area, the pump inlets shall be outfitted with appropriate screens that meet CDFW and NMFS criteria to prevent entrainment of fish and other sensitive aquatic organisms. Ensure that BMP 9 (Vehicle Maintenance & Parking) and BMP 10 (Equipment Maintenance & Fueling) are also implemented to ensure that fuels are properly contained near waterways and proper containment is provided during vehicle maintenance and cleaning activities. A back-up plan should also be developed and implemented in the event that the pump fails.
4) For full channel dewatering, pumped water shall be pre-filtered with a gravel pack and/or perforated pipe around sumps for subsurface flows and a silt fence around pumps for surface flow, or as otherwise directed by the Project Engineer, 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 shall be implemented such as a larger settling basin or additional filtration. If increases in turbidity persist, the County's Project Manager shall be alerted, and turbidity reduction measurements implemented immediately.
5) If necessary, discharged water shall pass over some form of energy dissipation to prevent downstream erosion and increased turbidity. Energy dissipation and turbidity reduction methods may include the following: settling basin, settling tank, upland vegetated area, dewatering silt bags, gravel bags, or other energy dissipation device. Sediment control, such as natural fiber straw wattles, will be placed downstream during the installation and removal of BMPs to ensure there is not a significant increase in sediment.

BMP MAINTENANCE

- Inspect during the construction of the system to ensure there is not an increase in turbidity. Should turbidity increase during cofferdam installation, a turbidity curtain or some other method will be installed downstream of the lower cofferdam. An inspection and assessment action plan will be utilized:
    - Ensure that bypass pump(s) can handle incoming flows, especially after precipitation.
    - Inspect flow barriers (dams, berms, etc.) at the start and end of each work day and if excess water is observed in work areas that are supposed to be dry. Inspect for leakage and repair.
    - Inspect diversion channels for signs of erosion, and repair or replace lining as necessary.
    - Inspect pumped and piped diversions to ensure flow is adequately diverted. Inspect for leakage and repair as necessary.
    - Inspect the diversion path for erosion and repair any damages with rock, gravel, or other appropriate methods.
    - Inspect the diversion discharge point for erosion and repair as necessary.
    - Inspect dewatering device(s) and ensure that discharge is not sediment laden. Check for buildup of sediment and debris and remove as needed.

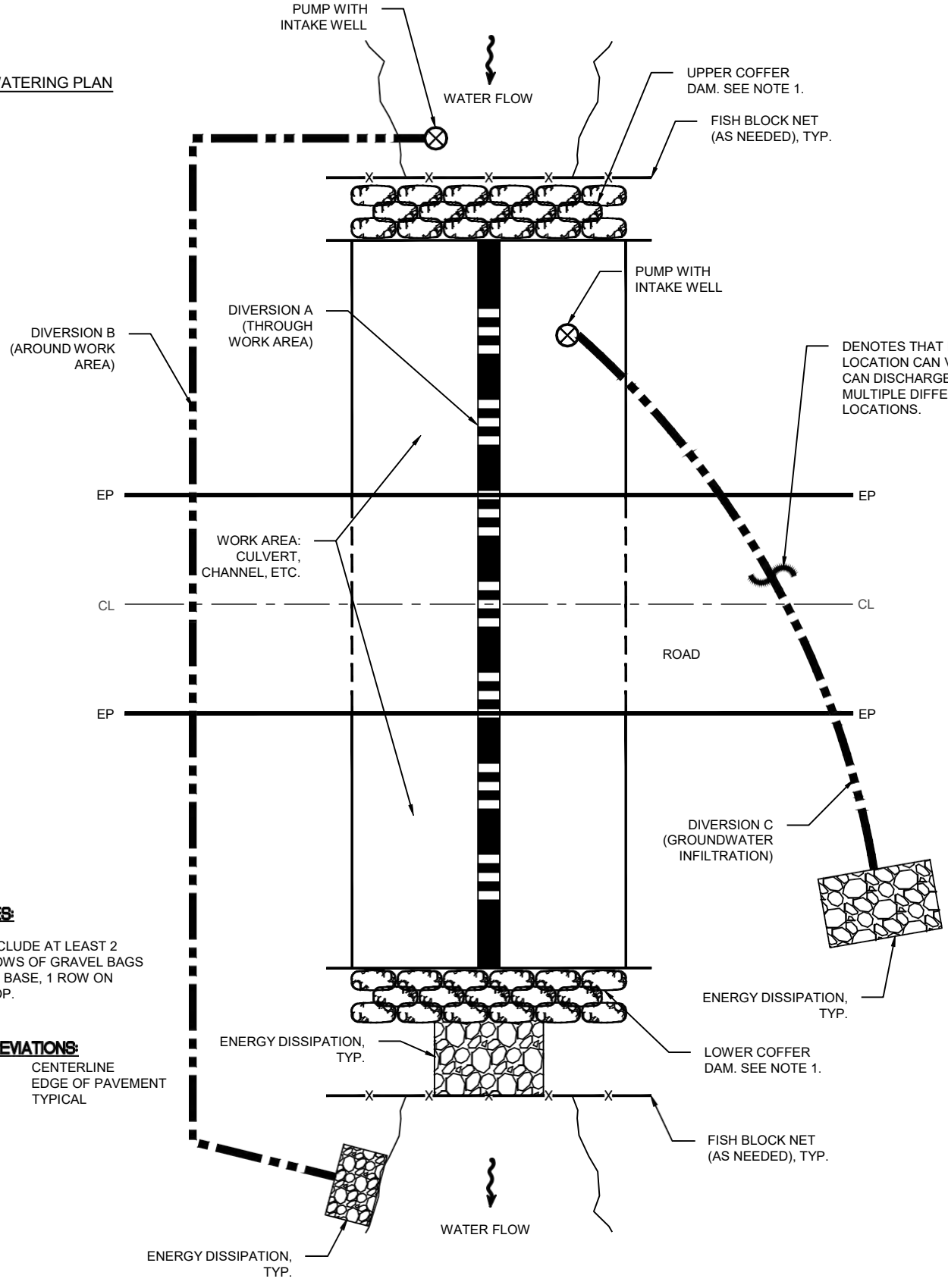
- During construction, inspect daily during the work week to observe the condition of the system. If the capacity of the system needs to be increased, consult with the Project Engineer for appropriate re-sizing.
- Schedule additional inspections during storm events. If an increase in turbidity is observed, work shall halt immediately.
- Immediately repair any gaps, holes or scour.
- Block nets shall be maintained throughout construction. Maintenance includes periodic removal of accumulated debris, as necessary to ensure function.

BMP REMOVAL

- When in-stream maintenance is completed, the flow diversion structure shall be removed as soon as possible. Impounded water shall be released at a reduced velocity to minimize erosion, turbidity, or harm to downstream habitat. Cofferdams shall 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 shall be directed into the low-flow channel within the work site to minimize downstream water quality impacts.
- The area disturbed by flow bypass mechanisms shall be restored at the completion of the project. This may include, but is not limited to, recontouring the area and planting of riparian vegetation.
- If the County is unable to complete work and remove the system by the stop-work deadline, coordination with the agencies will take place during the permit extension request.

- A contingency plan describing what the County will do should a flow event occur that exceeds the capacity of the system shall be developed. The plan should address at least the following:
    - Descriptions of the measures the County will take (e.g., increase the capacity of the system, demobilize and stabilize the construction site and remove the system, etc.);
    - The length of time it will take the County to enact the above measures.

DEWATERING PLAN



NOTES:

1. INCLUDE AT LEAST 2 ROWS OF GRAVEL BAGS AT BASE, 1 ROW ON TOP.

ABBREVIATIONS:

CL	CENTERLINE
EP	EDGE OF PAVEMENT
TYP	TYPICAL

FILENAME: F:\USERS\DESIGN\C3D\RMP EXHIBITS\DWG\RMP EXHIBITS.DWG

DESIGNED BY: JC	DEWATERING PLAN - SHEET 1	SCALE: NONE
CHECKED BY: AL/JC	COUNTY OF SAN MATEO	DATE: 04-14-2023
DRAWN BY: ADG	ROUTINE MAINTENANCE PROGRAM	FILE NO: NONE

ANN M. STILLMAN, DIRECTOR OF PUBLIC WORKS
COUNTY

555 COUNTY CENTER, 5TH FLOOR
REDWOOD CITY, CALIFORNIA 1665



Examples of ground stone tools.

County of San Mateo BMPs (cont.)

- Retaining a qualified cultural resources specialist to conduct a review and inventory of locations that involve soil disturbance in natural channels or native soils identified as Highly to Moderately Sensitive for cultural deposits.
- The County may require an archaeologist (and a Native American representative) to be present on-site during ground disturbing activities within areas identified as Highly Sensitive.
- The County will conduct annual cultural resources training sessions prior to commencing ground disturbing activities.

Inadvertent Discovery Procedures

- Stop work if you see something that could be archaeological, such as artifacts or dark soil changes with shellfish remains during excavation, or what might be human remains--or if an archaeological or tribal monitor is present and they ask you to stop work to inspect something.
- Redirect work to areas outside a radius of at least 50-feet from the find.
- Contact the Project Construction Supervisor, RMP Department of Public Works Lead, or RMP Parks Department Lead.
- Treat the archaeological remains with respect.

Inadvertent Discovery Procedures (cont.)

- Begin work again in the area only after clearance has been provided by an archaeologist or Native American representative, as appropriate.

Why Protect Cultural Resources?

Protection of cultural resources is important not only because it is required by law, but also because it is important to our community. Cultural resources are deeply beneficial to people by providing us a sense of continuity, identity, history, and ancestry. By protecting cultural resources, we respect our cultural heritage and preserve our history for future generations. Cultural resources are non-renewable; once they are destroyed, they are lost forever.

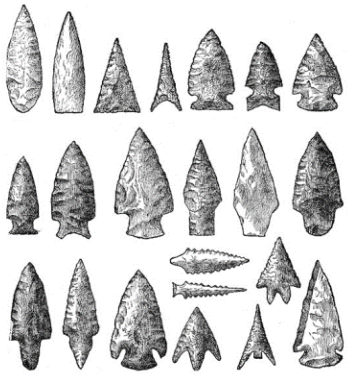
Contact Us

- **RMP Department of Public Works**:
  Julie Casagrande
  jcasagrande@smcgov.org
  (650) 599-1457
- **RMP Parks Department**:
  Evan Cole
  ecole@smcgov.org
  (650) 599-1375
- **Project Construction Supervisor**

COUNTY OF SAN MATEO CALIFORNIA

Cultural Resources

Guide to Identification and Protection Protocols during the Routine Maintenance Program Activities



Examples of prehistoric lithic artifacts.

What is a Cultural Resource?

At the most basic level, cultural resources are anything made by human beings or are associated with the beliefs or activities of human beings. Legislated definitions of significant cultural resources include:

National Historic Preservation Act (NHPA): Any prehistoric or historic district, site, building, structure, or object, including artifacts, records, and remains associated with the resources. The term also includes properties of traditional and cultural importance to a Native American tribe.

California Environmental Quality Act (CEQA): Any object, building, structure site, area place, record, manuscript, or tribal cultural resource significant in the architectural, engineering, scientific, economic, agricultural, educational, social, political, military, or cultural annals of California.

Native American Cultural Resources (most commonly prehistoric material, circa ~12K Years Ago-1770s)

(may include but not limited to):

- Flaked stone tools (arrowheads, knives, etc.).
- Waste flakes that resulted from the manufacture of flaked stone tools.
- Ground stone tools such as mortars and pestles. Layers (strata) of discolored earth resulting from fires.
- Dietary debris (such as animal bone, shellfish, or plant remains).
- Human remains.
- Structural remains, compact soils, wooden beams, poles, or fire hearths.

Euro-American Cultural Resources (historic period, circa ~1770s-1970s)

(may include but are not limited to):

- Glass (from bottles, vessels, windows, etc.). Ceramic (from dinnerware, vessels, etc.).
- Metal (nails, drink/food cans, tobacco tins, industrial parts, etc.).
- Building materials (brick, shingles, nails, etc.). Building remains (foundations, wall, etc.).
- Old wooden posts, pilings, or planks. Trash deposits (garbage heaps or dumps).
- Built Environment resources, such as roads, bridges, structures, and homesteads.



Examples of historic-era artifacts.

CULTURAL RESOURCE REGULATIONS

Federal, state and local regulations exist to protect cultural resources. Mistreatment of cultural resources can result in a misdemeanor or felony offense. Some relevant cultural resource regulations include:

- The NHPA, which requires that Federal agencies consider the effects of their actions on cultural resources.
- CEQA, which requires that effects to cultural resources be considered in the planning process for discretionary projects.

County of San Mateo Internal Best Management Practices (BMPs)

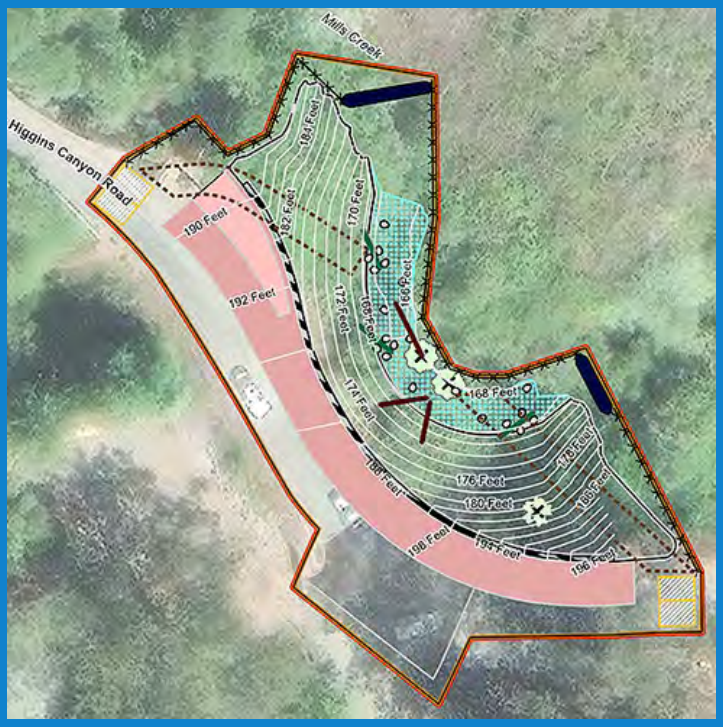
The Routine Maintenance Program (RMP) has Cultural Resource BMPs that are implemented depending on the nature of the maintenance project and the location of the project. Prior to beginning work at a given location, a sensitivity rating will be assigned to each project that may require steps such as:

APPENDIX C2

Preliminary Jurisdictional Delineation Report

Preliminary Jurisdictional Delineation Report for the Slip-Out Repair and Bank Stabilization Near 1780 Higgins Canyon Road Project, San Mateo County, California

SEPTEMBER 2024



PREPARED FOR

County of San Mateo
Department of Public Works

PREPARED BY

SWCA Environmental Consultants

PRELIMINARY JURISDICTIONAL DELINEATION REPORT FOR THE SLIP-OUT REPAIR AND BANK STABILIZATION NEAR 1780 HIGGINS CANYON ROAD PROJECT, SAN MATEO COUNTY, CALIFORNIA

Prepared for

County of San Mateo
Department of Public Works
555 County Center, 5th Floor
Redwood City, California 94063
Attn: Julie Casagrande, Senior Natural Resource Specialist

Prepared by

Erich Schickenberg, Wetland Specialist/Associate Project Botanist

SWCA Environmental Consultants
60 Stone Pine Road, Suite 201
Half Moon Bay, California 94019
(650) 440-4160
www.swca.com

SWCA Project No. 86468

September 2024

EXECUTIVE SUMMARY

SWCA Environmental Consultants (SWCA) was contracted by County of San Mateo Department of Public Works (County) to conduct a preliminary jurisdictional delineation in support of the Slip-Out Repair and Bank Stabilization Near 1780 Higgins Canyon Road Project (project), which consists of road repairs, bank stabilization, and habitat enhancement activities along the southwestern bank of Mills Creek adjacent to Higgins Canyon Road in unincorporated San Mateo County, California. The proposed project activities include approximately 185 linear feet of bank stabilization with a total project footprint of approximately 20,052 square feet.

On May 2, 2024, SWCA conducted a preliminary jurisdictional delineation of waters at the project area in accordance with the *Minimum Standards for Acceptance of Aquatic Resources Delineations* (U.S. Army Corps of Engineers [USACE] 2016). The survey area for the delineation consisted of the project footprint and a 100-foot buffer, totaling approximately 2.71 acres (118,047 square feet).

The survey area contained one potentially jurisdictional feature—a perennial stream and associated riparian habitat, referred to in the *County of San Mateo Routine Maintenance Program Manual* (Montrose Environmental 2023) as Mills Creek. Mills Creek is a perennial stream located along Higgins Canyon Road, approximately 1.32 miles east of California State Route 1, that is a tributary to Arroyo Leon in the Pilarcitos Creek watershed.

The portion of Mills Creek covered by this Preliminary Jurisdictional Delineation Report is located at the southern half of Higgins Canyon Road. Due to the presence of definable bed, banks, and ordinary high-water marks; riparian vegetation; and connectivity to the Pacific Ocean via Arroyo Leon and Pilarcitos Creeks, this watercourse would likely be considered waters of the United States (WOTUS) under the jurisdiction of the USACE and subject to federal Clean Water Act (CWA) regulations, inclusive of Section 401 and state water quality standards under the jurisdiction of the California State Water Resources Control Board (State Water Board)/Regional Water Quality Control Board (RWQCB). In addition, the bed, channel, bank, and adjacent riparian vegetation would likely be subject to California Fish and Game Code Division 2, Chapter 6, Sections 1600 through 1602 under the jurisdiction of the California Department of Fish and Wildlife (CDFW). Lastly, the project occurs within the California Coastal Commission (CCC) boundary and would be subject to California Coastal Act (CCA) and the County of San Mateo Local Coastal Program (LCP) regulations.

The 2.71-acre (118,047-square-foot) survey area contains approximately 1.47 acres (64,033 square feet) of potentially jurisdictional aquatic resources consisting of streambed and riparian non-wetland habitat. This includes approximately 0.13 acre (5,681 square feet) of potentially jurisdictional streambed habitat under the USACE, State Water Board/RWQCB, CDFW, and LCP/CCA and 1.34 acres (58,190 square feet) of potentially jurisdictional riparian non-wetland habitat under the State Water Board/RWQCB, CDFW, and LCP/CCA. Due to the temporary and permanent impacts to the channel and riparian vegetation, it is anticipated that the project will need to obtain federal CWA permits from the USACE and State Water Board/RWQCB, a Lake or Streambed Alteration Agreement from the CDFW, and a Coastal Development Permit from the County prior to implementing the project.

The findings in this report should be considered preliminary. Areas of potential jurisdiction are subject to final verification and approval by the regulatory agencies (i.e., USACE, State Water Board/RWQCB, CDFW, and CCC) and will be confirmed during the permitting phase of the project. This preliminary jurisdictional delineation report was prepared in accordance with the *Minimum Standards for Acceptance of Aquatic Resources Delineation Reports* (USACE 2016) to facilitate the County's efforts to avoid or minimize impacts to aquatic resources during the project design and in preparation for permit applications.

CONTENTS

Executive Summary i

1 Introduction 1

2 Contact Information 1

3 Location 2

4 Regulatory Setting 2

4.1 Clean Water Act Section 404 / U.S. Army Corps of Engineers 2

4.2 Clean Water Act Section 401 and Porter-Cologne Water Quality Control Act / Regional Water Quality Control Board 4

4.3 California Fish and Game Code Section 1602 / California Department of Fish and Wildlife 4

4.4 California Coastal Act/County of San Mateo Local Coastal Program 5

5 Methods 5

5.1 Delineation of Ordinary High-Water Mark / Top of Bank / Riparian Areas 6

6 Existing Conditions 6

6.1 Applicable Region and Subregions 6

6.2 Land Use 6

6.3 Topography and Hydrology 6

6.3.1 Topography 6

6.3.2 Hydrology 6

6.4 Natural Communities and Other Land Covers 7

6.4.1 Red Alder Forest 7

6.4.2 Coyote Brush Scrub 8

6.4.1 Ruderal/Disturbed 8

6.4.2 Developed 8

6.5 Soils 8

6.6 Climate and Precipitation 10

7 Results 11

8 Summary and Discussion 14

9 Literature Cited 16

Appendices

Appendix A. Site Photographs
Appendix B. Ordinary High Water Mark Delineation Datasheets
Appendic C. Antecedent Precipitation Tool
Appendix D. ORM Upload Sheet

Figures

Figure 1. Survey area location and vicinity map. 3
Figure 2. NWI, NHD, and soils map 9
Figure 3. Delineation results map. 12

Tables

Table 1. Soil Types Present in the Survey Area 10
Table 2. NWI Classifications Within the Survey Area 13
Table 3. Preliminary Jurisdictional Waters Totals in the Survey Area 13
Table 4. Preliminary Jurisdictional Waters in the Survey Area and Impact Area 15

1 INTRODUCTION

SWCA Environmental Consultants (SWCA) was contracted by the County of San Mateo Department of Public Works (County) to conduct a preliminary jurisdictional delineation in support of the Slip-Out Repair and Bank Stabilization Near 1780 Higgins Canyon Road Project (project), which consists of road repairs, bank stabilization, and habitat enhancement activities along the southwestern bank of Mills Creek adjacent to Higgins Canyon Road in San Mateo County, California. The proposed project activities include approximately 185 linear feet of bank stabilization with a total project footprint of approximately 20,052 square feet.

This Preliminary Jurisdictional Delineation Report presents the results of an assessment of potentially jurisdictional waters for the project and was prepared in accordance with the *Minimum Standards for Acceptance of Aquatic Resources Delineations* (U.S. Army Corps of Engineers [USACE] 2016). This delineation was conducted to determine the extent of the water features within the approximately 2.71-acre (118,047-square-foot) survey area, which consists of the project footprint as well as a 100-foot buffer, that are within the jurisdictions of the following agencies:

- USACE, pursuant to Section 404 of the Clean Water Act (CWA);
- California State Water Resources Control Board (State Water Board)/Regional Water Quality Control Board (RWQCB), pursuant to the Porter-Cologne Water Quality Control Act (Porter-Cologne Act; California Water Code, Chapter 2, Section 13050) and/or Section 401 of the CWA;
- California Department of Fish and Wildlife (CDFW), pursuant to Section 1600 of the California Fish and Game Code; and/or
- County of San Mateo Local Coastal Plan (LCP), pursuant to the California Coastal Act (CCA).

This delineation identified all features within the survey area that meet the definition of waters of the United States (WOTUS) and/or waters of the state or qualify as jurisdictional under the LCP. This report will facilitate the County's efforts to secure aquatic resources permits for the project and details the survey methods utilized, specific data collected, and survey results.

2 CONTACT INFORMATION

Project Applicant:
County of San Mateo Department of Public Works
Julie Casagrande, Senior Natural Resource Specialist
555 County Center, 5th Floor
Redwood City, California 94063-1665
(650) 559-1457
jcasagrande@smcgov.org

Applicant Agent:
Erich Schickenberg, Wetland Specialist/Associate Project Botanist
SWCA Environmental Consultants
60 Stone Pine Road, Suite 201
Half Moon Bay, California 94019
(650) 440-4160
erich.schickenberg@swca.com

3 LOCATION

The survey area is located outside of the southeastern border of the city of Half Moon Bay on Higgins Canyon Road, approximately 1.32 miles east of California State Route (SR) 1 and 2.25 miles east of the Pacific Ocean in unincorporated San Mateo County, California (Figure 1). The approximate latitude and longitude of the survey area are 37.446078° and −122.404572°, respectively. The project is located in Section 34 of Township 5 South, Range 5 West of the Half Moon Bay, California U.S. Geological Survey (USGS) 7.5-minute quadrangle. The survey area can be accessed from Higgins Canyon Road.

4 REGULATORY SETTING

4.1 Clean Water Act Section 404 / U.S. Army Corps of Engineers

Section 404 of the CWA prohibits the discharge of dredged or fill material into WOTUS without a permit or exemption.

On August 29, 2023, the U.S. Environmental Protection Agency (EPA) and USACE announced a final rule amendment that updated the definition of WOTUS, incorporating the May 25, 2023, U.S. Supreme Court case decision, *Sackett v. Environmental Protection Agency*. This 2023 WOTUS amendment took effect on September 8, 2023, and is applicable to the state of California. WOTUS are defined in 33 Code of Federal Regulations (CFR) 328.3 as follows.

(a) Waters of the United States means:

(1) Waters which are:

(i) Currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide;

(ii) The territorial seas; or

(iii) Interstate waters;

(2) Impoundments of waters otherwise defined as waters of the United States under this definition, other than impoundments of waters identified under paragraph (a)(5) of this section;

(3) Tributaries of waters identified in paragraph (a)(1) or (2) of this section that are relatively permanent, standing or continuously flowing bodies of water;

(4) Wetlands adjacent to the following waters:

(i) Waters identified in paragraph (a)(1) of this section; or

(ii) Relatively permanent, standing or continuously flowing bodies of water identified in paragraph (a)(2) or (a)(3) of this section and with a continuous surface connection to those waters;

(5) Intrastate lakes and ponds not identified in paragraphs (a)(1) through (4) of this section that are relatively permanent, standing or continuously flowing bodies of water with a continuous surface connection to the waters identified in paragraph (a)(1) or (a)(3) of this section.

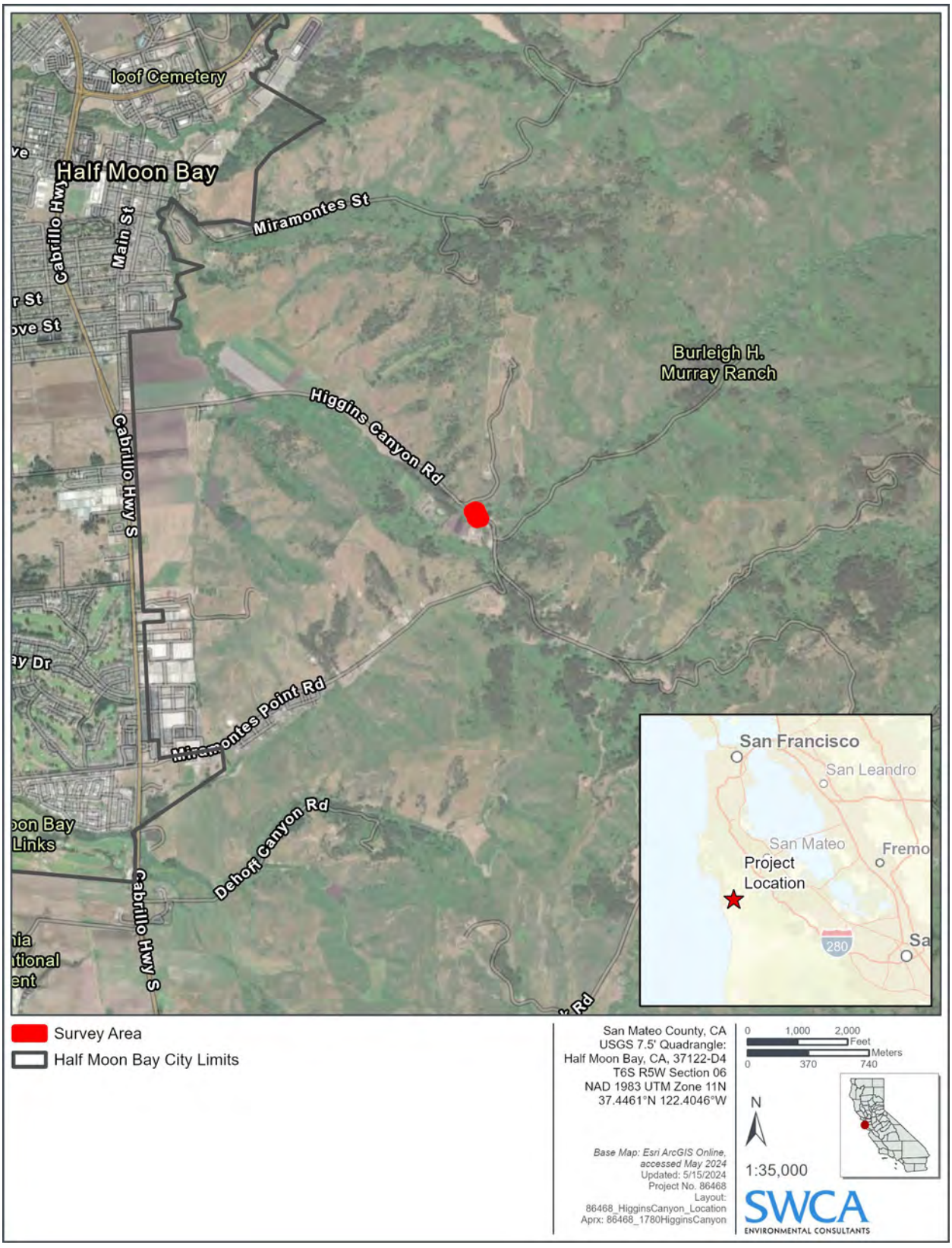


Figure 1**. Survey area location and vicinity map.**

Procedurally and by regulation, wetlands are defined as those areas "that are inundated or saturated by surface or groundwater 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" (33 CFR 328.3(b)). The limit of jurisdiction for WOTUS in the absence of adjacent wetlands or tidal influence extends to the ordinary high-water mark (OHWM) (33 CFR Part 328.4 (c)).

4.2 Clean Water Act Section 401 and Porter-Cologne Water Quality Control Act / Regional Water Quality Control Board

Section 401 of the CWA is implemented by California's RWQCBs and is triggered by CWA Section 404. The RWQCB issues a Water Quality Certification or waiver through the Section 401 process, which requires a proposed project to comply with water quality standards and other conditions of California law. This process includes an evaluation of the effects of the proposed project on both water quality and quantity (runoff). The timing of the USACE and RWQCB application reviews and permit decisions are coordinated, but the Section 401 certification decision is required for USACE to make a permit decision.

Under the Porter-Cologne Act, the various RWQCBs are charged with regulating waters of California, defined as "any surface water or groundwater, including saline waters, within the boundaries of the State." This encompasses all WOTUS and waters of the state not under federal jurisdiction. The discharge of dredged or fill material may constitute a discharge of waste that could affect the quality of waters of the state. In 2019 the State Water Board adopted the *State Wetland Definition and Procedures for Discharges of Dredged or Fill Material to Waters of the State*, which was updated in 2021 as the *State Policy for Water Quality Control: State Wetland Definition and Procedures for Discharges of Dredged or Fill Material to Waters of the State* (State Water Board 2021).

For any activity that could result in the discharge of dredged or fill material into waters of the state, where federal aquatic resource jurisdiction is absent, applicants must file a Waste Discharge Requirement application with the State Water Board (in accordance with 23 California Code of Regulations [CCR] 3855).

For the purposes of this report, RWQCB jurisdiction (i.e., waters of the state) has been interpreted conservatively as including natural streambeds, areas extending from the streambed/thalweg to the outer edge of adjacent riparian vegetation, isolated wetlands or waters that may not be under USACE jurisdiction, artificial ditches (non-agricultural) that could be relocated waters of the state and have become relatively permanent features of the natural landscape, and excavated ponds or other artificial features that collect and/or convey surface water. Based on previous experience with the San Francisco Bay RWQCB, their interpretation of state jurisdiction includes streambanks and riparian areas. Although there is no statewide definition and methodology for determining the limits of waters of the state, the RWQCB typically interprets waters of the state to include all WOTUS and any waters extending out from the OHWM to the riparian dripline.

4.3 California Fish and Game Code Section 1602 / California Department of Fish and Wildlife

Section 1602 of the California Fish and Game Code requires a project that may affect a river, stream, or lake to notify the CDFW before beginning the project. If activities will result in the diversion or obstruction of the natural flow of a stream, or substantially alter its bed, channel, or bank, or adversely affect existing fish and wildlife resources, a Lake or Streambed Alteration Agreement may be required. A

Lake or Streambed Alteration Agreement lists the CDFW conditions of approval relative to the proposed project and serves as an agreement between an applicant and the CDFW for the performance of activities subject to Section 1602. For the purposes of this report, CDFW jurisdiction is interpreted as extending from the streambed to the outer edge of associated riparian vegetation (for both certain natural and anthropogenic drainage features). This interpretation follows guidance from *A Field Guide to Lake and Streambed Alteration Agreements, Sections 1600-1607* (California Department of Fish and Game 1994).

4.4 California Coastal Act/County of San Mateo Local Coastal Program

The CCA of 1976 governs the decisions made by the California Coastal Commission (CCC) (established in 1972) regarding coastal issues, such as shoreline public access and recreation, terrestrial and marine habitat protection, water quality, commercial fisheries, and development within the California Coastal Zone (CCA 30103). Development, as defined in CCA 30106, within the California Coastal Zone would require either a Coastal Development Permit (CDP) or CDP Exemption from the CCC or from a local government with a CCC-certified LCP. The project occurs within the California Coastal Zone and overlaps the LCP planning areas for the County of San Mateo.

In late 1980, the County of San Mateo Board of Supervisors and the CCC approved the County of San Mateo LCP. In April 1981, the County of San Mateo assumed responsibility for implementing the CCA in the unincorporated area of San Mateo County, including issuance of CDPs. All development in the Coastal Zone requires either a CDP or an exemption from CDP requirements. For a permit to be issued, the development must comply with the policies of the LCP and those ordinances adopted to implement the LCP. The project must also comply with other provisions of the County of San Mateo Ordinance Code, such as zoning, building, and health regulations.

The County of San Mateo LCP establishes General Policies 7.1 through 7.14 (Sensitive Habitats), which are applicable to the proposed project and concern the protection of special-status species and sensitive habitats, including freshwater rivers, streams, and the riparian corridor.

5 METHODS

The preliminary jurisdictional determination consisted of a desktop data review followed by a field survey. Prior to the field survey, SWCA reviewed existing information, including aerial imagery, soil survey data (Natural Resources Conservation Service [NRCS] 2024a, 2024b), and National Wetlands Inventory (NWI) maps (U.S. Fish and Wildlife Service [USFWS] 2024).

On May 2, 2024, SWCA wetland biologists Erich Schickenberg and Alec Villanueva conducted a preliminary jurisdictional delineation of the project footprint, as well as a 100-foot buffer (see Figure 1). The project area and associated survey buffer are collectively referred to as the survey area in this report. The delineators used the *National Ordinary High Water Mark Field Delineation Manual for Rivers and Streams – Interim Version* (David et al. 2022) for linear water features containing an OHWM. All vegetation communities within the survey area were classified using the naming conventions of *A Manual of California Vegetation, Second Edition* (Sawyer et al. 2009), when feasible. Plant species were identified using the Jepson eFlora (Jepson Flora Project 2024). The jurisdictional boundaries of the aquatic resources were not mapped according to the *Corps of Engineers Wetlands Delineation Manual* (USACE 1987), as no potential wetlands were found within the survey area.

All potential WOTUS and waters of the state were mapped using a GPS unit with submeter accuracy. All spatial data were collected in the World Geodetic System 1984 (WGS84) coordinate system.

Representative photographs were taken (Appendix A). Representative transect descriptions of the watercourse were recorded using Rapid Ordinary High Water Mark Data Forms (Appendix B). One transect point was recorded within the watercourse to capture the typical watercourse morphology within the survey area. Inaccessible areas were digitized using geographic information systems (GIS) and available aerial imagery and contour data.

5.1 Delineation of Ordinary High-Water Mark / Top of Bank / Riparian Areas

For linear water features containing an OHWM, the delineators used the *National Ordinary High Water mark Field Delineation Manual for Rivers and Streams – Interim Version* (David et al. 2022). Descriptions of water features, OHWM indicators, and measurements of OHWM and top-of-bank (TOB) were recorded on the Rapid Ordinary High Water Mark Data Forms (see Appendix B). TOB was delineated at the vertical point along a channel bank where an abrupt change in slope was evident, sometimes, but not always, coinciding with the anticipated maximum water surface elevation during flood events. Several representative width measurements were averaged to obtain the OHWM and TOB widths for each feature. Riparian vegetation communities were mapped to the edge of the riparian canopy, as defined by the outer edge of the drip line. Riparian vegetation was mapped throughout the survey area using GPS data and aerial imagery.

6 EXISTING CONDITIONS

6.1 Applicable Region and Subregions

The survey area is located in the San Francisco Bay Area, Western Mountains, Valleys, and Coast region and Northwest Forests and Coast subregion (USACE 2010).

6.2 Land Use

The survey area straddles Higgins Canyon Road and Mills Creek with rural residential, public lands, and agricultural development along its peripheries. Land use in the vicinity of the survey area is generally restricted to rural residential communities, Burleigh H Murray State Park, and Lazy H. Ranch.

6.3 Topography and Hydrology

6.3.1 Topography

The topography within the survey area is generally hilly and gently slopes westward toward the Pacific Ocean. The banks of Mills Creek within the riparian canopy are steep and highly incised with loose soil and erosion. Elevation ranges in the survey area are between approximately 174 and 202 feet above mean sea level (USGS 2024).

6.3.2 Hydrology

The study area is located near a bridge crossing where Higgins Canyon Road crosses Mills Creek immediately upstream of the confluence of Arroyo Leon (see Figure 2). The portion of Mills Creek at the project location is slightly horseshoe-shaped, flowing downstream from the northeast and bending to the

northwest within the project footprint. Mills Creek is located in the Pilarcitos Creek watershed (Hydrologic Unit Code [HUC]12 180500060201), which, after the confluence with Arroyo Leon, flows into Pilarcitos creek before emptying into the Pacific Ocean. The NWI wetlands mapping tool (USFWS 2024) classifies Mills Creek and Arroyo Leon as Freshwater Forested/Shrub Wetland (PFOC) following the *Classification of Wetlands and Deepwater Habitats of the United States* (Cowardin et al. 1979). According to the National Hydrography Dataset (NHD), Mills Creek is likely characterized as a "perennial" stream (USGS 2024). Perennial, intermittent, and ephemeral channels are not defined under federal law or regulation. However, the EPA describes perennial, intermittent, and ephemeral channels as follows (EPA 2024):

> Year-round streams (perennial) typically have water flowing in them year-round. Most of the water comes from smaller upstream waters or groundwater while runoff from rainfall or other precipitation is supplemental.
>
> Seasonal streams (intermittent) flow during certain times of the year when smaller upstream waters are flowing and when groundwater provides enough water for stream flow. Runoff from rainfall or other precipitation supplements the flow of seasonal stream. During dry periods, seasonal streams may not have flowing surface water. Larger seasonal streams are more common in dry areas.
>
> Rain-dependent streams (ephemeral) flow only after precipitation. Runoff from rainfall is the primary source of water for these streams. Like seasonal streams, they can be found anywhere but are most prevalent in arid areas.

6.4 Natural Communities and Other Land Covers

Two natural communities and two other land cover types (excluding Mills Creek) were mapped in the survey area: Red Alder Forest (*Alnus rubra* Forest Alliance), Coyote Brush Scrub (*Baccharis pilularis* Shrubland Alliance), ruderal/disturbed vegetation, and developed areas. A more detailed description of the vegetation communities in the survey area follows.

6.4.1 Red Alder Forest

Red Alder Forests occur on the banks, bottoms, floodplains, and terraces along streams and river backwaters and are characterized by red alder (*Alnus rubra*) being dominant or co-dominant in the tree canopy with grand fir (*Abies grandis*), coast silk tassel (*Garrya elliptica*), Sitka spruce (*Picea sitchensis*), black cottonwood (*Populus trichocarpa*), Douglas fir (*Pseudotsuga menziesii*), coast willow (*Salix hookeriana*), arroyo willow (*Salix lasiolepis*), Coulter willow (*Salix sitchensis*), coast redwood (*Sequoia sempervirens*), western hemlock (*Tsuga heterophylla*), and California bay (*Umbellularia californica*).

Within the survey area, Red Alder Forest occurs in riparian areas along Mills Creek and Arroyo Leon. This community meets the membership rules for the *Alnus rubra* Forest Alliance (California Native Plant Society [CNPS] 2024). Red alder is dominant or co-dominant in the tree canopy along with other riparian species such as arroyo willow. The understory of Red Alder Forest within the survey area was dominated by hedge nettle (*Stachys chamissonis*), red elderberry (*Sambucus racemosa*), thimbleberry (*Rubus parviflorus*), and salmonberry (*Rubus spectabilis*). Red Alder Forest is considered a sensitive community by CDFW (CDFW 2024).

6.4.2 Coyote Brush Scrub

The Coyote Brush Scrub shrubland alliance is characterized by coyote brush (*Baccharis pilularis*) dominant or co-dominant in the shrub canopy with other shrub species such as California sagebrush (*Artemisia californica*), blueblossom (*Ceanothus thyrsiflorus*), beaked hazelnut (*Corylus cornuta*), and sticky monkeyflower (*Diplacus aurantiacus*). Trees such as Douglas fir, coast live oak (*Quercus agrifolia*), or California bay may be present at low levels. This vegetation community typically occurs on river mouths, stream sides, terraces, stabilized dunes of coastal bars, spits along the coastline, coastal bluffs, open slopes, and ridges with variable soils ranging from sandy to relatively heavy clay (Sawyer et al. 2009).

Coyote Brush Scrub within the survey area is characterized by coyote brush as the dominant or co-dominant in the shrub canopy along with poison oak (*Toxicodendron diversilobum*), French broom (*Genista monspessulana*), jubatagrass (*Cortaderia jubata*), California blackberry (*Rubus ursinus*), sticky monkeyflower, poison hemlock (*Conium maculatum*), and California man-root (*Marah fabacean*). This community meets the membership rules for the *Baccharis pilularis* Shrubland Alliance (CNPS 2024). This community occurs on the northern edge of the survey area, upslope of the riparian corridor along Mills Creek.

6.4.1 Ruderal/Disturbed

Ruderal/disturbed habitat occurs along the margins and roadside swales/ditches along Higgins Canyon Road. This community is dominated by non-native grasses and forbs such as wild oat (*Avena barbata*), ribwort (*Plantago lanceolata*), spring vetch (*Vicia sativa*), wild geranium (*Geranium dissectum*), ripgut brome (*Bromus diandrus*), and California burclover (*Medicago polymorpha*). This community does not meet the membership rules for any naturally occurring or semi-natural Manual of California Vegetation alliance (Sawyer et al. 2009; CDFW 2024).

6.4.2 Developed

Developed land includes areas that contain significant human-made impervious cover or are highly altered by humans. Developed areas are generally characterized by residential or commercial development and are often dominated by a mix of exotic ornamental and native plant species. Vegetation density, canopy cover, and species composition will vary based on purpose and/or design. Vegetation present in developed portions of the survey area include manicured lawns as well as ornamental trees such as coast redwood, blue gum eucalyptus (*Eucalyptus globulus*), Mexican fan palm (*Washingtonia robusta*), Ngaio tree (*Myoporum laetum*), and Monterey cypress (*Hesperocyparis macrocarpa*). This vegetation community does not meet the membership rules for any naturally occurring or semi-natural Manual of California Vegetation alliance (Sawyer et al. 2009; CDFW 2024).

6.5 Soils

Based on the NRCS Web Soil Survey data, the survey area contains four soil types: 1) Dublin clay, moderately steep, eroded; 2) Gullied land (Tierra and Watsonville soil materials); 3) Mixed alluvial land; and 4) Tierra loam, steep, eroded (NRCS 2024a; Figure 2). Soils were incidentally investigated during the survey; however, detailed soil mapping was not conducted as part the wetland delineation effort. Detailed soil descriptions are provided in Table 1.

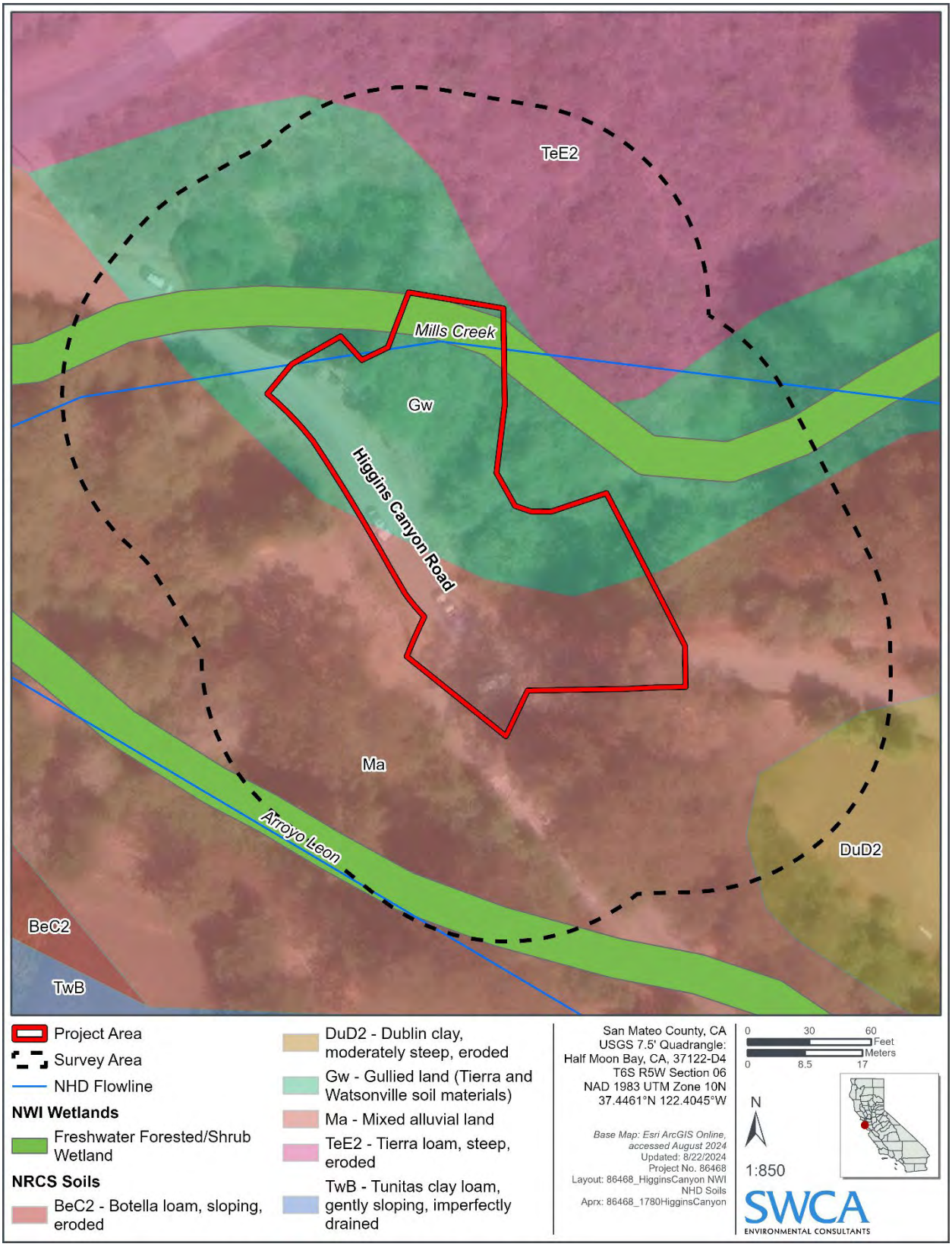


Figure 2. NWI, NHD, and soils map.

Table 1. Soil Types Present in the Survey Area

Map Unit Symbol	Map Unit Name	Soil Characteristics	Hydric
Ma	Mixed alluvial land	Alluvial land is land area where soil consists of loose clay, silt, sand, or gravel that has been deposited by running water in a stream bed, on a floodplain, in an alluvial fan or beach, or in similar settings.	Yes
Gw	Gullied land (Tierra and Watsonville soil materials)	Gullied land is land areas where all soil horizons have been removed by flowing water, resulting in V- or U-shaped channels.	No
TeE2	Tierra loam, steep, eroded	The Tierra series consists of deep, moderately well-drained soils that formed in alluvial materials from sedimentary rocks. Tierra soils are gently sloping to steep and are on dissected terraces and low hills at elevations of 100 to 1,200 feet. Slopes are 2% to 50%. The series formed in weakly consolidated somewhat stratified old alluvium interspersed with beds of sandstone. The climate is subhumid mesothermal with cool moist winters and cool dry summers. Moderately well drained; slow to rapid runoff; very slow permeability.	No
DuD2	Dublin clay, moderately steep, eroded	N/A	No

Source: NRCS (2024a).

6.6 Climate and Precipitation

The temperature and precipitation data described in this section are based on the closest National Weather Service Field Office Climate Data for the Half Moon Bay, California WETS table for the period between 1999 and 2024 (NRCS 2024c). San Mateo County has a Mediterranean climate, which includes warm to hot, dry summers and mild to cool, wet winters. Average minimum temperatures range from 42.0 to 54.2 degrees Fahrenheit (°F) and average maximum temperatures range from 59.5 to 66.6°F. Average annual precipitation at the Half Moon Bay Station is 23.78 inches, with most rainfall occurring between October and April.

The survey area experienced above-average precipitation levels during the months leading up to the jurisdictional delineation, receiving approximately 26.25 inches of rain between the start of the rainy season (October 2023) to the day of the field investigation (May 2, 2024). The National Drought Mitigation Center (2022) shows San Mateo County as not being in a drought (Category None) in the time leading up to and during the field investigation.

USACE Antecedent Precipitation Tool (APT) (version 1.0; USACE 2024) outputs for the survey area on May 2, 2024, are presented in Appendix C. The APT is a desktop tool developed by the USACE and commonly used by the USACE and EPA to support decisions as to whether field data collection and other site-specific observations occurred under normal climatic conditions. The APT facilitates the comparison of antecedent or recent rainfall conditions for a given location to the range of normal rainfall conditions that occurred during the preceding 30 years based on precipitation and climatological data available from multiple nearby gauges. In addition to providing a standardized methodology to evaluate normal precipitation conditions ("precipitation normalcy"), the APT can also be used to assess the presence of drought conditions, as well as the approximate dates of the wet and dry seasons for a given location.

The APT (version 1.0) model output for May 2, 2024, shows that the May survey was conducted under the following conditions:

- Normal conditions for antecedent precipitation (APT Product = 14)
- During the dry season (wetness condition)

- During a period of mild wetness (drought index)
- About 1.43 inches of precipitation in the preceding 30 days, within the 30-year normal range for that part of the year

7 RESULTS

One potentially jurisdictional feature—a perennial stream known as Mills Creek—and its surrounding riparian vegetation were mapped within the survey area (Figure 3). No evidence of additional wetlands or other water features were observed within the survey area. This feature was identified in the NWI wetlands mapping tool as a palustrine Freshwater Forested/Shrub Wetland (see Figure 2) (USFWS 2024).

Mills Creek is a perennial stream on the northeast side of Higgins Canyon Road that receives water discharge from the surrounding rural development and upland areas. Mills Creek has hydrologic connectivity to Arroyo Leon, which is mapped as a blue line stream (USGS 2024) and drains into Pilarcitos Creek before flowing into the Pacific Ocean, a traditionally navigable water.

Mills Creek within the study area is deeply incised along much of its length with steep, forested slopes on both sides. The perennial stream lies at the bottom of the valley with clearly defined bed, OHWM, and banks. The streambed of this perennial stream is largely unvegetated consisting of mostly runs with a few riffles averaging 8 inches in depth and occasional small pools reaching 2 feet in depth. The substrate present consists of a mixture of fine/silt, small cobble, and exposed bedrock. The natural channel of the stream matches the OHWM and spans between 5 to 16 feet wide within the study area. Indications of the OHWM include the presence of flowing water, scour, wracking, and a dominance of hydrophytic vegetation growing in the wetted portion of the channel (see Appendix A: Photographs A-3 and A-4).

The TOB within the study area is clearly demarcated by a sudden change in slope and varies in the height and distance away from the OHWM. On average, the TOB extends out from the OHWM on average about 4 to 5 feet high but can range anywhere from approximately 1 foot high in areas of deposition to 45 feet high in areas of bank incision and scouring. The width of the TOB spans from 23 to 34 feet wide varying in width depending on if the channel is incised or widens out into a terraced floodplain (see Photographs A-3 and A-5).

Riparian vegetation was dominated by Red Alder Forest with a sparse to moderately dense canopy in the tree and shrub layer, with an understory dominated by cape ivy (*Delairea odorata*), watercress (*Nasturtium officinale*), water parsley (*Oenanthe sarmentosa*), California blackberry, and garden nasturtium (*Tropaeolum majus*) in the herbaceous layer. The riparian corridor is approximately 90 to 120 feet wide and provides shade cover over the channel.

In total, 1.47 acres (64,033 square feet) of potentially jurisdictional streambed and riparian non-wetland were mapped within the survey area. Waters between the OHWM, encompassing the perennial stream, Mills Creek, contained approximately 0.13 acre (5,663 square feet) of streambed habitat. The forested riparian vegetation, including parts of the stream encompassed by the TOB but excluding the OHWM, contained approximately 1.34 acres of riparian non-wetland.

Photographs of the survey area and sampling points are included in Appendix A. The OHWM datasheet used in the delineation is provided in Appendix B. Table 2 summarizes the NWI Classifications within the survey area. Table 3 quantifies the potentially jurisdictional waters by agency jurisdiction for the delineated resources within the survey area. The totals in this table are not additive, as the jurisdictions overlap.

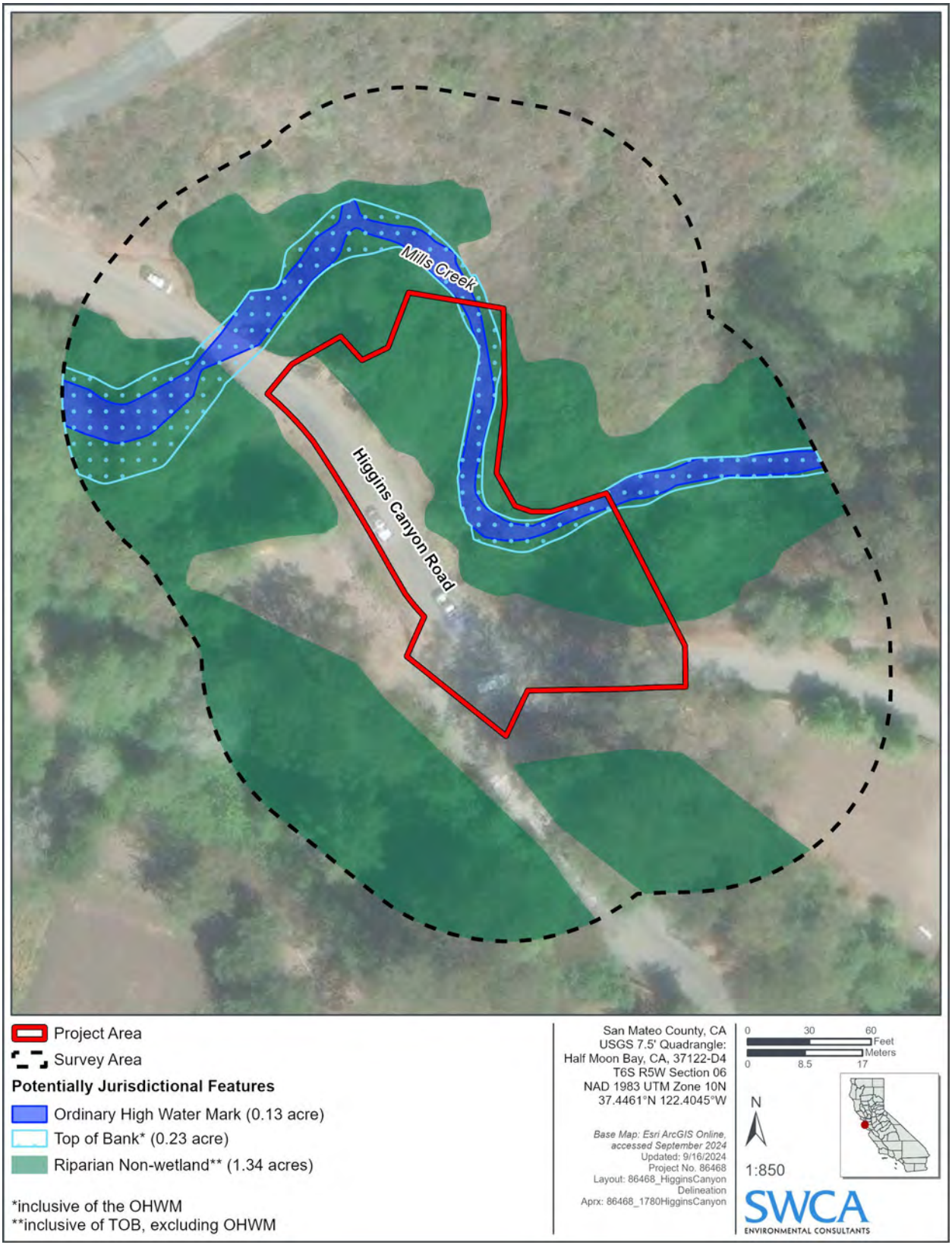


Figure 3. Delineation results map.

Table 2. NWI Classifications Within the Survey Area

Name	NWI Classification[1]	NWI Classification Definition	Location (latitude/longitude)	Approximate Size (acres)
Mills Creek	PFOC	Palustrine forested/shrub wetland seasonally flooded	37.446078° / −122.404572°	1.47

Source: USFWS (2024).

[1] NWI classifications are based on *Classification of Wetlands and Deepwater Habitats of the United States* (Cowardin et al. 1979).

Table 3. Preliminary Jurisdictional Waters Totals in the Survey Area

Potential Jurisdictional Waters[1]	Totals within the Survey Area		
	Acres	Square Feet	Linear Feet[2]
USACE [3]			
WOTUS – Perennial Stream (Mills Creek)	0.13	5,681	170
Total Potential USACE Jurisdiction	0.13	5,681	170
State Water Board / RWQCB [4]			
Waters of the State – Perennial Stream (Mills Creek)	0.13	5,681	170
Waters of the State – Riparian Non-Wetland	1.34	58,190	NA
Total Potential State Water Board / RWQCB Jurisdiction	1.47	63,871	170
CDFW [5]			
Streambed (Mills Creek)	0.13	5,681	170
Riparian Non-Wetlands	1.34	58,190	NA
Total Potential CDFW Jurisdiction	1.47	63,871	170
LCP/CCA[6]			
Sensitive Habitat – Perennial Stream (Mills Creek)	0.13	5,681	170
Sensitive Habitat – Riparian Corridor	1.34	58,190	NA
Total LCP/CCA Jurisdiction	1.47	63,871	170

[1] Areas of potential jurisdiction are subject to final verification and approval by the regulatory agencies.

[2] Total linear footage is based on the largest linear length in the survey area.

[3] Potential federal WOTUS include non-wetland portions of Mills Creek that occur at or below the OHWM. WOTUS within the survey area have been characterized as a "Perennial Stream."

[4] Potential waters of the state include a "Perennial Stream," a portion of Mills Creek occurring below the OHWM associated with potential WOTUS, and "Riparian Non-Wetland" habitat that includes areas above the OHWM to the outer edge of riparian vegetation associated with Mills Creek.

[5] Potential CDFW jurisdictional areas includes a "Streambed" area that occurs below the OHWM associated with WOTUS and waters of the state characterized as "Perennial Stream" and the "Riparian Non-Wetlands" habitat that includes TOB to the outer edge of riparian vegetation associated with Mills Creek, excluding areas within the OHWM.

[6] Potential LCP/CCA jurisdictional areas, called "Sensitive Habitat", include a "Perennial Stream" that occurs below the OHWM associated with WOTUS and waters of the state and a "Riparian Corridor" that extends above the OHWM to the outer edge of riparian vegetation associated with Mills Creek.

8 SUMMARY AND DISCUSSION

The survey area contained one major aquatic feature–Mills Creek–a perennial stream and its adjacent riparian non-wetland habitat. Approximately 0.13 acre (5,681 square feet) of potentially jurisdictional aquatic habitat under the USACE, State Water Board/RWQCB, CDFW, and LCP/CCA and 1.34 acres (58,190 square feet) of potentially jurisdictional riparian non-wetland habitat under the State Water Board/RWQCB, CDFW, and LCP/CCA.

As shown in Table 4, the project is expected to temporarily impact approximately 0.01 acre (382 square feet) of potentially jurisdictional aquatic habitat under the USACE, State Water Board/RWQCB, CDFW, and LCP/CCA and 0.03 acre (1,367 square feet) of potentially jurisdictional riparian non-wetland habitat under the State Water Board/RWQCB, CDFW, and LCP/CCA. Temporary impacts include impacts from water diversion, water dam, and temporary access roads. Additionally, the project is expected to permanently impact approximately 0.02 acre (907 square feet/ 113 linear feet) of potentially jurisdictional aquatic habitat under the USACE, State Water Board/RWQCB, CDFW, and LCP/CCA and 0.15 acre (6,631 square feet) of potentially jurisdictional riparian non-wetland habitat under the State Water Board/RWQCB, CDFW, and LCP/CCA. These impacts include permanent structures for habitat enhancement (i.e., engineered creek bed, vegetated boulder revetments, and vegetated soil lifts) and permanent structures related to road repair and bank stabilization (i.e., retaining wall) located in the jurisdictional areas.

It is anticipated that the proposed project will need to obtain federal CWA permits from the USACE and State Water Board/RWQCB, a Lake or Streambed Alteration Agreement from the CDFW, and a CDP from the County prior to implementing the project. Table 4 quantifies the potential jurisdictional waters (in acres, square feet, and linear feet) for the delineated resources within the survey area and impact area. Potential jurisdictional waters identified in this report are also quantified in the Delineation Results Map (see Figure 3).

Finally, the findings in this report should be considered preliminary. Areas of potential jurisdiction are subject to final verification and approval by the regulatory agencies (i.e., USACE, State Water Board/RWQCB, and CDFW) and will be confirmed during the permitting phase of the project. USACE-defined aquatic features, as required by the Sacramento District's *Minimum Standards for Acceptance of Aquatic Resources Delineation Reports* (USACE 2016), are summarized in the aquatic resources Operations and Maintenance Business Information Link (OMBIL) Regulatory Module (ORM) Upload Sheet in Appendix D.

Table 4. Preliminary Jurisdictional Waters in the Survey Area and Impact Area

Potential Jurisdictional Waters[1]	Totals within the Survey Area			Temporary Fill			Permanent Fill (Habitat Enhancement)[3]		
	Acres	Square Feet	Linear Feet[2]	Acres	Square Feet	Linear Feet	Acres	Square Feet	Linear Feet
USACE[4]									
WOTUS – Perennial Stream (Mills Creek)	0.13	5,681	170	0.01	382	58	0.02	907	113
State Water Board / RWQCB[5]									
Waters of the State – Perennial Stream (Mills Creek)	0.13	5,681	170	0.01	382	58	0.02	907	113
Waters of the State – Riparian Non-Wetland	1.34	58,190	NA	0.03	1,367		0.15	6,631	
Total Potential State Water Board / RWQCB Jurisdiction	**1.47**	**63,871**	**170**	**0.04**	**1,749**		**0.17**	**7,538**	
CDFW[6]									
Streambed (Mills Creek)	0.13	5,681	170	0.01	382	58	0.02	907	113
Riparian Non-wetlands	1.34	58,190	NA	0.03	1,367		0.15	6,631	
Total Potential CDFW Jurisdiction	**1.47**	**63,871**	**170**	**0.04**	**1,749**		**0.17**	**7,538**	
LCP/CCA[7]									
Sensitive Habitat – Perennial Stream (Mills Creek)	0.13	5,681	170	0.01	382	58	0.02	907	113
Sensitive Habitat – Riparian Corridor	1.34	58,190	NA	0.03	1,367		0.15	6,631	
Total LCP/CCA Jurisdiction	**1.47**	**63,871**	**170**	**0.04**	**1,749**		**0.17**	**7,538**	

[1] Areas of potential jurisdiction are subject to final verification and approval by the regulatory agencies.

[2] Total linear footage is based on the largest linear length in the survey area.

[3] Project components that are permanently being placed in the project area are considered permanent fill, even though they may have overall beneficial impacts.

[4] Potential federal WOTUS include non-wetland portions of Mills Creek that occur at or below the OHWM. WOTUS within the survey area have been characterized as a "Perennial Stream."

[5] Potential waters of the state include a "Perennial Stream," a portion of Mills Creek occurring below the OHWM associated with potential WOTUS, and "Riparian Non-Wetland" habitat that includes areas above the OHWM to the outer edge of riparian vegetation associated with Mills Creek.

[6] Potential CDFW jurisdictional areas includes a "Streambed" area that occurs below the OHWM associated with WOTUS and waters of the state characterized as "Perennial Stream" and the "Riparian Non-Wetlands" habitat that includes TOB to the outer edge of riparian vegetation associated with Mills Creek, excluding areas within the OHWM.

[7] Potential LCP/CCA jurisdictional areas, called "Sensitive Habitat," include a "Perennial Stream" that occurs below the OHWM associated with WOTUS and waters of the State and a "Riparian Corridor" that extends above the OHWM to the outer edge of riparian vegetation associated with Mills Creek.

9 LITERATURE CITED

California Department of Fish and Game. 1994. *A Field Guide to Lake and Streambed Alteration Agreements, Sections 1600-1607, California Fish and Game Code*. Sacramento, California: California Department of Fish and Game, Environmental Services Division. January.

California Department of Fish and Wildlife (CDFW). 2024. California Natural Community List. June 1, 2023. Available at: https://wildlife.ca.gov/Data/VegCAMP/Natural-Communities#natural%20communities. Accessed May 2024.

California Native Plant Society (CNPS). 2024. A Manual of California Vegetation Online. Available at: https://vegetation.cnps.org/. Accessed May 2024.

Cowardin, L. M., Carter, V, Golet, F, LaRoe, E. 1979. *Classification of Wetlands and Deepwater Habitats of the United States*. U.S. Department of the Interior, Fish and Wildlife Service.

David, G., K. Fritz, T.L. Nadeau, B. Topping, A. Allen, P. Trier, S. Kichefski, L. James, E. Wohl, and D. Hamill. 2022. *National Ordinary High Water Mark Field Delineation Manual for Rivers and Streams – Interim Version*. Vicksburg, Mississippi: U.S. Army Engineer Research and Development Center.

Jepson Flora Project (eds.). 2024. Jepson eFlora. Available at: https://ucjeps.berkeley.edu/eflora/. Accessed May 2024.

Lichvar, R.W., D.L. Banks, W.N. Kirchner, and N.C. Melvin. 2020. The National Wetland Plant List: 2020 wetland ratings. Available at: https://cwbi-app.sec.usace.army.mil/nwpl_static/data/DOC/lists_2020/National/National_2020v1.pdf. Accessed May 2024.

Montrose Environmental. 2023. *County of San Mateo Routine Maintenance Program Manual*. Available at: https://www.smcgov.org/publicworks/county-san-mateo-routine-maintenance-program. Accessed June 2024.

Munsell Color. 2012. Munsell Soil-color Charts: With Genuine Munsell Color Chips. Grand Rapids, Michigan: Munsell Color.

National Drought Mitigation Center. 2022. U.S. Drought Monitor - California. Available at: https://droughtmonitor.unl.edu/CurrentMap/StateDroughtMonitor.aspx?CA. Accessed July 2022.

Natural Resources Conservation Service (NRCS). 2024a. Web Soil Survey. Available at: https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx. Accessed June 2024.

———. 2024b. Soil Data Access Hydric Soils List. California – Contra Costa County, California. Available at: https://efotg.sc.egov.usda.gov/references/Public/IL/State_List_NRCS_Hydric_Soils_Report_Dynamic_Data.html. Accessed June 2024.

———. 2024c. Agricultural Applied Climate Information System (AgACIS). Available at: http://agacis.rcc-acis.org/?fips=06013. Accessed June 2024.

Sawyer, John O., Todd Keeler-Wolf, and Julie M. Evens. 2009. *A Manual of California Vegetation*. Second Edition. Sacramento, California: California Native Plant Society.

State Water Resources Control Board (State Water Board). 2021. *State Policy for Water Quality Control: State Wetland Definition and Procedures for Discharges of Dredged or Fill Material to Waters of the State*. Adopted April 2, 2019, revised April 6, 2021. Available at: https://www.waterboards.ca.gov/water_issues/programs/cwa401/docs/2021/procedures.pdf. Accessed June 2024.

U.S. Army Corps of Engineers (USACE) and Environmental Protection Agency (EPA). 2023. Revised definition of "Waters of the United States." *Federal Register* 88(11):3004–3144. 33 CFR Part 328; 40 CFR Part 120. January 18, 2023. Final Rule.

U.S. Army Corps of Engineers (USACE). 1987. *Corps of Engineers Wetlands Delineation Manual*. Technical Report Y-87-1. Vicksburg, Mississippi: Environmental Laboratory, U.S. Army Engineer Waterways Experiment Station. January.

———. 2010. *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region (Version 2.0)*, ed. J. S. Wakeley, R. W. Lichvar, and C. V. Noble. ERDC/EL TR-10-3. Vicksburg, Mississippi: U.S. Army Engineer Research and Development Center.

———. 2016. *Minimum Standards for Acceptance of Aquatic Resources Delineation Reports*. USACE Sacramento District. January. Available at: https://www.spk.usace.army.mil/Portals/12/documents/regulatory/jd/minimum-standards/Minimum_Standards_for_Delineation_with_Template-final.pdf. Accessed May 2024.

———. 2024. Antecedent Precipitation Tool (APT), Version 1.0. USACE. May 2. Available at: https://github.com/jDeters-USACE/Antecedent-Precipitation-Tool/releases/tag/v1.0. Accessed May 20, 2024.

U.S. Environmental Protection Agency (EPA). 2024. Section 404 of the Clean Water Act: Learn About Streams. Available at: https://www.epa.gov/cwa-404/learn-about-streams. Accessed May 2024.

U.S. Fish and Wildlife Service (USFWS). 2024. National Wetlands Inventory. Available at: http://www.fws.gov/wetlands/. Accessed May 2024.

U.S. Geological Survey (USGS). 2024. National Hydrography Dataset GIS Data. Available at: http://nhd.usgs.gov/. Accessed May 2024.

APPENDIX A

Site Photographs



Photograph A-1. Mills Creek portion of the survey area and associated vegetation communities; view facing northeast. Photograph taken May 2, 2024.



Photograph A-2. Location of the slip-out within the survey area; view facing north. Photograph taken May 2, 2024.



Photograph A-3. Representative conditions within the Mills Creek stream channel; view facing southeast. Photograph taken May 2, 2024.



Photograph A-4. Representative conditions in the Mills Creek stream channel; view facing northeast. Photograph taken May 2, 2024.



Photograph A-5. Steep incising on Mills Creek stream channel; view facing northeast. Photograph taken May 2, 2024.



Photograph A-6. Higgins Canyon Road bridge, riparian canopy, and ruderal disturbed vegetation along the road margins within the survey area; view facing northwest. Photograph taken May 2, 2024.



Photograph A-7. Representative conditions within the developed portions of the survey area; view facing southeast. Photograph taken May 2, 2024.



Photograph A-8. Coyote brush scrub vegetation within the survey area; view facing north. Photograph taken May 2. 2024.



Photograph A-9. Red alder riparian vegetation within the survey area; view facing northwest. Photograph taken May 2, 2024.

APPENDIX B

Ordinary High Water Mark Datasheets

U.S. Army Corps of Engineers (USACE)

INTERIM DRAFT RAPID ORDINARY HIGH WATER MARK (OHWM) FIELD IDENTIFICATION DATA SHEET

The proponent agency is Headquarters USACE CECW-COR.

Form Approved –
OMB No. 0710-0024
Expires: 2024-04-30

The Agency Disclosure Notice (ADN)

The Public reporting burden for this collection of information, 0710-0024, is estimated to average 30 minutes per response, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding the burden estimate or burden reduction suggestions to the Department of Defense, Washington Headquarters Services, at whs.mc-alex.esd.mbx.dd-dod-information-collections@mail.mil. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.

Project ID #: 86468-000-BAY	Site Name: Higgins Canyon Road Repair	Date and Time: 05/02/2024 11:29
Location (lat/long): 37.445905 -122.404172	Investigator(s): A. Villanueva, E. Schickenberg	

Step 1 Site overview from remote and online resources
Check boxes for online resources used to evaluate site:

☐ gauge data ☐ LiDAR ☐ geologic maps
☐ climatic data ☑ satellite imagery ☐ land use maps
☑ aerial photos ☑ topographic maps ☐ Other:

Describe land use and flow conditions from online resources.
Were there any recent extreme events (floods or drought)?
Adjacent land use is residential and commercial. Flows are typical for time of year. No precipitation with a week or more.

Step 2 Site conditions during field assessment. First look for changes in channel shape, depositional and erosional features, and changes in vegetation and sediment type, size, density, and distribution. Make note of natural or man-made disturbances that would affect flow and channel form, such as bridges, riprap, landslides, rockfalls etc.

Site Conditions: Incised banks . Sparse riparian canopy. Dense herbaceous layer to TOB. Substrate mostly small cobble with sandy silty bottom. Exposed bedrock present. Little gravel. 1-ton rip rap present. Mostly runs, few riffles, Small pools with depth 2ft. avg depth 8"

Step 3 Check the boxes next to the indicators used to identify the location of the OHWM.
OHWM is at a transition point, therefore some indicators that are used to determine location may be just below and above the OHWM. From the drop-down menu next to each indicator, select the appropriate location of the indicator by selecting either just below `b', at `x', or just above `a' the OHWM.
Go to page 2 to describe overall rationale for location of OHWM, write any additional observations, and to attach a photo log.

Geomorphic indicators

☑ **Break in slope:** a
- ☑ *on the bank:* x
- ☐ *undercut bank:*
- ☐ *valley bottom:*
- ☐ Other:

☐ **Shelving:**
- ☐ *shelf at top of bank:*
- ☐ *natural levee:*
- ☐ *man-made berms or levees:*
- ☐ *other berms:*

☑ **Channel bar:** x
- ☐ *shelving (berms) on bar:*
- ☑ *unvegetated:* x
- ☐ *vegetation transition (go to veg. indicators)*
- ☑ *sediment transition (go to sed. indicators)* x
- ☐ *upper limit of deposition on bar:*

☑ **Instream bedforms and other bedload transport evidence:** x
- ☐ *deposition bedload indicators (e.g., imbricated clasts, gravel sheets, etc.)*
- ☑ *bedforms (e.g., pools, riffles, steps, etc.):* b
- ☑ *erosional bedload indicators (e.g., obstacle marks, scour, smoothing, etc.)* x

☐ **Secondary channels:**

Sediment indicators

☐ **Soil development:**

☐ **Changes in character of soils** ☐

Mudcracks:

☑ **Changes in particle-sized distribution:** b
- ☑ *transition from* Pebble, Cobble to Coarse Silt, Medium Sand
- ☐ *upper limit of sand-sized particles*
- ☐ *silt deposits*

☑ **Exposed roots below**

Vegetation Indicators

☑ **Change in vegetation type and/or density:** x
Check the appropriate boxes and select the general vegetation change *(e.g., graminoids to woody shrubs).* ***Describe the vegetation transition looking from the middle of the channel, up the banks, and into the floodplain.***
- ☑ *vegetation absent to:* Forbs
- ☐ *moss to:*
- ☐ *forbs to:*
- ☐ *graminoids to:*
- ☐ *woody shrubs to:*
- ☐ *deciduous trees to:*
- ☐ *coniferous trees to:*

☐ **Vegetation matted down and/or bent:**

Ancillary indicators

☑ **Wracking/presence of organic litter:** x
☑ **Presence of large wood:** a
☑ **Leaf litter disturbed or washed away:** x
☑ **Water staining:** a
☑ **Weathered clasts or bedrock:** a

Other observed indicators? Describe:

Project ID #: 86468-000-BAY_

Step 4 Is additional information needed to support this determination? ☐ Yes ☑ No If yes, describe and attach information to datasheet:

Step 5 Describe rationale for location of OHWM

OHWM Rationale: We could see the alluvium deposits from high flow. Channel is very incised an water staining was visivle. wracking also indicated OHWM is below
OHWM width (ft): 14
OHWM depth (ft): 1
Dominant vegetation below OHWM: Unvegetated
Dominant vegetation at OHWM: R. spectabulis, Equisetum sp., N. officiallis
Dominant vegetation above OHWM: R. spectabulis, S. rigida, nettle, P. racemosa, Cornus sp., S. laseolepis, A. rhombifolia

Additional observations or notes

Attach a photo log of the site. Use the table below, or attach separately.

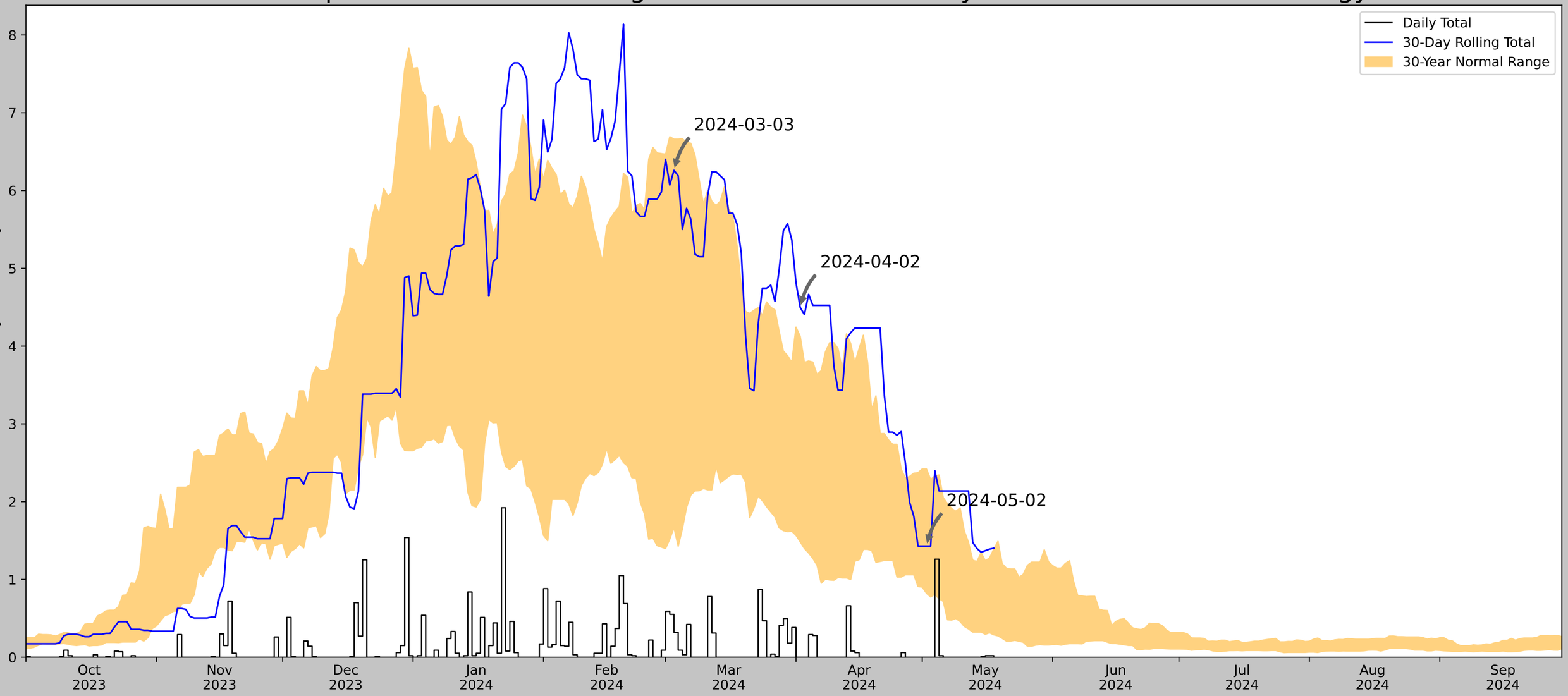
Photo log attached? ☐ Yes ☑ No If no, explain why not: Photos were collected in Field Maps with digital tablet.

List photographs and include descriptions in the table below.

Number photographs in the order that they are taken. Attach photographs and include annotations of features.

APPENDIX C

Antecedent Precipitation Tool



Coordinates	37.446078, -122.404572
Observation Date	2024-05-02
Elevation (ft)	180.511
Drought Index (PDSI)	Mild wetness (2024-04)
WebWIMP H_2O Balance	Dry Season

30 Days Ending	30^{th} %ile (in)	70^{th} %ile (in)	Observed (in)	Wetness Condition	Condition Value	Month Weight	Product
2024-05-02	0.822441	2.42126	1.429134	Normal	2	3	6
2024-04-02	1.483465	4.125984	4.496063	Wet	3	2	6
2024-03-03	1.664961	6.661418	6.259843	Normal	2	1	2
Result							Normal Conditions - 14

Figure and tables made by the
Antecedent Precipitation Tool
Version 1.0

Written by Jason Deters
U.S. Army Corps of Engineers

Weather Station Name	Coordinates	Elevation (ft)	Distance (mi)	Elevation Δ	Weighted Δ	Days Normal	Days Antecedent
HALF MOON BAY	37.4725, -122.4433	26.903	2.801	153.608	1.691	10646	90
HALF MOON BAY 0.7 NW	37.4777, -122.4454	36.089	0.377	9.186	0.173	20	0
HALF MOON BAY 0.4 NNE	37.4754, -122.4337	58.071	0.563	31.168	0.271	1	0
HALF MOON BAY 0.5 SSW	37.463, -122.4408	54.134	0.671	27.231	0.32	15	0
EL GRANADA 0.4 WSW	37.5071, -122.4726	141.076	2.88	114.173	1.625	2	0
REDWOOD CITY	37.4767, -122.2386	30.84	11.228	3.937	5.097	626	0
SAN FRANCISCO INTL AP	37.6197, -122.3656	9.843	11.025	17.06	5.149	42	0

APPENDIX D

ORM Upload Sheet

Aquatic Resources ORM Upload Sheet

Waters_Name	State	Cowardin_Code	HGM_Code	Meas_Type	Amount	Units	Waters_Type	Latitude	Longitude	Local Waterway
Mills Creek	CALIFORNIA	PFO	RIVERINE	Area	1.47	ACRE	DELIN.PJD-404	37.44607800	-122.40457200	Mill Creek is a tributary to Arroyo Leon which empties into the Pacific Ocean

APPENDIX D

Geotechnical Design Report

CE&G
A division of Haley & Aldrich

CAL ENGINEERING & GEOLOGY
785 Ygnacio Valley Road | Walnut Creek | CA 94596
6455 Almaden Expwy., Suite 100| San José | CA 95120
23785 Cabot Blvd., Suite 321 | Hayward | CA 94545
www.caleng.com

GEOTECHNICAL DESIGN REPORT

SLIP-OUT REPAIR NEAR 1780 HIGGINS CANYON ROAD

CE&G DOCUMENT: 0207545.001

SEPTEMBER 15, 2023

Prepared for:

San Mateo County Department of Public Works
555 County Center
Redwood City, California 94063

Kevin Loeb, PG, CEG
Engineering Geologist

Christian Rodil, EIT
Project Engineer

Reviewed by:

Dan Peluso, PE, GE
Principal Engineer

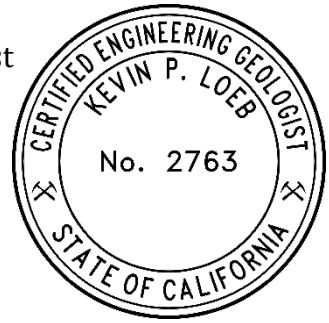




TABLE OF CONTENTS

1.0 Introduction 1
1.1 General 1
1.2 Project Description 1
1.3 Purpose and Scope of Services 1
2.0 Site Description 3
3.0 Geology 4
3.1 Geologic Setting 4
3.2 Regional Setting 4
3.3 Seismicity 5
3.4 Geohazard Mapping 6
3.5 Regional Groundwater 7
4.0 Site Investigation 8
4.1 Site Reconnaissance 8
4.2 LiDAR Scan and Site Reconnaisance 8
4.3 Subsurface Explorations 9
5.0 Conclusions and Discussion 12
5.1 General Summary 12
5.2 Drillability and Excavatability 12
5.3 Seismic Hazards 13
5.4 Creek Bank Erosion 13
5.5 Groundwater and Creek Flows 13
5.6 Landsliding 14
5.7 Slope Stability Analysis 14
5.8 Liquefaction 15
5.9 Corrosion 16
5.10 Repair Alternatives 17
5.11 Recommended Alternative 18
5.12 Geotechnical Considerations 19
6.0 Design and Construction Recommendations 20
6.1 Excavations 20
6.2 Earthwork 20
6.3 Seismic Design Parameters 22
6.4 Retaining Walls 23
6.5 Vegetated Slope Protection (VSP) 27
6.6 Surface Drainage 28
6.7 Soil or Bedrock Corrosion Potential 28

7.0 Limitations 29
8.0 References 30

FIGURES

Figure 1. Site Location Map
Figure 2. Site Plan
Figure 3. Regional Geology Map
Figure 4. Fault Activity Map
Figure 5. Liquefaction Map
Figure 6. Landslides Map
Figure 7. Cross Section A-A' and B-B'

APPENDICES

Appendix A. Site Photos
Appendix B. Boring Logs
Appendix C. Laboratory Testing
Appendix D. Calculations

1.0 INTRODUCTION

1.1 GENERAL

Cal Engineering & Geology, Inc. (CE&G), a division of Haley & Aldrich, has provided geotechnical engineering services for the slip-out repair near 1780 Higgins Canyon Road in Half Moon Bay, California. The work has been completed to provide recommended repair alternatives to stabilize the slope and restore the cross-sectional width of Higgins Canyon Road for the County of San Mateo (County).

1.2 PROJECT DESCRIPTION

Due to heavy rain in late December 2022 through early January 2023, a landslide occurred near 1780 Higgins Canyon Road in unincorporated San Mateo County near Half Moon Bay, California (Figure 1). An adjacent emergency Rock Slope Protection (RSP) slope repair immediately east of the subject landslide, completed in April 2022 by San Mateo County, has also eroded due to recent rain events. These two failures have combined into one failure with a width of approximately 115 feet and extend downslope from the road surface approximately 28 feet. It is assumed that the landslides were due to the saturated slope materials in combination with erosion from elevated creek flows. The landslides have encroached onto Higgins Canyon Road, causing a roadside slip-out on the outboard shoulder. Photos of the project site and slip-out can be found in Appendix A. We understand that San Mateo County intends to restore the road and creek bank but has not identified a preferred repair option.

1.3 PURPOSE AND SCOPE OF SERVICES

The investigation completed by CE&G was undertaken to assess the existing surface and subsurface conditions in the immediate vicinity of the proposed project and to develop geotechnical design recommendations for the proposed improvements.

The scope of work completed for the geotechnical investigation and report included the following:

1. Meetings and consultation with San Mateo County personnel and management of geotechnical explorations.

2. Performance of a design-level aerial LiDAR scan to develop a topographic base map utilizing an unmanned aerial system.

3. Completion of a desktop study to identify and evaluate relevant geologic and geotechnical information available for the site, including published geologic maps and unpublished geotechnical information in our files regarding the site and vicinity.

4. Geologic reconnaissance to observe and map current site conditions and to mark for USA (Underground Service Alert).

5. Subsurface exploration using a truck-mounted drill rig in accordance with a drilling permit facilitated by the County.

6. Laboratory testing to determine key engineering index properties of selected earth materials.

7. Engineering analysis to develop and evaluate alternative geotechnical approaches to restore the roadway embankment and develop parameters for the repair design.

8. Preparation of this geotechnical design report.

2.0 SITE DESCRIPTION

The project site is located near 1780 Higgins Canyon Road in unincorporated San Mateo County near Half Moon Bay, California, on the western foothills of the Santa Cruz Mountains. The site is just east of a bridge that crosses Mills Creek. Higgins Canyon Road is a narrow two-lane paved roadway that is about 18 to 21 feet in width in the site vicinity and trends northwest to southeast. The subject slope sits on a southern creek bank along Mills Creek and is moderately vegetated with small to large trees and shrubs. Mills Creek at the project location is slightly horseshoe-shaped and comes downstream from the northeast and bends to the northwest at our project location, which is assumed to be contributing to the erosion at the toe of the subject slope. The road elevation ranges approximately between 200 and 202 feet above the main sea level. The creek bottom is approximately 174 feet above the main sea level.

Detailed descriptions of the site and road distress features are further described in the site reconnaissance section of this report (Section 4.1). Key site features are shown in Figure 2.

3.0 GEOLOGY

3.1 GEOLOGIC SETTING

The project site lies within the Coast Ranges geomorphic province of California. This province is characterized by northwest-southeast trending mountain ranges and intervening valleys, such as that occupied by San Francisco Bay and the Santa Clara Valley. The right-lateral strike-slip San Andreas fault system controls the northwest-southeast structural grain of the Coast Ranges and the Bay Area. The San Andreas fault system includes the Hayward-Rodgers Creek, Calaveras, Concord-Green Valley, and Greenville-Marsh Creek faults, among others, which have resulted in the uplift of the northwest-trending Diablo and Santa Cruz Mountain Ranges. The Santa Cruz Mountain Range makes up the majority of the San Francisco Peninsula, which is bounded by San Francisco Bay to the east and the Pacific Ocean to the west. The project site is located in the westernmost foothills of the Santa Cruz Mountain Range, approximately 2.9 miles inland from the Pacific Coast.

3.2 REGIONAL SETTING

The geologic setting is shown on the Regional Geology Map, Figure 3.

The general vicinity of the project site has been mapped several times, with geologic mapping having different emphases: Brabb and others (1998); Knudsen and others (2000); Graymer and others (2006); and Witter and others (2006).

According to Brabb and others (1998), the majority of the project site is mapped as being underlain by Holocene-aged alluvium, which is described as "unconsolidated gravel, sand, silt, and clay along streams." The east and west sides of the site are mapped as being underlain by Pleistocene-aged coarse-grained older alluvial fan and stream terrace deposits that generally consist of poorly consolidated gravel, sand, and silt (Brabb and others, 1998). Later mapping by Graymer and others (2006) agrees with mapping by Brabb and others (1998).

Bedrock consisting of Purisima Formation (Pliocene and Upper Miocene) likely underlies the above-described alluvial soils (Brabb and others, 1998). The Purisima Formation is generally described as gray and greenish-gray fine-grained sandstone, siltstone, and mudstone, but also includes some porcelaneous shale and mudstone, chert, silty mudstone, and volcanic ash (Brabb and others, 1998). Purisima Formation sedimentary beds locally strike northwest and dip to the southwest at approximately 41° (Brabb and others, 1998).

3.3 SEISMICITY

The project site is located within the greater San Francisco Bay Area, which is recognized as one of the more seismically active regions of California. The seismic activity in this region results from the complex movements along the transform boundary between the Pacific Plate and the North American Plate. Along this transform boundary, the Pacific Plate is slowly moving to the northwest relative to the more stable North American Plate at approximately 40 mm/yr in the Bay Area (Page, 1992). The differential movements between the two crustal plates caused the formation of a series of active fault systems within the transform boundary. The transform boundary between the two plates extends across a broad zone of the North American Plate, within which right-lateral strike-slip faulting predominates. In this broad transform boundary, the San Andreas fault accommodates less than half of the average total relative plate motion. Much of the remainder of the motion in the South Bay Area is distributed across faults such as the San Gregorio, Monte Vista-Shannon, Sargent, Hayward, Calaveras, Greenville, and Zayante-Vergeles fault zones.

Due to the site's location in the seismically active San Francisco Bay Area, it will likely experience strong ground shaking from a large (Moment Magnitude [Mw] 6.7) or greater earthquake along with one or more of the nearby active faults during the design lifetime of the project (WGCEP, 2003). It should be noted that the third Uniform California Earthquake Rupture Forecast (UCERF3) time-independent model supports a magnitude-dependent methodology that accounts for historic open intervals on faults without a date of last event constraint. The exact factors influencing differences between UCERF2 and UCERF3 vary throughout the region and depend on the evaluation of specific seismogenic sources. For example, with the 30 yr M≥6.7 probabilities, the most significant changes from UCERF2 are a threefold increase on the Calaveras fault and a threefold decrease on the San Jacinto fault. The model also suggests that the average time between 6.7 Mw or larger events has increased. The UCERF3 model indicates that M≥6.7 probabilities may not be representative of other hazard or loss measures, and the applicability of UCERF3 should be evaluated on a case-by-case basis if required during site-specific ground motion analyses or at the behest of the regulatory agencies (WGCEP, 2014).

Some contributors to seismic risk for the project include the Monte Vista/Shannon, San Andreas, Hayward, Calaveras, Sargent, Zayante-Vergeles, Greenville, and San Gregorio-Hosgri faults. A large-magnitude earthquake on any of these fault systems has the potential to cause significant ground shaking in the vicinity of the planned improvements. The intensity of ground shaking that is likely to occur in the area is generally dependent upon the magnitude of the earthquake and the distance to the epicenter.

Some relevant seismic sources in the San Francisco Bay area and their distances from the site are summarized in Table 3-1.

Table 3-1. Distances to Selected Major Active Fault Surface Traces

Fault Name	Distance and Direction from Site to Surface Fault Traces
San Gregorio	4.4 km southwest
Pilarcitos	4.7 km northeast
San Andreas	7.6 km northeast
Monte Vista-Shannon	18 km southeast
Hayward (southern segment)	38 km northeast
Calaveras	49 km northeast

3.4 GEOHAZARD MAPPING

3.4.1 Active Faults

According to CGS (2018), a Holocene-active fault is defined as a fault that has had surface displacement within Holocene time (the last 11,700 years), and a pre-Holocene fault is defined as a fault whose recency of past movement is older than 11,700 years. The Alquist-Priolo Earthquake Fault Zoning Act only addresses the hazard of surface fault rupture for Holocene-active faults, although pre-Holocene-active faults may also have the potential for future surface fault rupture (CGS, 2018). The Alquist-Priolo Earthquake Fault Zoning Act's main purpose is to prevent the construction of buildings used for human occupancy on the surface trace of active faults. Before a new project is permitted, cities and counties require a geologic investigation to demonstrate that proposed buildings will not be constructed on active faults. According to CGS (2021), the site is not located within an Alquist-Priolo Earthquake Fault Zone.

According to the USGS Quaternary Fault and Fold Database (2017), there are no active faults mapped as crossing the project site (Figure 4).

3.4.2 Liquefaction Hazards

Soil liquefaction is a phenomenon in which saturated granular soils, and certain fine-grained soils, lose their strength due to the buildup of excess pore water pressure during cyclic loading, such as that induced by earthquakes. Soils most susceptible to liquefaction are saturated, clean, loose, fine-grained sands and non-plastic silts. Certain gravels, plastic silts, and clays are also susceptible to liquefaction. The primary factors affecting soil liquefaction include: 1) intensity and duration of seismic shaking; 2) soil type; 3) relative

density of granular soils; 4) moisture content and plasticity of fine-grained soils; 5) overburden pressure; and 6) depth to groundwater.

Witter and others (2006) have generated a map showing liquefaction susceptibility for the San Francisco Bay Area with a 5-class scale that includes very low (essentially in bedrock areas), low, moderate, high, and very high liquefaction susceptibility classes. Witter and others (2006) map the soil underlying the project site as having very low to low liquefaction susceptibility (Figure 5).

According to the Earthquake Zones of Required Investigation for the Half Moon Bay 7.5 Minute Quadrangle, the Mills Creek channel in the project area is within a liquefaction hazard zone. Higgins Canyon Road itself is not mapped within a liquefaction hazard zone.

According to the San Mateo County Hazard Mapping Tool, the project site is located within a very low to low susceptibility liquefaction zone.

3.4.3 Landslide Hazards

A preliminary inventory map showing deep-seated landslides in the Half Moon Bay quadrangle was prepared by Brabb and others (2000) and does not show a mapped landslide within the project area.

According to the Earthquake Zones of Required Investigation for the Half Moon Bay 7.5 Minute Quadrangle, the project site is not within an area mapped as an earthquake-induced landslide hazard zone.

According to the San Mateo County Hazard Map, the project site is located within an area having high landslide susceptibility.

3.5 REGIONAL GROUNDWATER

The California Department of Water Resources identifies the site as lying within the Half Moon Bay Terrace groundwater basin.

A map prepared by CGS (2021) showing the depth of historically high groundwater levels for the Half Moon Bay 7.5-minute quadrangle shows historic high groundwater levels of less than 10 feet along Mills Creek.

Groundwater within the site's hillslope areas is likely variable, with the water table commonly sloping downhill toward the closest drainage axis.

Site-specific groundwater data from our investigation is discussed in Section 4.3.3.

4.0 SITE INVESTIGATION

4.1 SITE RECONNAISSANCE

CE&G performed field reconnaissance of the site on December 22nd, 2022, and January 19th and March 6th, 2023, before and after drilling exploratory borings. The reconnaissance consisted of visually identifying key geologic and geomorphic features, photographic documentation of the project site, determining site access for drilling equipment, and identifying and marking boring locations for clearance by Underground Service Alert (USA). A private utility locator (GeoTech Utility Locating) was used to clear the exploration locations of existing utilities.

4.2 LIDAR SCAN AND SITE RECONNAISANCE

A design-level aerial light detection and ranging (LiDAR) scan of the site was performed on February 17th, 2023, to develop a topographic basemap of the site utilizing an unmanned aerial system. An aerial image of the site was also collected during the drone flight and was used to produce an orthoimage. The topographic basemap and orthoimage were used for documenting surface features and geologic interpretations during our geologic reconnaissance on March 6th, 2023. The observed surface features and our geologic interpretations are presented in Figure 2. Some field observations made by the time of the final site reconnaissance visit are listed below. The below notes also reference site photographs, which are included in Appendix-A.

Site Observations:

- Higgins Canyon Road in the site vicinity is asphalt-paved and ranges from approximately 18 to 21 feet wide.
- There are two slip-out scarps on the downslope side of Higgins Canyon Road. The scarps were previously separated by a narrow knob of road fill (see Figure 2); however, the lower portion of the knob has since failed, and the two scarps are now connected as one large scarp.
- The width of the overall failed area extends about 85 feet along Higgins Canyon Road. This area is located along a sharp outside bend in Mills Creek, which appears to have eroded the base of the slope, resulting in at least four separate slip-out events.
- The scarp has encroached into Higgins Canyon Road by about 12 to 18 inches. Most of the slide mass has been washed away by Mills Creek, except for some boulder-

sized riprap near the toe of the scarp. The scarp exposes shoulder fill and underlying alluvial soils. Bedrock was not observed within the scarp.

- Two utility lines consisting of a one-inch and four-inch plastic pipe were exposed in the upper portions of the scarp. Based on nearby utility markings by USA, the utility lines may belong to AT&T.

- Longitudinal tension cracking is present along the roadway margin.

4.3 SUBSURFACE EXPLORATIONS

The subsurface investigation consisted of drilling three geotechnical borings (B-1, B-2, and B-3). The borings were drilled on January 25, 2023, by Britton Exploration, Inc., using a track-mounted Mobile CME-55 drill rig equipped with 6-inch diameter solid-flight augers.

Borings B-1 and B-2 were drilled and sampled to a total depth of 36 feet below ground surface (bgs), and Boring B-3 was drilled and sampled to a total depth of 40.5 feet bgs. Upon completion, the borings were backfilled with neat cement grout in accordance with San Mateo County permitting requirements. The surface of borings B-1, B-2, and B-3 were dyed black to match pre-existing conditions. Drilling spoils were thinly spread on-site in the vicinity of the boreholes.

4.3.1 Logging and Sampling

The materials encountered in the borings were logged in the field by a CE&G project engineer. The soil was visually classified in the field, office, and laboratory according to the Unified Soil Classification System (USCS) in general accordance with ASTM D2487 and D2488.

During the drilling operations, soil samples were obtained using one of the following sampling methods:

- California Modified (CM) Sampler; 3.0-inch outer diameter (O.D.), 2.5-inch inner diameter (I.D.) (ASTM D1586)
- Standard Penetration Test (SPT) Split Spoon Sampler; 2.0-inch O.D., 1.375-inch I.D. (ASTM D1586)

The CM and SPT samplers were driven 18 inches (unless otherwise noted on the boring logs) with a 140-pound cable-drop hammer dropping 30 inches. The number of blows required to drive the SPT or CM samplers through each 6-inch interval was recorded for

each sample. The results are included in the boring logs in Appendix A. The blow counts included on the boring logs represent the field values and are uncorrected.

Soil samples obtained from the borings were packaged and sealed in the field to reduce the potential for moisture loss and disturbance. The samples were then taken to CE&G's laboratory in Hayward, California, and Cooper Testing Labs in Palo Alto, California, for testing and/or storage.

4.3.2 Soil Conditions Encountered

Subsurface soil conditions in the borings were generally consistent with regional geologic mapping. The following soil conditions were encountered beneath the surface:

Pavement

Approximately 4 to 8 inches of asphaltic concrete was encountered over another 5 inches of concrete at the surface of borings B-1, B-2, and B-3.

Artificial Fill

Fill was encountered in borings B-1, B-2, and B-3 to depths of approximately 5 to 10 feet bgs. The encountered fill generally consists of stiff to hard clay with mixtures of sand and gravel.

Quaternary Alluvium

Alluvial deposits, once deposited by Mills Creek, were encountered beneath the fill materials in each boring. The alluvium that was encountered to depths of approximately 30 to 35 feet generally consists of medium-dense to very dense gravels with mixtures of sands and clay, stiff clays, and very dense silts with mixtures of sands and gravels.

Purisima Formation Bedrock

Bedrock was encountered in Borings B-1 and B-2 at approximately 35 feet bgs and in Boring B-3 at approximately 30 feet bgs to the maximum depths explored. Bedrock consisted of soft to moderately hard sandy claystone, with moderately severe to moderate weathering. The bedrock is part of the Purisima Formation.

A detailed description of the encountered materials is included in the boring logs in Appendix A. Our interpretation of the soil profile below the project area is shown in Figure 7.

4.3.3 Groundwater Conditions Encountered

Groundwater was encountered in Borings B-1 and B-2 at approximately 32 and 35 feet bgs, respectively. Groundwater was not encountered in Boring B-3. This observation was based on the retrieval of wet samples at depth and through measurement after equilibrium.

4.3.4 Geotechnical Laboratory Testing

Testing was performed to obtain information concerning the qualitative and quantitative physical properties of the samples recovered during the subsurface exploration program. Tests were performed by Cooper Testing Labs in Palo Alto, California, and CE&G's laboratory in Hayward, California, in conformance with applicable ASTM standards. The following tests were performed:

- Moisture Content and Dry Unit Weight (ASTM D2216)
- Particle Size Analysis (ASTM D6913)
- Atterberg Limits (ASTM D4318; dry method)
- Triaxial Unconsolidated-Undrained (ASTM D2850)
- R-Value (ASTM D2844)
- Corrosion Caltrans Package includes:
    - Resistivity (Minimum) (Caltrans 643)
    - pH (Caltrans 643)
    - Chloride (Caltrans 422m)
    - Sulfate (Caltrans 417m)

Laboratory test results are shown on the boring logs presented in Appendix B and on laboratory test result sheets in Appendix C.

5.0 CONCLUSIONS AND DISCUSSION

5.1 GENERAL SUMMARY

In our judgment, high groundwater levels in combination with overly saturated roadway embankment fill soils and erosion at the toe of the slope by high flows in Mills Creek are likely the main contributing factors to the driving forces of the landslides. This judgment is based on observed seepage within the slide scarp areas downslope of the road and along the outboard edge of the road. Groundwater was also encountered in our borings at the time of drilling.

Based on the results of our investigation, we believe the site is geologically and geotechnically suitable for implementing a retaining wall repair. Geotechnical considerations to note during project design and construction are:

- Drillability and excavatability of encountered materials;
- Seismic design considerations for the project;
- Landsliding;
- Corrosion; and
- Maintaining proper surface and subsurface drainage.

Our evaluations and recommendations are based on the information obtained during this investigation. It is our opinion the site is geologically and geotechnically suitable for implementing a retaining wall repair. A discussion of our findings and recommendations for repairs to be considered for mitigating slope erosion are included in the following sections.

5.2 DRILLABILITY AND EXCAVATABILITY

Subsurface exploration was completed using 6-inch-diameter solid flight augers and encountered fill soil from the surface to depths of approximately 9 to 10 feet below the ground surface. Alluvial soil was encountered below the fill and extended to claystone bedrock that was encountered between 30 and 35 feet below the ground surface. Although auger refusal was not encountered, split-spoon drive sampling performed during the subsurface exploration operation encountered refusal (>50 blows per 6 inches) within the underlying bedrock in the borings. Based on the subsurface exploration, we anticipate conventional earthwork and excavation equipment may be used to construct and excavate the fill and native soils and upper bedrock consisting of very soft to medium hard sandy siltstone.

5.3 SEISMIC HAZARDS

Large magnitude earthquakes and strong ground shaking are likely to affect the project area within the design lifetime of the proposed improvements. Peak ground shaking parameters are presented below in Section 6.2 and should be considered in the design of the proposed improvements. Local ground-modifying effects of high-intensity ground shaking are considered secondary seismic effects. Our review of these processes is presented below.

- In our judgment, the potential for fault ground rupture or coseismal faulting to significantly affect the proposed improvements is low.
- In our judgment, the potential for ridgetop fissuring, ridgetop shattering, ridgetop spreading, or other seismically induced ground deformation to significantly affect the proposed improvements is low.
- In our judgment, the potential for soil liquefaction to significantly affect the proposed project is low due to the absence of loose to medium-dense granular soils below the groundwater table.

5.4 CREEK BANK EROSION

The banks of Mills Creek are generally over-steepened in the project area and are particularly susceptible to instability during the rainy season when flow velocity, depth, and volume are significantly greater. The creek conveys stormwater that can produce both high water levels and high-velocity flows during peak storm conditions. The creek geometry, along with the potential for stormwater events, makes the creek bank susceptible to erosion and undercutting under these conditions. Creek bank erosion (especially at the toe of the slope) is a primary cause of shallow slope failures and slumping, which leads to further erosion and a renewed cycle of slope degradation. Creek bank erosion should be considered in the primary design and construction of the project improvements.

5.5 GROUNDWATER AND CREEK FLOWS

Groundwater levels can fluctuate seasonally and/or over a period of years and could rise higher than the groundwater elevations encountered in the borings. During our investigation, groundwater was encountered below the elevation of the creek bottom, which suggests this section of the creek was recharging the local alluvial fan deposits at that time. Slope drainage should be incorporated into the repair of the slope to minimize hydrostatic pressures in the slope.

These conditions should be considered during the analysis, design, and construction of the permanent slope repair and, in particular, the design height of the erosion protection on the bank slope.

5.6 LANDSLIDING

As previously described, no evidence of deep-seated landsliding was detected at the site. Relatively restricted shallow sloughing (landsliding) of alluvium and the uppermost, severely weathered bedrock appears to have been involved in the landslide. Such shallow instability was likely associated with the concentration of surface runoff from the roadway onto the slope below the roadway and the water level rising within the Mills Creek channel.

In our judgment, the potential for deep-seated landsliding (involving bedrock) to adversely affect the site improvements is low under static conditions and low to moderate under seismic conditions.

We also judge the potential for shallow-seated landsliding (under static and seismic conditions) to adversely affect the site improvements to be low, provided site improvements are appropriately designed and constructed and surface runoff is appropriately managed.

5.7 SLOPE STABILITY ANALYSIS

Analysis has been performed to evaluate the existing slope and recommended repair alternative. Laboratory testing was performed on soil samples obtained from the borings to aid in the classification and estimation of the shear strength properties of the soils encountered. Slope stability analysis was performed using the computer program Slide2 by Rocscience (version 9.012) to assess the stability of the current slope and a general slope repair configuration. Cross-sections were developed from the CE&G LiDAR scan and our site observations. Characterization of the soil stratigraphy was determined from the borings performed at the site and subsequent laboratory testing. Soil strength parameters used in the analysis were estimated using laboratory shear strength test results and soil strength correlations based on the field data collected paired with slope stability back-analysis checks. The results of the analyses performed are presented in Appendix D, Slope Stability Analysis. For slope stability modeling, the soil material and strength properties upslope are estimated where no borings were drilled.

A back analysis was completed to assist in estimating the material properties of the encountered soil and bedrock to model the existing conditions. As observed in the field, the creek bank is exhibiting past material erosion and is not considered evidence of the overall

global stability of the slope. Riverbank erosion is mainly caused by high waters due to storms followed by a drawdown during the days after. Table 5-1 below shows the results of the back analysis.

Table 5-1. Slope Stability Back Analysis

Analysis Condition	Factor of Safety
Existing Model	0.99

A slope stability analysis featuring a generalized repair design configuration was completed to analyze the slope after it has been repaired, evaluating the high groundwater and seismic conditions of the slope. An additional repair design configuration with Rock Slope Protection (RSP) was also analyzed. Table 5-2 shows the results of the slope stability analysis with generalized repair design configurations.

Table 5-2. Slope Stability Analysis of Generalized Repair Design Configuration

Analysis Condition	Factor of Safety
Retaining Wall	1.20
Retaining Wall – Seismic	0.87
Wall w/ RSP	1.71
Wall w/ RSP – Seismic	1.09

In summary, we offer the following conclusions from the slope stability analysis:

1. Control of subsurface drainage is essential for the long-term stability of any repair.

2. A slope repair increases the factor of safety of the slope during high groundwater conditions, particularly with subsurface drainage incorporated into the repair.

If it is determined that a retaining wall will be constructed on the slope, it should be anchored into bedrock.

Section 5.10 below provides discussions of the slope repair alternatives.

5.8 LIQUEFACTION

The soils along the creek channel are within a liquefaction hazard zone mapped by the State of California. To address this, we evaluated the above-noted criteria required for

liquefaction to occur. Based on a review of historic groundwater levels, the highest groundwater level recorded in the site vicinity is approximately 32 to 35 feet below the road's ground surface. The soils encountered below 32 feet include dense to very dense granular soils and/or bedrock (minimum blow count = 40 blows per foot, uncorrected), which are not considered susceptible to liquefaction. In summary, based on subsurface information collected during this investigation, we judge the potential for significant settlement to occur as a result of liquefaction at this site to be low because the groundwater level is generally low, the granular soils below the site are generally too dense to liquefy.

Seismic densification is the densification of unsaturated, loose to medium-dense granular soils due to strong vibrations such as that resulting from earthquake shaking. There is a potential for seismic densification of on-site native loose to medium-dense granular soils. We estimated approximately ½- to 1-inch of settlement within the granular soils comprising the creek bank may result from strong ground shaking during a major earthquake.

5.9 CORROSION

Corrosion testing, in general accordance with Caltrans methods, was performed on one soil sample from boring B-1. Testing results are presented in the following table:

Table 5-3. Corrosion Testing Results

Boring (depth in feet)	Resistivity (Ohm-cm)	Chloride (mg/kg)	Sulfate (mg/kg)	pH
B-1 (1.5)	1586	94	109	7.1

Caltrans Corrosion Guidelines, May 2021, identify a site as corrosive for structural elements if one or more of the following conditions exist:

- Chloride concentration is 500 ppm or greater;
- Sulfate concentration is 1,500 ppm or greater;
- pH is 5.5 or less.

A minimum resistivity value for soil and/or water less than 1500 ohm-cm indicates the presence of high quantities of soluble salts and a higher susceptibility to being corrosive. Based on the results of the laboratory testing performed, the tested soil sample is not considered to be corrosive to metals or concrete based on the Caltrans criteria listed above.

According to ACI 318 Section 4.3, Table 4.3.1:

- Sulfate concentration below 0.10 percent by weight (1,000 ppm) is negligible (no restrictions on concrete type)
- Water-soluble chloride content of less than 500 ppm is generally considered non-corrosive to concrete.

Based on the results of the laboratory testing performed, the soil sample tested is considered not corrosive to concrete.

Corrosion results should be considered preliminary and are an indicator of potential soil corrosivity for the sample tested. Other soils found on-site may be more, less, or of similar corrosive nature. Our scope of services does not include corrosion engineering; therefore, a detailed analysis of the corrosion tests is not included.

5.10 REPAIR ALTERNATIVES

We have considered several conceptual alternatives to repair the slope. For a permanent repair to be implemented, several factors specific to the site will have an impact on the development and implementation of the permanent repair, including:

- Lateral extent to be repaired,
- Hydraulic design conditions,
- Shoring of existing roadway,
- Limited right-of-way
- Overhead clearance and utilities,
- Environmental requirements for permitting,
- Planning and coordination of construction staging areas, and
- Potential disturbance to trees in the project area.

We considered repair alternatives such as earth repairs and retaining walls.

5.10.1 Earth Repairs

Earth repairs may require an excavation encroaching into the pavement and may require the road to be closed for the duration of the construction. Earth repairs would require exporting all excavated material and importing engineered fill to replace the material for

the entire length of the repair. An earth repair would allow for the placement of subdrains and reinforced geogrid to stabilize the slope. This repair option would allow for the placement of erosion protection measures at the toe of the slope, such as vegetated slope protection (VSP) consisting of planted rip rap, that intends to decrease the flow velocity of the creek.

5.10.2 Soldier Pile and Lagging Wall with Tiebacks

A soldier pile and lagging wall with tiebacks may require significantly less encroachment on the road, allowing vehicles to pass by during construction. Tiebacks drilled and placed along the wall may encroach onto nearby easements, depending on the length and configuration of the tiebacks. A tieback wall would allow for the placement of erosion protection measures, such as VSP (planted rip rap), that intends to decrease the flow velocity of the creek. A tieback wall would allow for the placement of subdrains behind the wall to remove the buildup of hydrostatic pressures.

Additionally, we recommend the final design of the riverbank repair consider potential changes in river flows resulting from climate change, if applicable.

5.11 RECOMMENDED ALTERNATIVE

Based on our preliminary engineering evaluation, we recommend a soldier pile and lagging wall with tiebacks and VSP down to the creek bottom for the following reasons:

1. Trees removed as part of site clearing can be recycled as log deflectors or root wads placed within the VSP at the slope bottom for erosion control,

2. VSP provides both resistance to higher flow velocity/shear stresses typically observed in sharp channel meanders and can accommodate vegetation growth,

3. Reduced excavation depths required and allows for more efficient shoring designs,

4. Confine limits of native soil replacement with VSP to areas most probable to be subject to high shear stresses that cause erosion and scour.

Construction duration and phasing will largely be determined by the contractor's proposed approach and schedule. Overhead utilities above the channel bank, as well as subsurface utilities beneath Higgins Canyon Road, must be considered for each of the alternatives.

5.12 GEOTECHNICAL CONSIDERATIONS

Some geotechnical issues that will affect the design and construction of the proposed creek slope bank repair are as follows:

- **Temporary Excavation Configuration** – Based on the County's limited right-of-way, steep temporary construction slopes would be required as part of the creek bank repair.

- **Creek Bank Erosion** – Flows in the creek may undermine the toe of the slope, requiring erosion control to maintain the stability of the permanently repaired slope.

- **Drillability** – Subsurface exploration was completed using solid-flight augers and did not encounter auger refusal to the maximum depths explored. Based on the subsurface exploration, we anticipate that an appropriately sized drill rig equipped with rock bits will be able to drill through the soil and bedrock underlying the project site.

- **Retaining Wall** –Based on the site geometry, depth to competent materials, and proposed retaining wall layout, the anticipated wall heights are achievable through a tieback wall approach. Advantages to a tieback wall include shorter steel and smaller steel section, whereas disadvantages include a more complex design, more steps in the construction, and the need to install tiebacks. Recommendations have been provided in Section 6 for the tieback retaining wall.

- **Surface Water Drainage** – Surface water runoff should be collected from the roadway above and discharged in an appropriate energy dissipater away from the slide area below the proposed repair. Surface drainage improvements should be designed to adequately collect and accommodate the volume of water that reach these drainages.

6.0 DESIGN AND CONSTRUCTION RECOMMENDATIONS

6.1 EXCAVATIONS

Excavations for the project are anticipated to be up to but not limited to 25 feet deep for the construction of the repair alternatives. We anticipate that an appropriately sized backhoe or excavator can excavate the soil underlying the project site. The narrow road may limit excavation equipment size and laydown areas along the road. Excavations for the repair are anticipated to encounter stiff clayey fill soils overlying medium dense to very dense granular soils.

Temporary excavation slopes should not be steeper than 1.5H:1V and should conform to the requirements of Occupational Safety and Health Administration (OSHA) requirements, and the State of California Department of Transportation, Trenching and Shoring Manual for earthen slopes. The stability and safety of excavations, braced or unbraced, are the contractor's responsibility.

CE&G should be retained to observe subsurface conditions at the time of excavation to confirm assumed conditions and provide revised recommendations, if necessary.

6.2 EARTHWORK

Grading required for the project will include excavation to develop temporary site access and create a bench for drilling and construction of the soldier piles and tiebacks. This bench will also be needed for the placement of excavated material as engineered fill in order to approximately restore the original grade at the site. Minor grading could also be required to modify or construct drainage facilities and to distribute excess excavated material on-site, as appropriate.

Before the commencement of the grading operation, the site should be cleared for the buried or overhead utilities. Care should be taken not to damage any utilities present. This should be done in coordination with utility providers. The site should be grubbed of existing vegetation and any large fallen trees. All existing debris should be removed from the site, including but not limited to existing pavements and buried pipes within the work area. Before engineered fill is placed, loose soil and vegetation should be removed from the areas to receive fill. All depressions created by tree and stump removal should be excavated to firm soil or bedrock prior to placement of fill.

6.2.1 Engineered Fill Placement and Compaction

On-site soils that will likely be excavated as part of the retaining wall construction may be used as general engineered fill. Fill should be placed and compacted to a relative compaction of 90 percent ASTM D-1557 latest edition. Fill materials shall be spread evenly and compacted in uniform lifts not exceeding 8 inches in uncompacted thickness. Fill materials not meeting the specified relative compaction shall be ripped, moisture conditioned, and reworked until the required relative compaction and moisture content are attained.

6.2.2 Select Import Backfill

All imported fill must be reviewed and approved by the geotechnical engineer before importation to the site. A minimum of five days will be required to evaluate and test the suitability of all proposed imported materials. All select import backfill materials should meet the following criteria:

The import materials shall be non-expansive and have a Plasticity Index of less than 12 percent and a Liquid Limit of 30 percent or less with a minimum friction angle of 34 degrees. The import material shall not contain rocks or lumps larger than 6 inches in greatest dimension and should not contain more than 15 percent of the material larger than 3 inches. These materials shall be free of organic debris or contaminated materials.

Imported fill materials should be placed and compacted to a minimum of 90 percent relative compaction at a moisture content of at least 2 percent over optimum as determined by the ASTM D-1557 (latest revision) test procedure. Fill material in the upper 24 inches of the pavement subgrade shall be compacted to a minimum of 95 percent relative compaction.

6.2.3 Wet Weather Construction

We recommend that earthwork not be performed during wet weather seasons. If site grading and construction are to be performed during rainy periods, the owner and contractors should be fully aware of the potential impact of wet weather. Rainstorms could cause unstable excavations, delays to construction, and damage to previously completed work by saturating compacted fills or subgrades or flooding excavations.

Earthwork during rainy months will require extra effort and caution from the contractors. The contractor should be responsible for protecting his work to avoid damage by rainwater. Standing pools of water should be pumped out immediately. The project construction bid documents should address construction during wet weather conditions.

We recommend that the contractor submit a wet weather construction plan outlining procedures they will employ to protect their work and minimize damage to their work by rainstorms.

6.3 SEISMIC DESIGN PARAMETERS

Due to the site's proximity to the numerous active fault systems which traverse the greater San Francisco Bay Area, the project site will likely be subjected to the effects of a major earthquake during the design life of the proposed improvements. The effects are likely to consist of significant ground accelerations. These ground-type movements may cause damage to the proposed improvements. Therefore, we recommend that, at minimum, the structural systems for the proposed improvements be designed per the requirements of Chapter 16 of the 2019 California Building Code and ASCE 7-16, Supplement 3, for Site Class D type soils and Risk Category 1, and latitude 37.445993, longitude -121.404572. The design parameters yielded an MCE PGA of 0.873g. The ASCE 7-16 seismic design parameters for the site are included in Table 6-1. 2019 CBC Seismic Design Parameters .

Table 6-1. 2019 CBC Seismic Design Parameters

Item	Design Value
Site Soil Class Definition	D
Ss – 0.2 Second Spectral Response Acceleration	1.899
S_1 – 1.0 Second Spectral Response Acceleration	0.718
Fa – Values of Site Coefficient	1.0
Fv – Value of Site Coefficient	1.7*
S_{DS} – Designed Spectral Response Acceleration for Short Periods	1.266
S_{D1} – Designed Spectral Response Acceleration for 1-Sec Periods	1.221
S_{MS} – MCER Spectral Response Acceleration Parameter (g)	1.899
S_{M1} – MCER Spectral Response Acceleration Parameter (g)	1.7x0.718x1.5=1.831**
PGA	0.794
PGA_M	0.873

* - This value shall only be used for the calculation of T_S and the parameters S_{M1} and S_{D1} before they are increased by 50%

** - In accordance with the EXCEPTION to ASCE 7-16, Section 11.4.8, the value of the parameter S_{M1} determined by Eq. (11.4-2) has been increased by 50% for all applications of S_{M1} to eliminate the need for performing a ground motion hazard analysis.

As a result of earthquake shaking, the soil behind the retaining walls will exert an additional horizontal force on the walls. We recommend using an additional seismic equivalent fluid pressure (EFP) of 39 PCF to model the earthquake-induced force on the walls. The seismic equivalent fluid pressure was selected based on the design response spectrum peak ground acceleration (PGA), which is 2/3 of the Maximum Considered Earthquake (MCE) PGA, determined using the United States Geologic Survey (USGS) Earthquake Hazards Program website (USGS, 2015) for Site Class D type soils. Using methods published by Sitar and Agusti 2013 in their paper for *Seismic Earth Pressures on Retaining Structures in Cohesive Soils,* a seismic equivalent fluid pressure equal to the following was used for a cantilever (level) retaining wall.

EFP = 25 PCF

Based on load factors of 1.2 used for earth pressures and 1.0 for seismic, the seismic EFP was reduced by 1.2.

6.4 RETAINING WALLS

To stabilize the existing slope, we recommend constructing a soldier pile and concrete lagging retaining wall with tieback anchors. Based on the results of our subsurface exploration, the depth to the top of bedrock along the retaining wall alignment extends to approximately 30 feet below the anticipated top of the wall, and the existing slope below the wall is generally 1H:1V in inclination. Retaining walls with heights of 20 feet and with the geometry that exists along the proposed alignment typically require deep piers with larger structural elements for a cantilever wall or require the use of tiebacks in order to scale down the size and depth of the soldier piles. The end piers for the wall may be designed as cantilever structural elements, and the interior piers should be designed with tiebacks incorporated into the structure. Recommendations for this wall type are included in the following sections.

It should be noted that the suitability for repair using a geogrid-reinforced slope or a geogrid-reinforced wall was also considered. These approaches were eliminated as likely economically infeasible due to the difficult construction access on the steep site slopes for an earthwork solution and the long distance down the slope that would be required to start a fill slope as well as the large volume of required excavation and the space required for soil stockpiling and processing, as well as the likely need to work within the creek channel.

6.4.1 Lateral Earth Pressures

Static lateral earth pressure will be imposed on all shored excavations. Table 6-2 summarizes the lateral earth pressures recommended for use in the design of unbraced temporary shoring. Active pressure should be assumed for conditions where the top of the wall is free to deflect up to ½ inch. Passive pressure should be ignored for a depth of 24 inches in unpaved areas and may be utilized to resist overturning and sliding. Where structures will be located below groundwater, hydrostatic pressures are already considered in the passive lateral earth pressure values shown in Table 6-2.

Table 6-2 – Lateral Earth Pressures – Shoring

Pressure Type	Above Creek Bed		Below Creek Bed	
	Above Groundwater Level (Equiv. Fluid Pressure)	Below Groundwater Level (Equiv. Fluid Pressure + Hydrostatic)	Above Groundwater Level (Equiv. Fluid Pressure)	Below Groundwater Level (Equiv. Fluid Pressure + Hydrostatic)
Active	50 pcf	90 pcf	35 pcf	90 pcf
At-Rest	70 pcf	100 pcf	50 pcf	90 pcf
Passive	355 pcf [1]	245 pcf [1]	540 pcf	345 pcf

[1] where slope (1.5H:1V or flatter) exists in front of the shoring wall, reduce to 120 PCF. Increase to table value where the horizontal distance from the wall to the slope face is 10 feet or greater.

The design of unbraced shoring will likely be controlled by deflections. Lateral deflection at the top of the shoring shall not be greater than ½-inch.

If the temporary shoring will be braced, rectangular, or trapezoidal loading diagrams such as those recommended by Terzaghi & Peck, Tschebortarioff, and others (Caltrans Trenching and Shoring Manual and FHWA GEC No. 4) should be used. These methods generally correlate the earth pressure load to a percentage of the unit weight of the soil times the height of the excavation. The method and loading should be determined by the contractor and provided to the Engineer for review.

If a rectangular or trapezoidal loading is used, the native sandy deposits can be assumed to have a uniform lateral load of 30H psf for the full height (H) (in feet) of the excavation shoring plus a lateral fluid pressure of 62.4 PCF (unit weight of water) starting at the design groundwater elevation to account for groundwater. It is recommended that the contractor's shoring design engineer evaluate high and low groundwater cases to confirm which case governs the design. Shoring for excavations that penetrate below an imaginary

plane having an inclination of 1½:1 (horizontal to vertical) extending down from the bottom edge of the foundations must be designed for foundation surcharge pressures and must limit deflections to less than ½ inch. The shoring design should consider surcharge loading from traffic on the adjacent areas and construction equipment adjacent to excavations.

6.4.2 Tieback Retaining Wall

The tieback soldier pile retaining wall should be designed for unrestrained (active) conditions using the following:

- The planned wall alignment is not yet known. However, based on the topography and soil conditions, we estimate the wall height to be approximately 18 feet. For walls over about 12 feet in height, tiebacks will likely be needed.
- The first design loading condition should be for a cantilever wall extending to the excavation limits for the tiebacks. For the design of the cantilever section, we recommend an active equivalent fluid pressure of 50 pcf and a passive equivalent fluid pressure of 360 pcf to a depth of 9 feet and an active equivalent fluid pressure of 40 pcf and a passive equivalent fluid pressure of 420 pcf between 9 and 18 feet. The passive pressure should be taken on two pile diameters and begin 5 feet below the bench excavation for the installation of the tiebacks. The active equivalent fluid pressure should be assumed to act continuously along the wall. This loading condition is temporary for construction purposes and should have a target factor of safety of 1.2.
- A passive equivalent fluid pressure of 540 psf/ft starting 3 feet below the bottom of the creek bed acting over two pier diameters;
- A seismic equivalent fluid pressure of 25 pcf acting over the full height of the retaining wall. Seismic loading should be applied in addition to the above active equivalent fluid pressure ignoring traffic live load.
- For the tieback loading condition, a trapezoidal-shaped load distribution based upon the apparent earth pressure diagram on page 51 of the FHWA manual (Figure 24 – included in Appendix E). The FHWA diagram shows the load distribution to the anchors based on the anchor locations.
- Determination of the tieback force and soldier pile maximum moment should be based upon comparing the requirements from both temporary cantilever loading and final tieback loading conditions. This requirement is necessary since the

requirements will vary at each stage, and the pile and tieback must be designed to handle both cases.

- Tieback rods should be a minimum of 1-inch diameter, ASTM A722, Grade 150, Class I double corrosion protected, or equivalent;
- The tieback should be locked off at 100 percent of the design load;
- For preliminary tieback design, tiebacks should be drilled at an inclination of 15 to 20 degrees below the horizontal and have an unbounded zone of 10 feet;
- Ultimate ground-grout bond strength of 110 psi is recommended for preliminary tieback design. This bond strength assumes the tieback is pressure grouted. For gravity-grouted anchors, the average ultimate bond stress is significantly lower at 20 psi.
- The tieback should be designed with a post-grout tube in the event secondary grouting is determined to be necessary;
- Since the construction methods used to install tiebacks can dramatically influence the capacity of the anchors, the final tieback design and length of the bonded zone shall be the responsibility of the contractor to achieve the design capacity. Anchors may use secondary grouting techniques;
- Proof and performance testing should be performed to a maximum load of 1.33 times the dead load. At least one anchor shall be performance tested. Anchor acceptance should conform to the criteria included in the FHWA manual for creep and apparent free length;
- Minimum pile diameter of 30 inches;
- Minimum pile spacing of three diameters on center;
- Minimum pile depth of 10 feet below the creek bottom;
- Minimum tieback anchor diameter of 6 inches;

The active and seismic equivalent fluid pressures assume the retaining wall will be backfilled using on-site materials excavated during soldier pile drilling operations or select import backfill with a minimum friction angle of 34 degrees and as outlined in Section 6.1.

6.4.3 Retaining Wall Drainage

The above equivalent fluid pressures for a tieback retaining wall assume fully drained conditions behind the soldier pile wall. Therefore, the wall should be provided with a full-

height back wall drainage consisting of a 12-inch-wide layer of Caltrans Class 2 permeable material that stops 12 inches below the ground surface. Native clayey soil or aggregate base and asphalt pavement should be used for the upper foot of the wall backfill and should cap the drainage material. A clean coarse gravel or drain rock may be used as an alternative to the Class 2 Permeable drainage material. If coarse gravel or drain rock is selected as a drainage material, it should be separated from all adjacent soil by an engineering filter fabric such as Mirafi 140N or a similar geotextile. Enough space should be provided between the laggings to allow seepage through the face of the wall.

In lieu of the above-mentioned drain rock, a prefabricated drainage composite such as "CCW MiraDRAIN 6000XL" or equivalent may be used for drainage behind the retaining walls. This drainage composite should be installed in accordance with the manufacturer's recommendations on the back of the tieback wall at least 1 foot below the ground surface and should be wrapped around a drainage pipe at the base of the wall.

6.4.4 Construction Considerations

The contractor is expected to provide suitable equipment to drill soldier piles. It is recommended that the contractor fully evaluate considerations such as the use of additional specialized equipment during the bidding process.

The bottoms of soldier piles should be dry and free of loose cuttings and debris before installing the steel beams and concrete. This shall be done to satisfy the engineer or geologist from Cal Engineering & Geology, Inc., who observes the drilling operations. The concrete should be placed carefully in the drilled holes so that over-pouring of the piles (mushrooming at the top) does not occur and the concrete does not have a free fall drop over 4 feet.

Free groundwater was encountered at 32 to 35 feet depths during the exploratory drilling. The drilling contractor should be prepared to drill and place steel and concrete for the piles on the same day. Under no circumstances shall water be allowed to remain in a drilled pile hole overnight. Should this occur, it will be necessary for the contractor to enlarge the hole to a wider diameter and/or a greater depth to the satisfaction of the engineer or geologist from our office who is observing the drilling operation.

6.5 VEGETATED SLOPE PROTECTION (VSP)

Unprotected steep slopes are prone to future localized slumping and shallow slope failures. Remediation to reduce the potential for future slope erosion and shallow failures include flattening and/or armoring the existing slopes. We recommend that the toe of the creek

bank slopes be armored with planted riprap or a similar form of erosion protection to minimize erosion. Slope armoring, such as the placement of planted riprap slope protection at the toe of the slopes, will reduce the potential for toe erosion and progressive slope instability.

6.6 SURFACE DRAINAGE

Surface drainage along the roadway is to be considered by the Design Team and incorporated into the project plans where appropriate. Collected surface water from the roadway should be conveyed by a pipe to a discharge point below active sliding or gullying, and appropriate energy dissipaters should be constructed at the outlet points to reduce the potential for future slope instability or erosion/gullying.

6.7 SOIL OR BEDROCK CORROSION POTENTIAL

The corrosion potential of the on-site soil and bedrock materials was tested as part of this investigation. A sample 1.5 feet deep from boring B-1 was chosen to have resistivity and chloride and sulfate tests at Cooper Testing Laboratory. Following the standard stated in California Test 643, the resistivity of the sample was determined, and the sample was classified as one with low corrosion potential. However, since the site is adjacent to a creek, and due to the resistivity value of the tested sample being near the threshold value for corrosive soils, the County should use a coating for all steel beams and use Class 1 corrosion protection for tiebacks. If the County has previous experience with the corrosivity of the on-site soils and import material, and/or additional corrosion testing is completed, these recommendations can be modified accordingly.

7.0 LIMITATIONS

The conclusions and recommendations presented in this report are based on the information provided regarding the planned construction and the results of the geologic mapping, subsurface exploration, and testing, combined with interpolation of the subsurface conditions between boring locations. Site conditions described in the text of this report are those existing at the time of our last field reconnaissance and are not necessarily representative of the site conditions at other times or locations. This information notwithstanding, the nature and extent of subsurface variations between borings may not become evident until construction. If variations are encountered during construction, Cal Engineering & Geology, Inc. should be notified promptly so that conditions can be reviewed and recommendations reconsidered, as appropriate.

It is the County's responsibility to ensure that the recommendations contained in this report are carried out during the construction phases of the project. This report was prepared based on preliminary design information provided, which is subject to change during the design process. At approximately the 90 percent design level, Cal Engineering & Geology, Inc. should review the design assumptions made in this report and prepare addenda or memoranda as appropriate. Any modifications included in these addenda or memoranda should be carefully reviewed by the project designers to make sure that any conclusions or recommendations that are modified are accounted for in the final design of the project.

The findings of this report should be considered valid for a period of three years unless the conditions of the site change. After a period of three years, CE&G should be contacted to review the site conditions and prepare a letter regarding the applicability of this report.

This report presents the results of a geotechnical and geologic investigation only and should not be construed as an environmental audit or study. The evaluation or identification of the potential presence of hazardous materials at the site was not requested and was beyond the scope of this investigation and report.

The conclusions and recommendations contained in this report are valid only for the project described in this report. We have employed accepted geotechnical engineering procedures, and our professional opinions and conclusions are made in accordance with generally accepted geotechnical engineering principles and practices. This standard is in lieu of all other warranties, either expressed or implied.

8.0 REFERENCES

ASCE 7 Hazard Tool, Online, Accessed February 2023, Data Source: USGS Seismic Design Maps based on ASCE/SEI 7-16.

ASTM International, Standard Specification for High-Strength Steel Bars for Prestressed Concrete, ASTM A722/A722M-18

ASTM International, 2023, Standard Test Method for Unconsolidated-Undrained Triaxial Compression Test on Cohesive Soils, ASTM D2850-23

ASTM International, 2021, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)): ASTM D1557-12 (2021)

ASTM International, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils, ASTM D4318-17

ASTM International, Standard Test Methods for Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis, ASTM D6913/D6913M-17

ASTM International, Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass, ASTM D2216-19

ASTM International, Standard Test Method for Standard Penetration Test (SPT) and Split-Barrel Sampling of Soils, ASTM D1586/D1586M-18

ASTM International, Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System), ASTM D2487-17

ASTM International, 2017, Volume 04.08 Soil and Rock (I): D421-D5876.

Brabb, E.E., and others, 1998, Geologic of the onshore part of San Mateo County, California: A digital Database: U.S. Geological Survey Open-File Report 98-137.

Brabb, E. E. R., Cotton, S., Kropp, W. R., Wright, A. L., Zinn, R. H., Mills, E. N., and Joanna, E., 2000, Possible costs associated with investigating and mitigating some geologic hazards in rural parts of San Mateo County, California.

Brabb, E. E., Graymer, R.W., and Jones, D. L., 2000, Geologic map and map database of the Palo Alto 30'X 60'quadrangle, California.

California Building Standards Commission, 2019 California Building Code.

California Geological Survey, 2008, Guidelines for Evaluating and Mitigating Seismic Hazards in California. CGS Special Publication 117A.

California Geological Survey, 2018, Earthquake Fault Zones: A Guide for Government Agencies, Property Owners/Developers, and Geoscience Practitioners for Assessing Fault Rupture Hazards in California. CGS Special Publication 42.

California Geological Survey, 2021, Earthquake Zones of Required Investigation Map for the Half Moon Bay 7.5 Minute Quadrangle.

California Geological Survey, 2021, Seismic Hazard Zone Report for the Half Moon Bay 7.5-minute Quadrangle, San Mateo County, California: California Geological Survey Seismic Hazard Zone Report 132.

Caltrans-California Department of Transportation Division of Engineering Services Materials Engineering and Testing Services Corrosion and Structural Concrete Field Investigation Branch (2021). Corrosion Guidelines, Version 3.2. May 2021.

Cochrane, G. R., Dartnell, P., Greene, H. G., Johnson, S. Y., Golden, N. E., Hartwell, S. R., and Bretz, C. K., 2014, California State Waters Map Series—Offshore of Half Moon Bay, California. US Geological Survey Open-File Report, 1214.

Department of Water Resources (DWR), 2019, Groundwater Basin Boundary Assessment Tool, accessed February 2023.

Federal Highway Administration, 1999, FHWA-IF-99-015, *Geotechnical Engineering Circular No. 4 – Ground Anchors and Anchored Systems*, June 1999.

Graymer, R. W., Moring, B. C., Saucedo, G. J., Wentworth, C. M., Brabb, E. E., & Knudsen, K. L., 2006, Geologic map of the San Francisco Bay region. Reston, VA, USA: US Department of the Interior, US Geological Survey.

Knudsen, K. L., Witter, J. M., Wentworth, R. C., Helley, C. M., Nicholson, E. J., Wright, R. S., and HM Brown, K. M., 2000, Preliminary maps of Quaternary deposits and liquefaction susceptibility, nine-county San Francisco Bay Region, California: A digital database.

San Mateo County Local Hazard Mitigation Plan, 2016, vol. 1. https://planning.smcgov.org/local-hazard-mitigation-plan

U.S. Geological Survey and California Geological Survey, 2017, Quaternary fault and fold database for the United States, accessed February 2023.

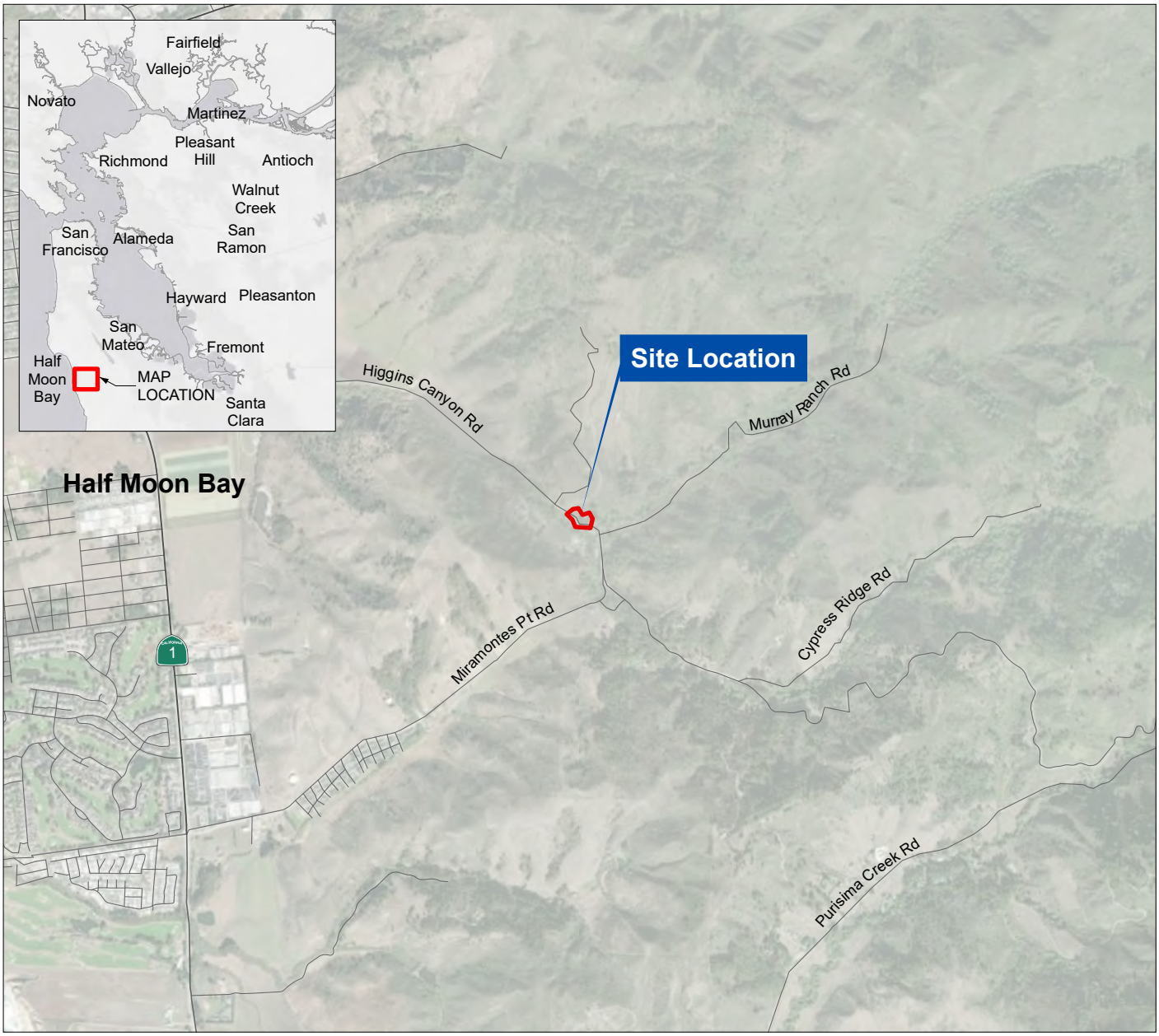
Witter, R. C., Knudsen, K. L., Sowers, J. M., Wentworth, C. M., Koehler, R. D., Randolph, C. E., ... & Gans, K. D., 2006, Maps of Quaternary deposits and liquefaction susceptibility in the central San Francisco Bay region, California (No. 2006-1037). Digital Database: U.S. Geological Survey Open-File Report 00-444.Working Group on California Earthquake Probabilities (WGCEP), 2003, Earthquake Probabilities in the San Francisco Bay Region: 2002-2031: U.S. Geological Survey Open File Report 2003-214.

Working Group on California Earthquake Probabilities (WGCEP) (2003), Earthquake Probabilities in the San Francisco Bay Region: 2002-2031: U.S. Geological Survey Open File Report 2003-214.

Working Group on California Earthquake Probabilities (WGCEP), 2013, The Uniform California Earthquake Rupture Forecast Version 3 (UCERF3) – Time Independent Model: U.S. Geological Survey Open-File Report 2013-1165.

Working Group on California Earthquake Probabilities (WGCEP), 2014, Long-Term Time-Dependent Probabilities for the Third Uniform California Earthquake Rupture Forecast (UCERF3): Bulletin of the Seismology Society of America.

FIGURES



BASEMAP REFERENCE

1. STREET CENTERLINES FROM CALTRANS CALIFORNIA ROAD SYSTEM, DOWNLOADED ON 18 FEB 2020.
2. ORTHOIMAGERY FROM ESRI (MAXAR), 2019.

0 0.25 0.5 1
MILES

N

CE&G
A division of Haley & Aldrich

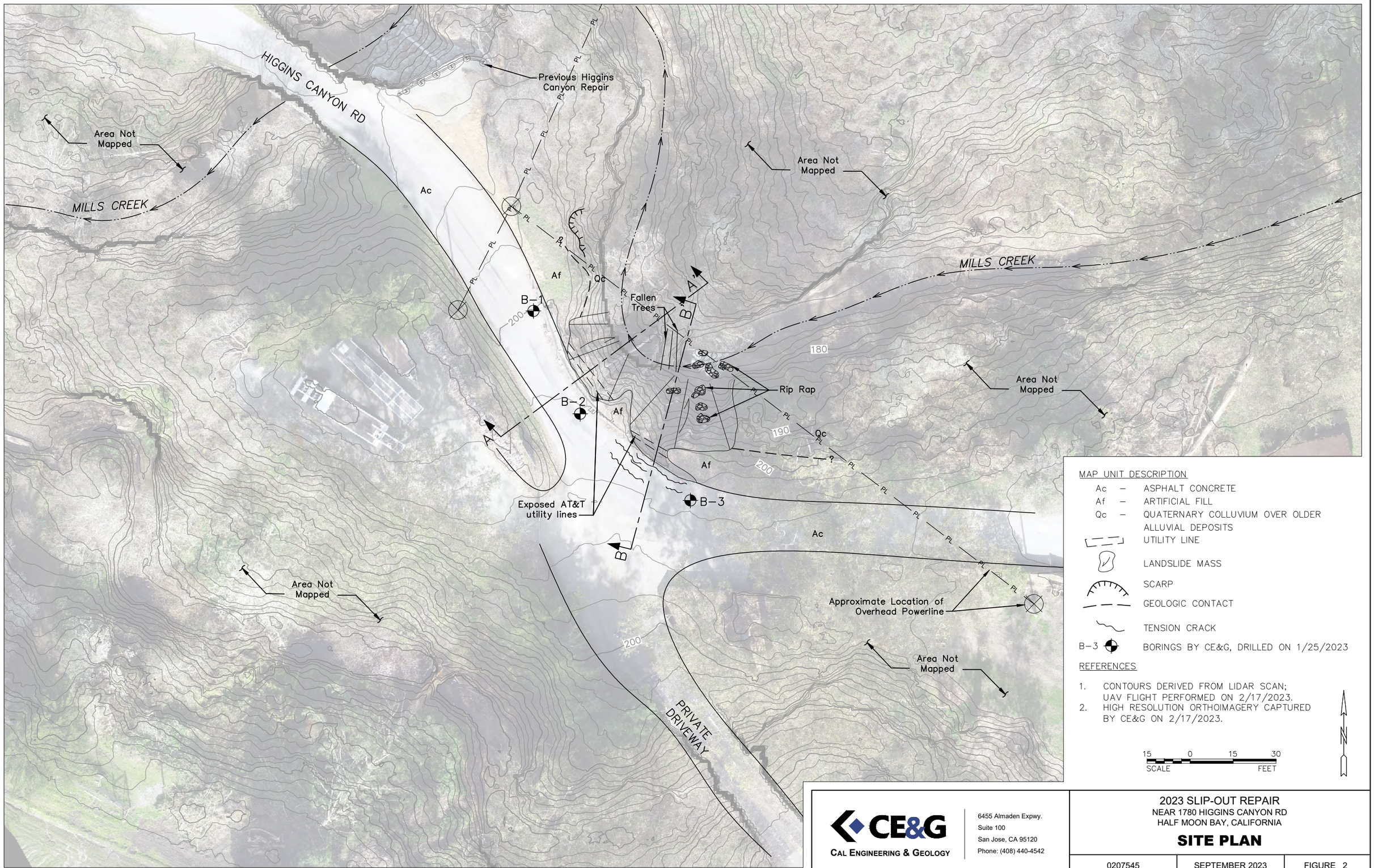
6455 Almaden Expwy.
Suite 100
San Jose, CA 95120
Phone: (408) 440-4542

1780 HIGGINS CANYON ROAD SLOPE STABILIZATION PROJECT
1780 HIGGINS CANYON ROAD
HALF MOON BAY, CALIFORNIA

SITE LOCATION MAP

0207545	SEPTEMBER 2023	FIGURE 1

\\haleyaldrich\share\granite\2022\0207545-SanMateoCo-1780HigginsCynRdRetWall\GIS\ArcGIS\221440-HigginsCynRd-RetWall.aprx; 9/12/2023; slamothe



MAP UNIT DESCRIPTION

- Ac – ASPHALT CONCRETE
- Af – ARTIFICIAL FILL
- Qc – QUATERNARY COLLUVIUM OVER OLDER ALLUVIAL DEPOSITS
- UTILITY LINE
- LANDSLIDE MASS
- SCARP
- GEOLOGIC CONTACT
- TENSION CRACK
- B-3 BORINGS BY CE&G, DRILLED ON 1/25/2023

REFERENCES

1. CONTOURS DERIVED FROM LIDAR SCAN; UAV FLIGHT PERFORMED ON 2/17/2023.
2. HIGH RESOLUTION ORTHOIMAGERY CAPTURED BY CE&G ON 2/17/2023.

15 0 15 30
SCALE FEET

N

CE&G
CAL ENGINEERING & GEOLOGY
6455 Almaden Expwy.
Suite 100
San Jose, CA 95120
Phone: (408) 440-4542

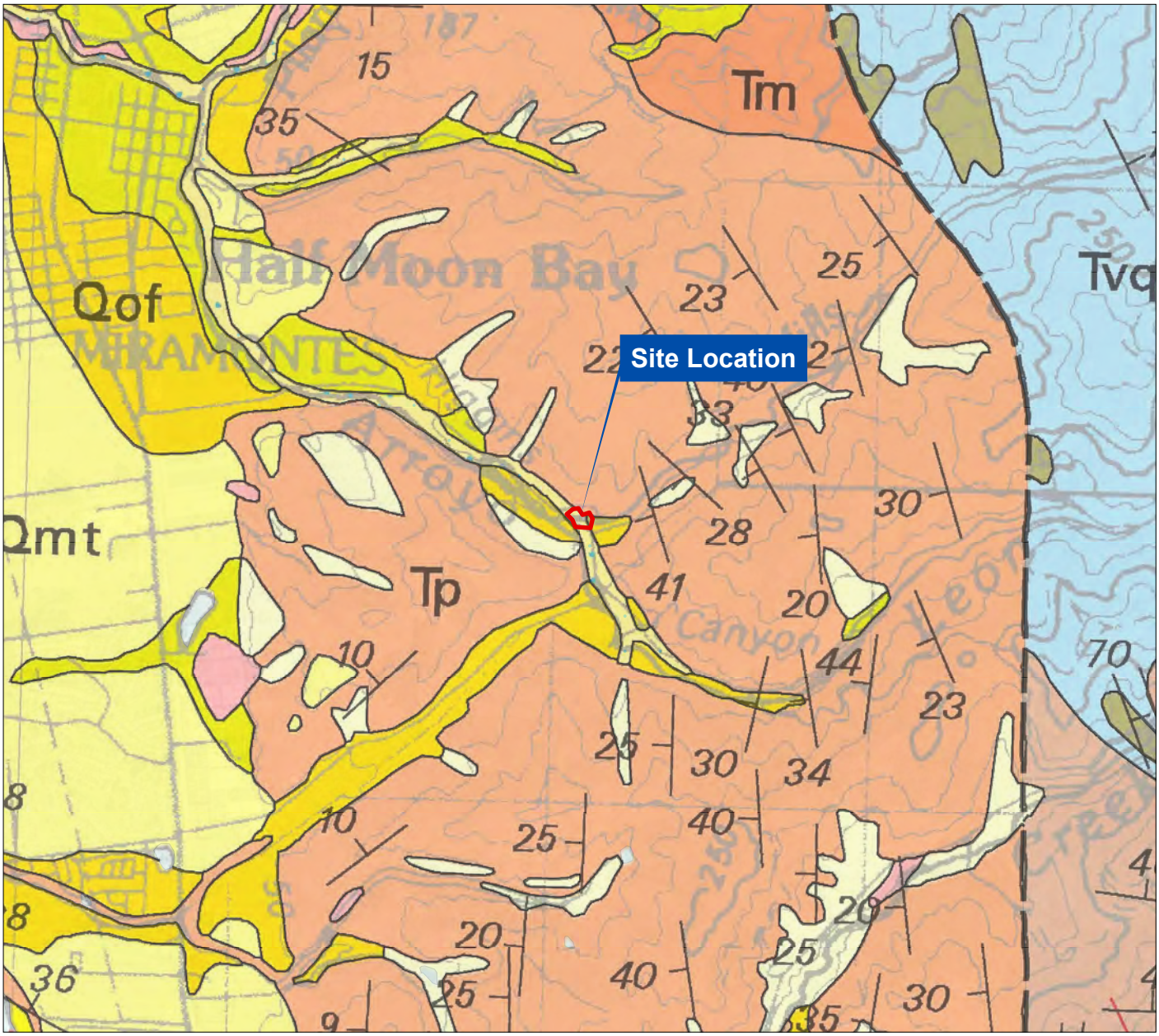
2023 SLIP-OUT REPAIR

NEAR 1780 HIGGINS CANYON RD
HALF MOON BAY, CALIFORNIA

SITE PLAN

0207545	SEPTEMBER 2023	FIGURE 2

\\holeyoldrich\share\granite\2022\0207545-SanMateoCo-1780HigginsCynRdRetWall\AutoCAD\Figures\Fig2-SitePlan.dwg 9-08-23 09:26:43 AM slamothe



BASEMAP REFERENCE

1. REGIONAL GEOLOGY FROM BRABB ET AL., 2000.

0 0.25 0.5 1
MILES

N

MAP UNIT DESCRIPTION

			STRIKE & DIP
Qyf	YOUNGER (INNER) ALLUVIAL FAN DEPOSITS (HOLOCENE)	Qmt	MARINE TERRACE DEPOSITS (PLEISTOCENE)
Qyfo	YOUNGER (OUTER) ALLUVIAL FAN DEPOSITS (HOLOCENE)	Tp	PURISIMA FORMATION (PLIOCENE AND UPPER MIOCENE)
Qcl	COLLUVIUM (HOLOCENE)	Tm	MONTEREY FORMATION (MIDDLE MIOCENE)
Qs	SAND DUNE AND BEACH DEPOSITS (HOLOCENE)	Tla	LAMBERT SHALE (OLIGOCENE AND LOWER MIOCENE)
Qal	ALLUVIUM (HOLOCENE)	Tmb	MINDEGO BASALT AND RELATED VOLCANIC ROCKS (MIOCENE AND/OR OLIGOCENE)
Qof	COARSE-GRAINED OLDER ALLUVIAL FAN AND STREAM TERRACE DEPOSITS (PLEISTOCENE)	Tvq	VAQUEROS SANDSTONE (LOWER MIOCENE AND OLIGOCENE)

CE&G
A division of Haley & Aldrich

6455 Almaden Expwy.
Suite 100
San Jose, CA 95120
Phone: (408) 440-4542

1780 HIGGINS CANYON ROAD SLOPE STABILIZATION PROJECT
1780 HIGGINS CANYON ROAD
HALF MOON BAY, CALIFORNIA

REGIONAL GEOLOGY MAP

0207545	SEPTEMBER 2023	FIGURE 3

\\haleyaldrich\share\granite\2022\0207545-SanMateoCo-1780HigginsCynRdRetWall\GIS\ArcGIS\221440-HigginsCynRd-RetWall.aprx; 9/12/2023; slamothe



BASEMAP REFERENCE

1. FAULT LOCATIONS FROM US GEOLOGICAL SURVEY QUATERNARY FAULTS AND FOLDS DATABASE, ACCESSED ONLINE ON 30 JULY 2021.

0 1.5 3 6
MILES

N

MAP UNIT DESCRIPTION

- Historical (<150 years), well constrained location
- Historical (<150 years), moderately constrained location
- Historical (<150 years), inferred location
- Latest Quaternary (<15,000 years), well constrained location
- Latest Quaternary (<15,000 years), moderately constrained location
- Latest Quaternary (<15,000 years), inferred location
- Late Quaternary (<130,000 years), well constrained location
- Late Quaternary (<130,000 years), moderately constrained location
- Late Quaternary (<130,000 years), inferred location
- Undifferentiated Quaternary(<1.6 million years), well constrained location
- Undifferentiated Quaternary(<1.6 million years), moderately constrained location
- undifferentiated Quaternary(<1.6 million years), inferred location

CE&G
A division of Haley & Aldrich

6455 Almaden Expwy.
Suite 100
San Jose, CA 95120
Phone: (408) 440-4542

1780 HIGGINS CANYON ROAD SLOPE STABILIZATION PROJECT
1780 HIGGINS CANYON ROAD
HALF MOON BAY, CALIFORNIA

FAULT ACTIVITY MAP

0207545	SEPTEMBER 2023	FIGURE 4

\\haleyaldrich\share\granite\2022\0207545-SanMateoCo-1780HigginsCynRdRetWall\GIS\ArcGIS\221440-HigginsCynRd-RetWall.aprx; 9/12/2023; slamothe



BASEMAP REFERENCE

1. HALF MOON BAY QUADRANGLE LANDSLIDE INVENTORY DATA FROM BRABB, 2000.

0 0.13 0.25 0.5
MILES

N

MAP UNIT DESCRIPTION

D	DEFINITE LANDSLIDE DEPOSIT
P	PROBABLE LANDSLIDE DEPOSIT
?	QUESTIONABLE LANDSLIDE DEPOSIT
UA	UNATTRIBUTED LANDSLIDE DEPOSIT

CE&G
A division of Haley & Aldrich

6455 Almaden Expwy.
Suite 100
San Jose, CA 95120
Phone: (408) 440-4542

1780 HIGGINS CANYON ROAD SLOPE STABILIZATION PROJECT
1780 HIGGINS CANYON ROAD
HALF MOON BAY, CALIFORNIA

LANDSLIDE INVENTORY

0207545	SEPTEMBER 2023	FIGURE 5

\\haleyaldrich\share\granite\2022\0207545-SanMateoCo-1780HigginsCynRdRetWall\GIS\ArcGIS\221440-HigginsCynRd-RetWall.aprx; 9/12/2023; slamothe



BASEMAP REFERENCE

1. RELATIVE LIQUEFACTION SUSCEPTIBILITY FROM WITTER (2006).

0 0.25 0.5 1
MILES

N

MAP UNIT DESCRIPTION

- VERY HIGH
- MODERATE
- LOW
- VERY LOW

CE&G
A division of Haley & Aldrich

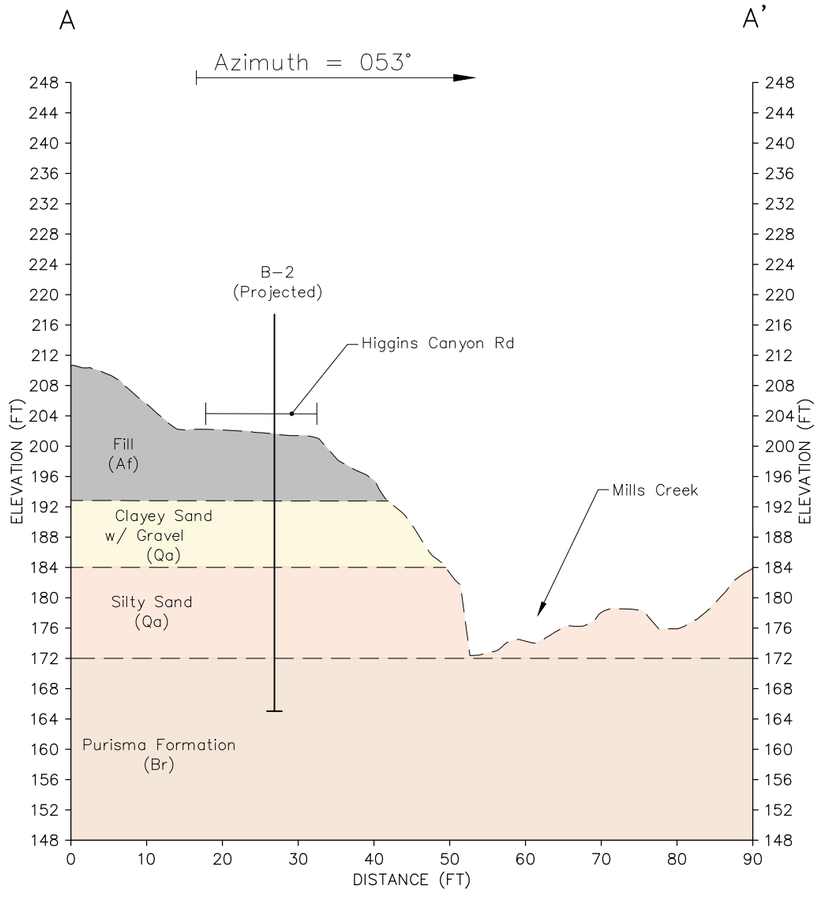
6455 Almaden Expwy.
Suite 100
San Jose, CA 95120
Phone: (408) 440-4542

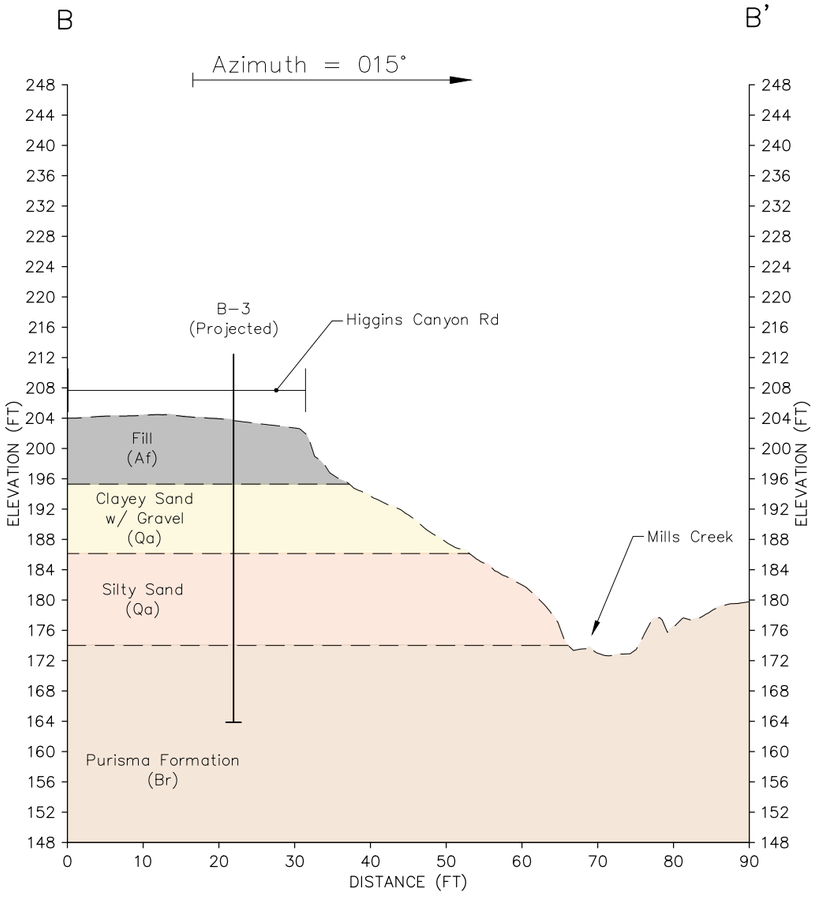
1780 HIGGINS CANYON ROAD SLOPE STABILIZATION PROJECT
1780 HIGGINS CANYON ROAD
HALF MOON BAY, CALIFORNIA

LIQUEFACTION SUSCEPTIBILITY MAP

0207545	SEPTEMBER 2023	FIGURE 6

\\haleyaldrich\share\granite\2022\0207545-SanMateoCo-1780HigginsCynRdRetWall\GIS\ArcGIS\221440-HigginsCynRd-RetWall.aprx; 9/12/2023; slamothe





LEGEND

Af – Artificial Fill

Qa – Quaternary Alluvium

Br – Bedrock

CROSS SECTION A–A'

CROSS SECTION B–B'

REFERENCES

1. EXISTING SURFACE PROFILE DERIVED FROM LIDAR SCAN; UAV FLIGHT PERFORMED ON 2/17/2023.

15 0 15 30
SCALE FEET

CE&G
CAL ENGINEERING & GEOLOGY
6455 Almaden Expwy.
Suite 100
San Jose, CA 95120
Phone: (408) 440-4542

2023 SLIP-OUT REPAIR
NEAR 1780 HIGGINS CANYON RD
HALF MOON BAY, CALIFORNIA

CROSS SECTIONS

0207545	SEPTEMBER 2023	FIGURE 7

\\holeyaldrich.com\share\granite\2022\0207545-SanMateoCo-1780HigginsCynRdRetWall\AutoCAD\Figures\Fig2-SitePlan.dwg 9-15-23 04:25:34 PM kdrozynska

Appendix A. Site Photos



Photo 1: Northwest-facing view of the slip-out area. The photo was taken on March 8th, 2023.



Photo 2: West-facing view of the slip-out area. The photo was taken on March 8th, 2023.



Photo 3: West-facing view of the slip-out area. Note the two exposed utility lines in the scarp area (see yellow arrow). The photo was taken on March 8th, 2023.



Photo 4: East-facing view of the slip-out area. Note the two exposed utility lines in the scarp area. The photo was taken on March 8th, 2023.



Photo 5: Northeast-facing view of the slip-out area. Note the exposed utility line (see yellow arrow). Also note exposed riprap in slope fill (orange arrow). The photo was taken on March 8th, 2023.



Photo 6: Southeast-facing view of the slip-out area. The photo was taken on March 8th, 2023.



Photo 7: East-facing view of the slip-out area. The photo was taken on March 8th, 2023.



Photo 8: Northwest-facing view of the slip-out area. The photo was taken on March 8th, 2023.

Appendix B. Boring Logs

UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D-2487)

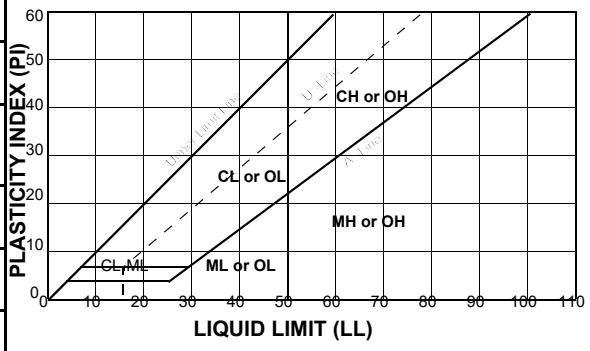
Field Identification			Group Symbols	Typical Names	Laboratory Classification Criteria	
Coarse-Grained Soils More than 50% of material is retained on the No. 200 sieve.	**Gravels** More than 50% coarse fraction retained on the No. 4 sieve	**Clean Gravels** < 5% Fines	**GW**	Well-graded gravels, gravel-sand mixtures, little or no fines	$C_U = D_{60} \div D_{10} \geq 4$ and $C_C = (D_{30})^2 \div (D_{10} \times D_{60}) \geq 1$ & ≤ 3	
			GP	Poorly graded gravels, gravel-sand mixtures, little or no fines	$C_U = D_{60} \div D_{10} < 4$ and/or $C_C = (D_{30})^2 \div (D_{10} \times D_{60}) < 1$ & > 3	
		Gravels with Fines >12% Fines	**GM**	Silty gravels, poorly graded gravel-sand-silt mixtures	Fines classify as ML or MH	If fines classify as CL-ML, use dual symbol GC/GM
			GC	Clayey gravels, poorly graded gravel-sand-clay mixtures	Fines classify as CL or CH	
	Sands More than 50% coarse fraction passes the No. 4 sieve	**Clean Sands** < 5% Fines	**SW**	Well-graded sands, gravelly sands, little or no fines	$C_U = D_{60} \div D_{10} \geq 6$ and $C_C = (D_{30})^2 \div (D_{10} \times D_{60}) \geq 1$ & ≤ 3	
			SP	Poorly graded sands, gravelly sands, little or no fines	$C_U = D_{60} \div D_{10} < 6$ and/or $C_C = (D_{30})^2 \div (D_{10} \times D_{60}) < 1$ & > 3	
		Sands with Fines >12% Fines	**SM**	Silty sands, poorly graded sand-silt mixtures	Fines classify as ML or MH	If fines classify as CL-ML, use dual symbol SC/SM
			SC	Clayey sands, poorly graded sand-clay mixtures	Fines classify as CL or CH	
Fine-Grained Soils More than 50% of material passes the No. 200 sieve.	**Identification Procedures on Percentage Passing the No. 40 Sieve**					
	Silts & Clays Liquid Limit less than 50%		**ML**	Inorganic silts, very fine sands, rock flour, silty or clayey fine sands with slight plasticity		
			CL	Inorganic clays of low to medium plasticity, gravelly, sandy, and/or silty clays, lean clays		
			OL	Organic silts, organic silty clays of low plasticity		
	Silts & Clays Liquid Limit greater than 50%		**MH**	Inorganic silts, micaceous or diatomaceous fine sandy/-silty soil, elastic silts		
			CH	Inorganic clays of high plasticity, fat clays		
			OH	Organic clays of medium to high plasticity		
HIGHLY ORGANIC SOILS			**PT**	Peat and other highly organic soils		

CLASSIFICATION OF GRAVELS & SANDS WITH 5% TO 12% FINES REQUIRES DUAL SYMBOLS
GW/GM or GP/GM: Gravel/Silty Gravel
GW/GC or GP/GC: Gravel/Clayey Gravel
SW/SM or SP/SM: Sand/Silty Sand
SW/SC or SP/SC: Sand/Clayey Sand

PLASTICITY CHART

For Classification of Fine-Grained Soils and Fine-Grained Fraction of Coarse-Grained Soils

Equation of "A"-Line: PI = 4 @ LL = 4 to 25.5, then PI = 0.73 × (LL – 20)
Equation of "U"-Line: LL = 16 @ PI = 0 to 7, then PI = 0.9 × (LL – 8)



KEY TO SAMPLER TYPES AND OTHER LOG SYMBOLS

CS	California Standard Sampler
CM	California Modified Sampler
SPT	Standard Penetration Test Sampler
SHL	Shelby Tube Sampler
BU	Bulk Sample
LL	Liquid Limit of Sample (ASTM D-4318)
PI	Plasticity Index of Sample (ASTM D-4318)
Q_U	Unconfined Compression Test (ASTM D-2166)

▽	Depth at which Groundwater was Encountered During Drilling
▼	Depth at which Groundwater was Measured After Drilling
PP	Pocket Penetrometer Test
PTV	Pocket Torvane Test
–#200	% of Material Passing the No. 200 Sieve Test (ASTM D-1140)
PSA	Particle-Size Analysis (ASTM D-422 & D-1140)
C	Consolidation Test (ASTM D-2435)
TXUU	Unconsolidated Undrained Compression Test (ASTM D-2850)

KEY TO SAMPLE INTERVALS

CS	Length of Sampler Interval with a CS Sampler
⊠	Length of Sampler Interval with a CM Sampler
⊓	Length of Sampler Interval with a SPT Sampler
SHL	Length of Sampler Interval with a SHL Sampler
BU	Bulk Sample Recovered for Interval Shown (i.e., cuttings)
⊥	Length of Coring Run with Core Barrel Type Sampler
NR	No Sample Recovered for Interval Shown

CE&G
CAL ENGINEERING & GEOLOGY

UNIFIED SOIL CLASSIFICATION SYSTEM AND KEY TO BORING LOG

Rock Hardness Descriptions

Very Hard	Cannot be scratched with knife or sharp pick. Breaking of hand specimen requires several hard blows of geologist's pick.
Hard	Can be scratched with knife or pick only with difficulty. Hard blow of hammer required to detach hand specimen.
Moderately Hard	Can be scratched with knife or pick. Gouges or grooves to 1/4-inch deep can be excavated by hard blow of geologist's pick. Hand specimens can be detached by moderate blow.
Medium	Can be grooved or gouged 1/16-inch deep by firm pressure of knife or pick point. Can be excavated in small chips to pieces about 1-inch maximum size by hard blows of the point of a geologist's pick.
Soft	Can be gouged or grooved readily with knife or pick point. Can be excavated in chips to pieces several inches in size by moderate blows of a pick point. Small tin pieces can be broken by finger pressure.
Very Soft	Can be carved with knife. Can be excavated readily with point of pick. Pieces 1-inch or more in thickness can be broken with finger pressure. Can be scratched readily by fingernail.

Bedding Thickness & Joint/Fracture Spacing Descriptions

Centimeters	Inches	Bedding	Joints/Fractures
< 2	< ¾	Laminated	Extremely Close
2-5	¾-2	Very Thin	Very Close
5-30	2-12	Thin	Close
30-90	12-36	Medium	Moderate
90-300	36-120	Thick	Wide
> 300	> 120	Very Thick	Very Wide

Rock Weathering Descriptions

Fresh	Rock fresh, crystals bright, few joints may show slight staining. Rock rings under hammer if crystalline.
Very Slight	Rock generally fresh, joints may show thin clay coatings, crystals in broken face show bright. Rock rings under hammer if crystalline.
Slight	Rock generally fresh, joints stained, and discoloration extends into rock up to 1 inch. Joints may contain clay. In granitoid rocks some occasional feldspar crystals are dulled and discolored. Crystalline rocks ring under hammer.
Moderate	Significant portions of rock show discoloration and weathering effects. In granitoid rocks, most feldspars are dull and discolored; some show clayey. Rock has dull sound under hammer and shows significant loss of strength as compared with fresh rock.
Moderately Severe	All rock except quartz discolored or stained. In granitoid rocks, all feldspars dull and discolored and majority show kaolinization. Rock shows severe loss of strength and can be excavated with geologist's pick. Rock goes "clunk" when struck.
Severe	All rock except quartz discolored or stained. Rock "fabric" clear and evident, but reduced in strength to strong soil. In granitoid rocks, all feldspars kaolinized to some extent. Some fragments of strong rock usually left.
Very Severe	All rock except quartz discolored or stained. Rock "fabric" discernible. But mass effectively reduced to "soil" with only fragments of strong rock remaining.
Complete	Rock reduced to "soil." Rock "fabric" not discernible or discernible only in small scattered locations. Quartz may be present as dikes or stringers.

The above Bedrock Characteristics are based on the ASCE Manual No. 56, "Subsrface Investigation For Design And Construction Of Foundations Of Buildings," 1976.

KEY TO SYMBOLS

CE&G
A division of Haley & Aldrich

CLIENT San Mateo County
PROJECT NAME 1780 Higgins Canyon Road Slope Stabilization
PROJECT NUMBER 0207545
PROJECT LOCATION San Mateo County

LITHOLOGIC SYMBOLS
(Unified Soil Classification System)


ASPHALT: Asphalt


BEDROCK: Bedrock


CL: USCS Low Plasticity Clay


GC: USCS Clayey Gravel


ML: USCS Silt


SC: USCS Clayey Sand


SM: USCS Silty Sand


SP: USCS Poorly-graded Sand


SP-SM: USCS Poorly-graded Sand with Silt

SAMPLER SYMBOLS


California Modified Sampler


Standard Penetration Test

WELL CONSTRUCTION SYMBOLS

ABBREVIATIONS

LL - LIQUID LIMIT (%)
PI - PLASTIC INDEX (%)
W - MOISTURE CONTENT (%)
DD - DRY DENSITY (PCF)
NP - NON PLASTIC
-200 - PERCENT PASSING NO. 200 SIEVE
PP - POCKET PENETROMETER (TSF)

TV - TORVANE
PID - PHOTOIONIZATION DETECTOR
UC - UNCONFINED COMPRESSION
ppm - PARTS PER MILLION


Water Level at Time Drilling, or as Shown


Water Level at End of Drilling, or as Shown


Water Level After 24 Hours, or as Shown

BORING NUMBER B-1

CE&G
A division of Haley & Aldrich

CLIENT San Mateo County
PROJECT NAME 1780 Higgins Canyon Road Slope Stabilization
PROJECT NUMBER 0207545
PROJECT LOCATION San Mateo County
DATE STARTED 1/25/2023 **COMPLETED** 1/25/2023
GROUND ELEVATION 200 ft **DATUM** NAVD88 **HOLE SIZE** 6 in.
DRILLING CONTRACTOR Britton Exploration
COORDINATES: **LATITUDE** 37.445933 **LONGITUDE** -122.404442
DRILLING RIG/METHOD CME-55/6-in. Solid Flight Auger
GROUNDWATER AT TIME OF DRILLING 28.0 ft / Elev 172.0 ft
LOGGED BY C. Rodil **CHECKED BY** K. Loeb
GROUNDWATER AT END OF DRILLING --- Not Measured
HAMMER TYPE 140 lb hammer with 30 in. cathead
GROUNDWATER AFTER DRILLING 32.0 ft / Elev 168.0 ft

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	BLOW COUNTS (FIELD VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT (%)	ATTERBERG LIMITS: PLASTIC LIMIT (%)	ATTERBERG LIMITS: PLASTICITY INDEX (%)	FINES CONTENT (%)
0		Approximately 4" Asphaltic Concrete over 4.5" Aggregate Base									
		Lean CLAY (CL): very dark grayish brown (10YR 3/2), moist, stiff, low plasticity, trace fine gravel [FILL]	CM	7-9-8							
		Corrosion test @ 1.5 ft									
		Lean CLAY w/ Sand (CL): dark yellowish brown (10YR 4/6), dry, medium stiff, low plasticity, fine to medium sand, trace fine gravel	SPT	5-4-3							
5											
		Lean CLAY (CL): yellowish brown (10YR 5/4), moist, very stiff, low plasticity	CM	6-10-17	3.5 3.5	105	21				
		-some gravel	SPT	4-8-13							
10											
		Clayey SAND w/ Gravel (SC): light yellowish brown (10YR 6/4) to yellowish brown (10YR 5/6), moist, medium dense, fine to medium sand, fine gravel up to 0.5" [Alluvium]	CM	6-12-17		105	16				
15											
		-gravel up to 1.5"	CM	11-22-33		118	12				
20		Lean CLAY w/ Sand (CL): olive yellow (2.5Y 6/6), moist, stiff to very stiff, low plasticity, fine to medium sand, increases in sand with depth	CM	8-11-13	3.25	94	30	46	19	27	85
		TXUU test @ 21.0 ft									
		Poorly Graded SAND (SP): reddish yellow (7.5Y 6/6), moist, dense, few fine angular gravel up to 0.75"									
25			CM	20-19-32							
		Poorly Graded SAND w/ Silt (SP-SM): yellowish brown (10YR 5/4), moist, dense, fine to medium sand, some silt, some organics									
		-rig chatter									
		Poorly Graded SAND w/ Gravel (SP): greenish gray (GLEY 1 5/1), moist to wet, dense, fine to medium sand, few coarse sand, angular gravel up to 0.75"									
30			CM	13-24-31		112	16				
35											

(Continued Next Page)

CE&G
A division of Haley & Aldrich

BORING NUMBER B-1

CLIENT San Mateo County **PROJECT NAME** 1780 Higgins Canyon Road Slope Stabilization

PROJECT NUMBER 0207545 **PROJECT LOCATION** San Mateo County

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	BLOW COUNTS (FIELD VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
								LIQUID LIMIT (%)	PLASTIC LIMIT (%)	PLASTICITY INDEX (%)	
35		Sandy CLAYSTONE (Bedrock): greenish gray (GLEY 1 5/1), dry, soft to medium hardness, moderately severe to moderate weathering [Purisima Formation]	CM	15-50/3"							

Bottom of borehole at 36.0 ft. Borehole backfilled with neat cement grout.

BORING NUMBER B-2

CE&G
A division of Haley & Aldrich

CLIENT San Mateo County
PROJECT NAME 1780 Higgins Canyon Road Slope Stabilization
PROJECT NUMBER 0207545
PROJECT LOCATION San Mateo County
DATE STARTED 1/25/2023 **COMPLETED** 1/25/2023
GROUND ELEVATION 202 ft **DATUM** NAVD88 **HOLE SIZE** 6 in.
DRILLING CONTRACTOR Britton Exploration
COORDINATES: **LATITUDE** 37.446008 **LONGITUDE** -122.404583
DRILLING RIG/METHOD CME-55/6-in. Solid Flight Auger
GROUNDWATER AT TIME OF DRILLING ---
LOGGED BY C. Rodil **CHECKED BY** K. Loeb
GROUNDWATER AT END OF DRILLING --- Not Measured
HAMMER TYPE 140 lb hammer with 30 in. cathead
GROUNDWATER AFTER DRILLING --- Not Measured

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	BLOW COUNTS (FIELD VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT (%)	ATTERBERG LIMITS: PLASTIC LIMIT (%)	ATTERBERG LIMITS: PLASTICITY INDEX (%)	FINES CONTENT (%)
0		Approximately 8" Asphaltic Concrete over 4" Aggregate Base									
		Lean CLAY w/ Sand (CL): dark yellowish brown (10YR 3/4), dry, very stiff to hard, fine to medium sand, few fine subrounded gravel up to 0.75" [FILL] R-Value test @ 1 - 5 ft -becomes yellowish brown (10YR 5/4)	CM	8-7-10	4.0 4.5						
			SPT	4-6-7							
5		-decrease in sand and gravel, becomes moist	CM	5-11-15	3.25 4.5	100	25				
			SPT	4-6-9	3.0						
10		Clayey SAND w/ Gravel (SC): brown (10YR 4/3) to yellowish brown (10YR 5/4), moist, medium dense, fine to coarse sand, gravel up to 2.0" [Alluvium]	CM	6-11-13		102	16				33
15		Lean CLAY (CL): light yellowish brown (2.5Y 6/4), moist, stiff, low to medium plasticity, trace fine sand TXUU test @ 16.0 ft -becomes dark grayish brown (2.5Y 4/2), increase in plasticity	CM	2-4-7	1.5 1.25	94	29	47	18	29	
20		Clayey GRAVEL w/ Sand (GC): yellowish brown (10YR 5/6) to dark yellowish brown (10YR 3/4), moist, very dense, fine to medium sand, gravel up to 0.75"	CM	13-28-43							
25		Sandy SILT w/ Gravel (ML): greenish gray (GLEY 1 5/1), moist, very dense, fine to medium sand, few coarse sand, few fine gravel up to 0.75"	CM	13-28-50		98	21				54
30											
35											

(Continued Next Page)

CE&G
A division of Haley & Aldrich

BORING NUMBER B-2

CLIENT San Mateo County **PROJECT NAME** 1780 Higgins Canyon Road Slope Stabilization

PROJECT NUMBER 0207545 **PROJECT LOCATION** San Mateo County

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	BLOW COUNTS (FIELD VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
								LIQUID LIMIT (%)	PLASTIC LIMIT (%)	PLASTICITY INDEX (%)	
35		Sandy CLAYSTONE (Bedrock): greenish gray (GLEY 1 5/1), moist, soft to medium hardness, moderately severe weathering [Purisima Formation]	CM	28-50/4"							
		Bottom of borehole at 36.5 ft. Borehole backfilled with neat cement grout.									

BORING NUMBER B-3

CE&G
A division of Haley & Aldrich

CLIENT San Mateo County
PROJECT NAME 1780 Higgins Canyon Road Slope Stabilization
PROJECT NUMBER 0207545
PROJECT LOCATION San Mateo County
DATE STARTED 1/25/2023 **COMPLETED** 1/25/2023
GROUND ELEVATION 200 ft **DATUM** NAVD88 **HOLE SIZE** 6 in.
DRILLING CONTRACTOR Britton Exploration
COORDINATES: **LATITUDE** 37.446136 **LONGITUDE** -122.40468
DRILLING RIG/METHOD CME-55/6-in. Solid Flight Auger
GROUNDWATER AT TIME OF DRILLING --- Not Encountered
LOGGED BY C. Rodil **CHECKED BY** K. Loeb
GROUNDWATER AT END OF DRILLING --- Not Encountered
HAMMER TYPE 140 lb hammer with 30 in. cathead
GROUNDWATER AFTER DRILLING --- Not Encountered

DEPTH (ft)	MATERIAL DESCRIPTION	SAMPLE TYPE	BLOW COUNTS (FIELD VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT (%)	ATTERBERG LIMITS: PLASTIC LIMIT (%)	ATTERBERG LIMITS: PLASTICITY INDEX (%)	FINES CONTENT (%)
0	Approximatly 4" Asphaltic Concrete over 5" Aggregate Base									
	Lean CLAY (CL): light olive brown (2.5Y 5/4), moist, stiff, low plasticity [FILL]	CM	3-5-10	2.0 2.0						
	-trace fine gravel	SPT	3-5-6							
5										
	TXUU test @ 6.0 ft	CM	7-8-11	3.25 2.5	110	18	34	15	19	
	-becomes sandy, fine to medium sand, increase in gravel	SPT	7-8-10	2.5						
	-rig chatter									
10	Clayey GRAVEL w/ Sand (GC): brownish yellow (10YR 6/6) to yellowish brown (10YR 5/6), moist, dense, fine to coarse sand, subrounded gravel up to 1.5"	CM	10-15-28		110	18				
15	-becomes very dense	CM	14-22-38		104	21				
	Silty SAND (SM): light yellowish brown (2.5Y 6//4), moist, very dense, fine to medium sand, few fine gravel									
20		CM	20-44-50		104	20				
	Silty SAND w/ Gravel (SM): greenish gray (GLEY 1 5/1) and dark yellowish brown (10YR 4/4), moist, very dense, fine to coarse sand, angular gravel up to 0.75"									
25		CM	22-40-50/4"							19
	-becomes very dark grayish brown (10YR 3/2)									
30										
	Sandy CLAYSTONE (Bedrock): greenish gray (GLEY 1 5/1), dry, medium to moderately hard, moderately severe to moderate weathering [Purisima Formation]	CM	50/5"							
35										

(Continued Next Page)

CLIENT San Mateo County **PROJECT NAME** 1780 Higgins Canyon Road Slope Stabilization

PROJECT NUMBER 0207545 **PROJECT LOCATION** San Mateo County

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	BLOW COUNTS (FIELD VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT (%)	ATTERBERG LIMITS: PLASTIC LIMIT (%)	ATTERBERG LIMITS: PLASTICITY INDEX (%)	FINES CONTENT (%)
35											
		Sandy CLAYSTONE (Bedrock): greenish gray (GLEY 1 5/1), dry, medium to moderately hard, moderately severe to moderate weathering [Purisima Formation] *(continued)*	CM	50/5"		100	19				
40			CM	50/4"							

Bottom of borehole at 40.5 ft. Borehole backfilled with neat cement grout.

Appendix C. Laboratory Testing

CE&G
A division of Haley & Aldrich

SUMMARY OF LABORATORY RESULTS

CLIENT San Mateo County **PROJECT NAME** 1780 Higgins Canyon Road Slope Stabilization

PROJECT NUMBER 0207545 **PROJECT LOCATION** San Mateo County

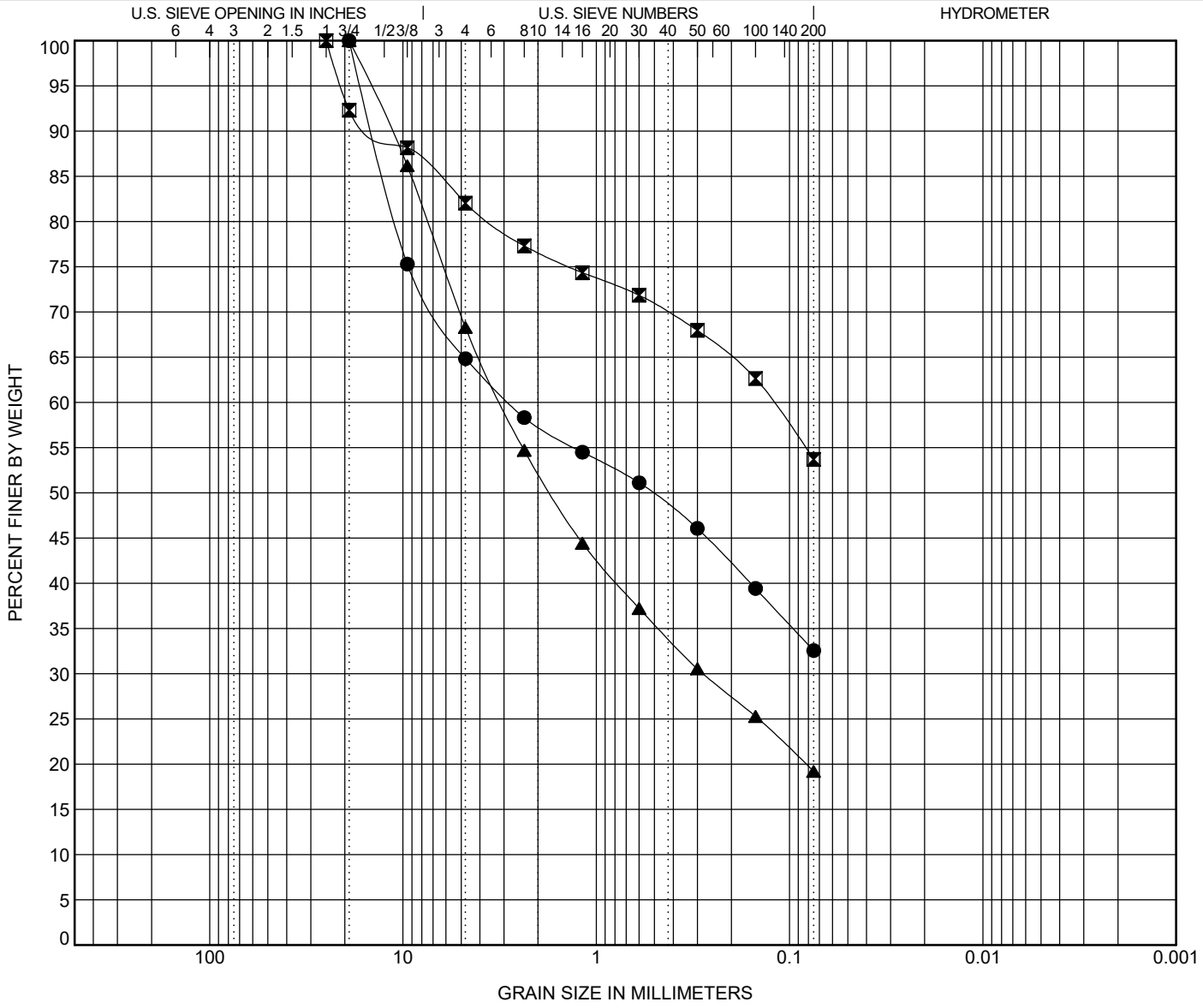
Borehole	Depth	Date Tested	Liquid Limit	Plastic Limit	Plasticity Index	Maximum Screen Size (mm)	%<#200 Sieve	Class-ification	Water Content (%)	Dry Density (pcf)	Satur-ation (%)	Void Ratio
B-1	6.0	2/14/2023							21.3	104.8		
B-1	11.0	2/14/2023							15.9	105.5		
B-1	16.0	2/14/2023							12.2	117.8		
B-1	21.0	2/16/2023	46	19	27				29.5	93.7		
B-1	21.5	2/22/2023				4.75	85					
B-1	31.0	2/14/2023							15.8	111.9		
B-2	6.0	2/14/2023							24.9	100.0		
B-2	10.5	2/14/2023							16.2	102.2		
B-2	11.0	2/14/2023				19	33					
B-2	16.0	2/16/2023	47	18	29				29.0	94.0		
B-2	26.0	2/14/2023				25	54		21.3	98.5		
B-3	6.0	2/16/2023	34	15	19				18.4	110.4		
B-3	11.0	2/14/2023							18.0	110.4		
B-3	16.0	2/14/2023							21.0	104.4		
B-3	21.0	2/14/2023							20.3	104.3		
B-3	26.0	2/14/2023				19	19					
B-3	35.0	2/14/2023							18.9	100.3		

GRAIN SIZE DISTRIBUTION

CE&G
CAL ENGINEERING & GEOLOGY

CLIENT San Mateo County **PROJECT NAME** 1780 Higgins Canyon Road Slip-Out

PROJECT NUMBER 221440 **PROJECT LOCATION** San Mateo County

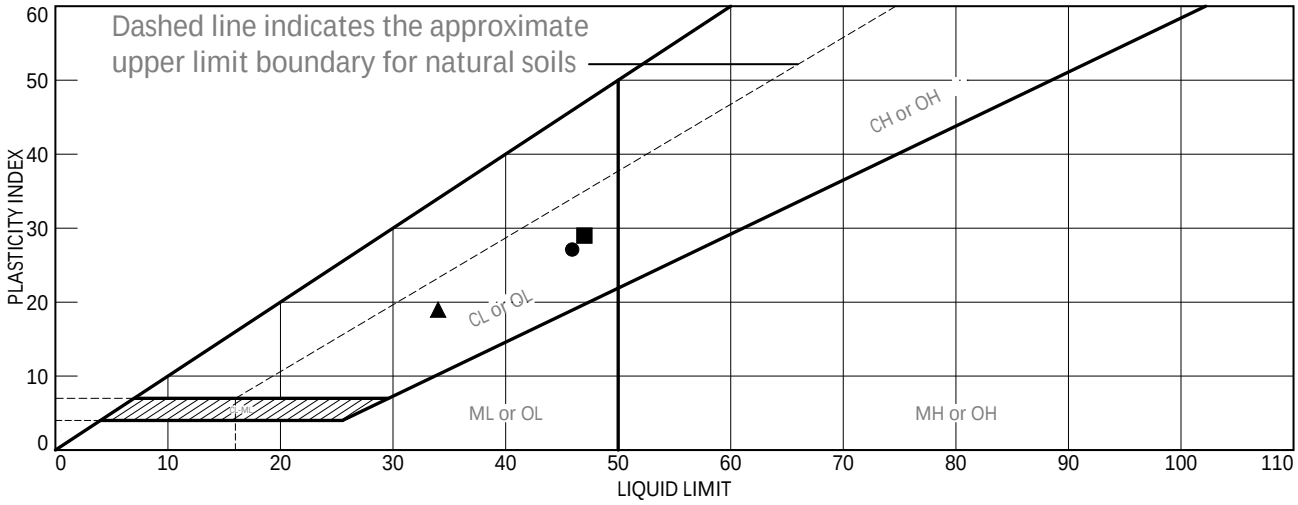


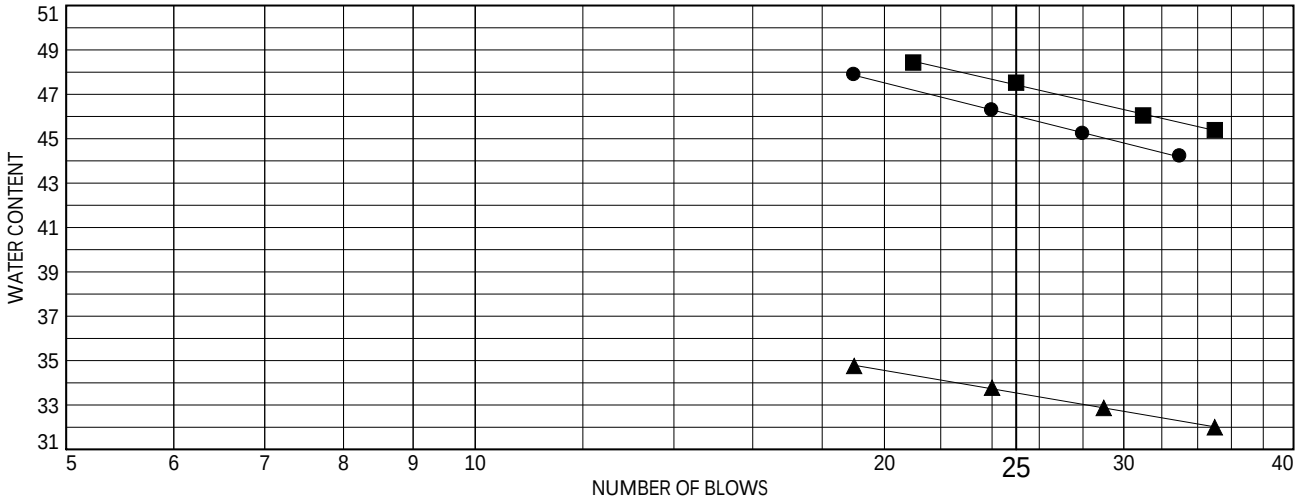
COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BOREHOLE	DEPTH	DATE TESTED	Classification	LL	PL	PI	Cc	Cu
●	**B-2**	**11.0**	**2/14/2023**						
⊠	**B-2**	**26.0**	**2/14/2023**						
▲	**B-3**	**26.0**	**2/14/2023**						

	BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**B-2**	**11.0**	**19**	**2.826**			**35.2**	**32.3**	**32.6**	
⊠	**B-2**	**26.0**	**25**	**0.122**			**18.0**	**28.4**	**53.7**	
▲	**B-3**	**26.0**	**19**	**3.102**	**0.279**		**31.7**	**49.1**	**19.2**	

LIQUID AND PLASTIC LIMITS TEST REPORT (ASTM D4318)





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Yellowish Brown Lean CLAY w/ Sand	46	19	27			
■	Light Olive Brown Lean CLAY w/ Sand	47	18	29			
▲	Dark Yellowish Brown Lean CLAY w/ Sand, trace Gravel	34	15	19			

Project No. 471-404 Client: Cal Engineering & Geology

Project: 1780 Higgins Canyon Road - 0207545

●Source of Sample: B-1 Depth: 21.0' Sample Number: 1-13

■Source of Sample: B-2 Depth: 16.0' Sample Number: 2-10

▲Source of Sample: B-3 Depth: 6.0' Sample Number: 3-5

Remarks:

COOPER TESTING LABORATORY

Figure

COOPER TESTING LABORATORY

#200 Sieve Wash Analysis
ASTM D 1140

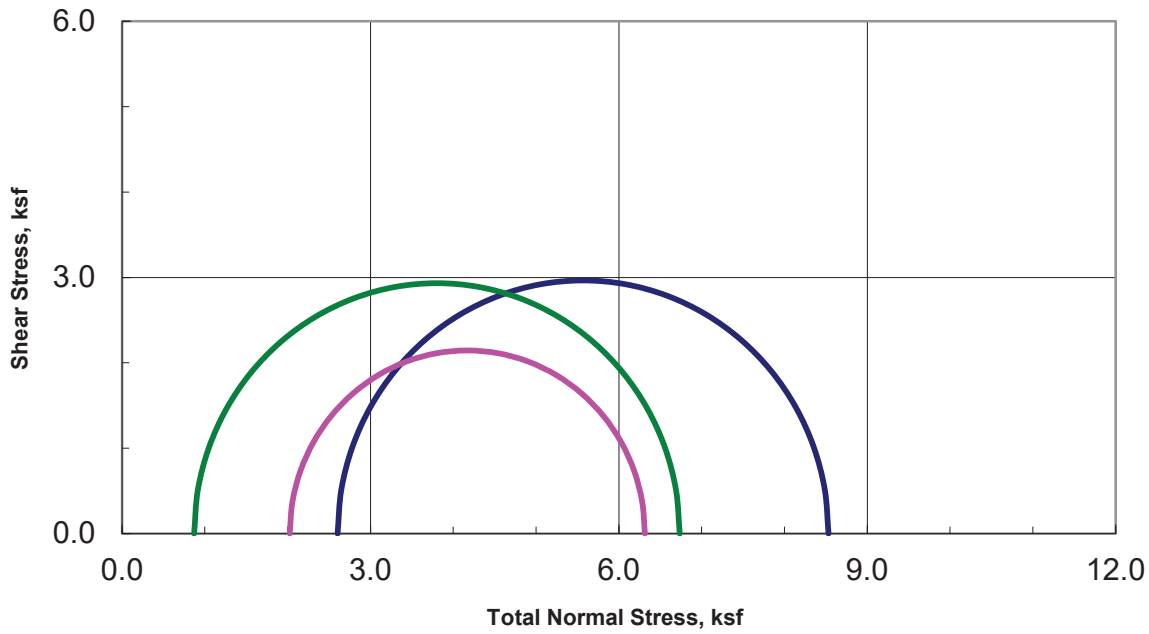
Job No.:	471-404	**Project No.:**	0207545	**Run By:**	MD
Client:	Cal Engineering & Geology	**Date:**	2/22/2023	**Checked By:**	DC
Project:	1780 Higgins Canyon Road				

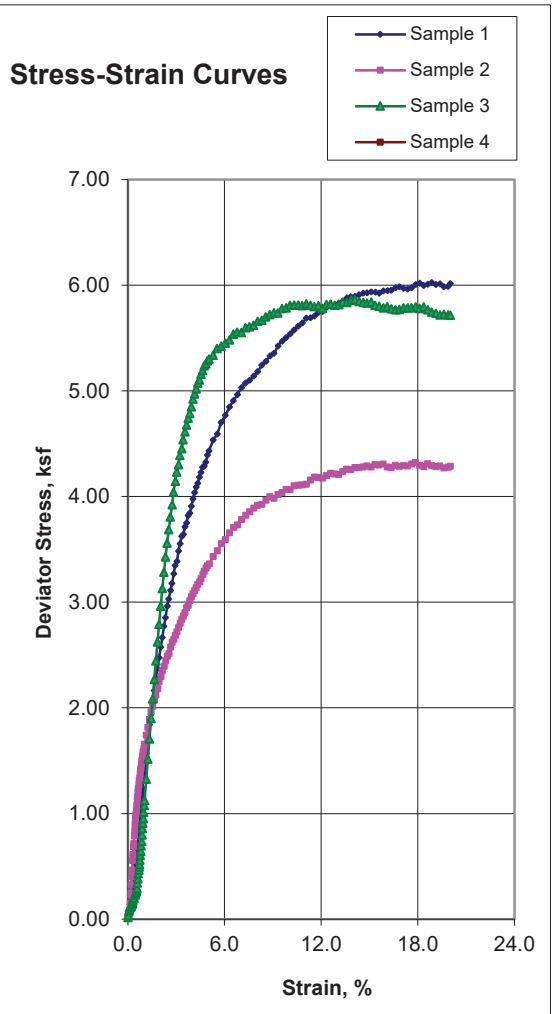
Boring:	B-1							
Sample:	1-13							
Depth, ft.:	21.0							
Soil Type:	Yellowish Brown Lean CLAY w/ Sand							
Wt of Dish & Dry Soil, gm	407.9							
Weight of Dish, gm	172.4							
Weight of Dry Soil, gm	235.5							
Wt. Ret. on #4 Sieve, gm	0.0							
Wt. Ret. on #200 Sieve, gm	36.3							
% Gravel	**0.0**							
% Sand	**15.4**							
% Silt & Clay	**84.6**							

Remarks: As an added benefit to our clients, the gravel fraction may be included in this report. Whether or not it is included is dependent upon both the technician's time available and if there is a significant enough amount of gravel. The gravel is always included in the percent retained on the #200 sieve but may not be weighed separately to determine the percentage, especially if there is only a trace amount, (5% or less).

Cooper Testing Labs, Inc.
937 Commercial Street
Palo Alto, CA 94303

Unconsolidated-Undrained Triaxial Test
ASTM D2850





Sample Data				
	1	2	3	4
Moisture %	29.5	29.0	18.4	
Dry Den,pcf	93.7	94.0	110.4	
Void Ratio	0.798	0.793	0.526	
Saturation %	99.8	98.7	94.6	
Height in	5.02	5.00	5.00	
Diameter in	2.41	2.39	2.41	
Cell psi	18.1	14.1	6.0	
Strain %	15.00	15.00	14.10	
Deviator, ksf	5.929	4.290	5.865	
Rate %/min	1.00	1.00	1.00	
in/min	0.050	0.050	0.050	
Job No.:	471-404			
Client:	Cal Engineering & Geology			
Project:	0207545			
Boring:	B-1	B-2	B-3	
Sample:	1-13	2-10	3-5	
Depth ft:	21.0	16.0	6.0	

Visual Soil Description	
Sample #	
1	Yellowish Brown Lean CLAY w/ Sand
2	Light Olive Brown Lean CLAY w/ Sand
3	Dark Yellowish Brown Lean CLAY w/ Sand, trace Gravel
4	

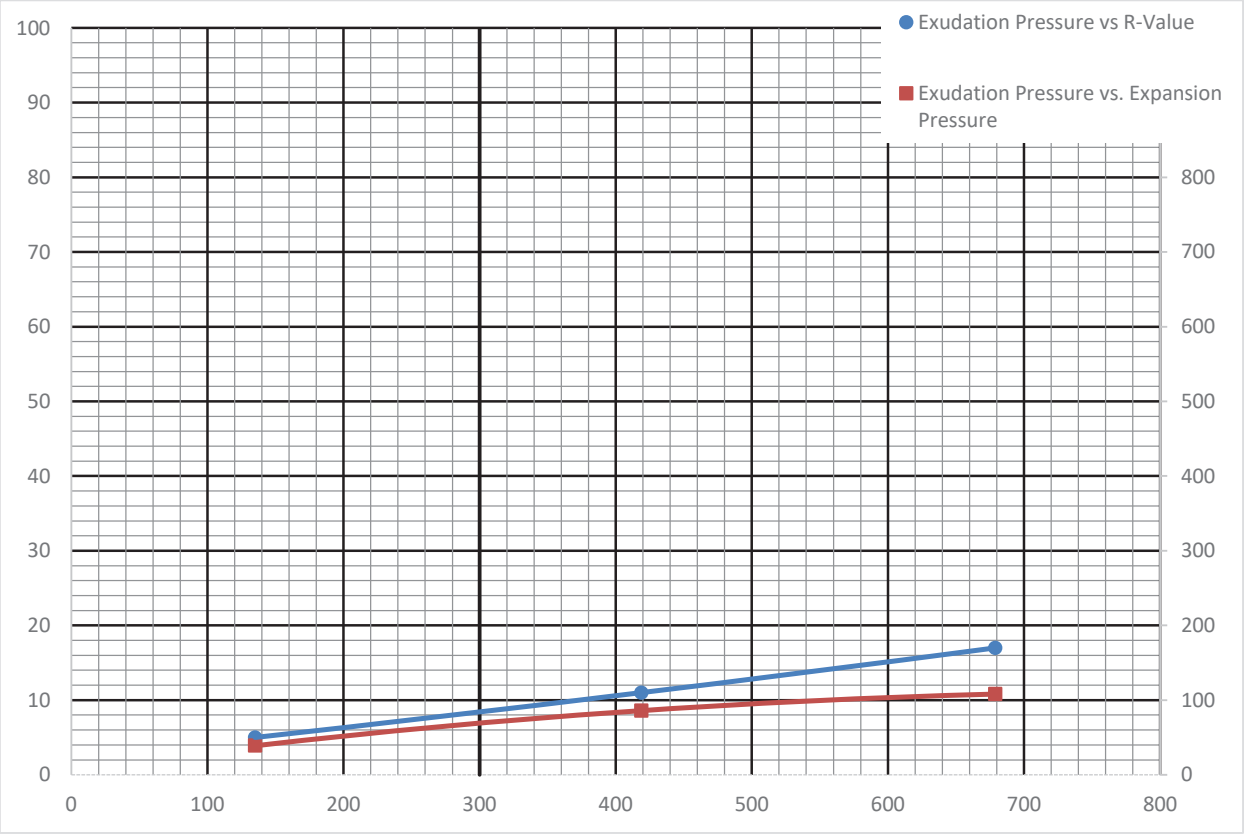
Remarks:

Note: Strengths are picked at the peak deviator stress or 15% strain which ever occurs first per ASTM D2850.

R-Value
CTM 301

CTL Job No.:	471-404	Boring:	B-2	Reduced By:	RU
Client:	Cal Engineering & Geology	Sample:	Bulk	Checked By:	PJ
Project Number:	207545	Depth:	1-5'	Date:	2/21/2023
Project Name:	1780 Higgins Canyon Road		**R-Value**		**8**
Soil Description:	Olive Brown Sandy CLAY				
Remarks:			**Expansion Pressure**		**65**

Specimen Designation	A	B	C	D	E
Compactor Foot Pressure (psi)	80	40	30		
Exudation Pressure (psi)	679	419	135		
Exudation Load (lbf)	8533	5265	1696		
Height After Compaction (in)	2.41	2.40	2.48		
Expansion Pressure (psf)	108	86	39		
Stabilometer @ 2000	120	134	148		
Turns Displacement	3.87	3.74	4.18		
R-value	18	11	5		
Corrected R-Value	17	11	5		
Moisture Content (%)	18.0	21.3	25.6		
Wet Density (pcf)	128.4	124.8	121.3		
Dry Density (pcf)	108.8	102.9	96.6		



Corrosivity Test Summary

CTL # 471-404 **Date:** 2/22/2023 **Tested By:** PJ **Checked:** PJ

Client: Cal Engineering & Geology **Project:** 1780 Higgirs Canyon Road **Proj. No:** 0207545

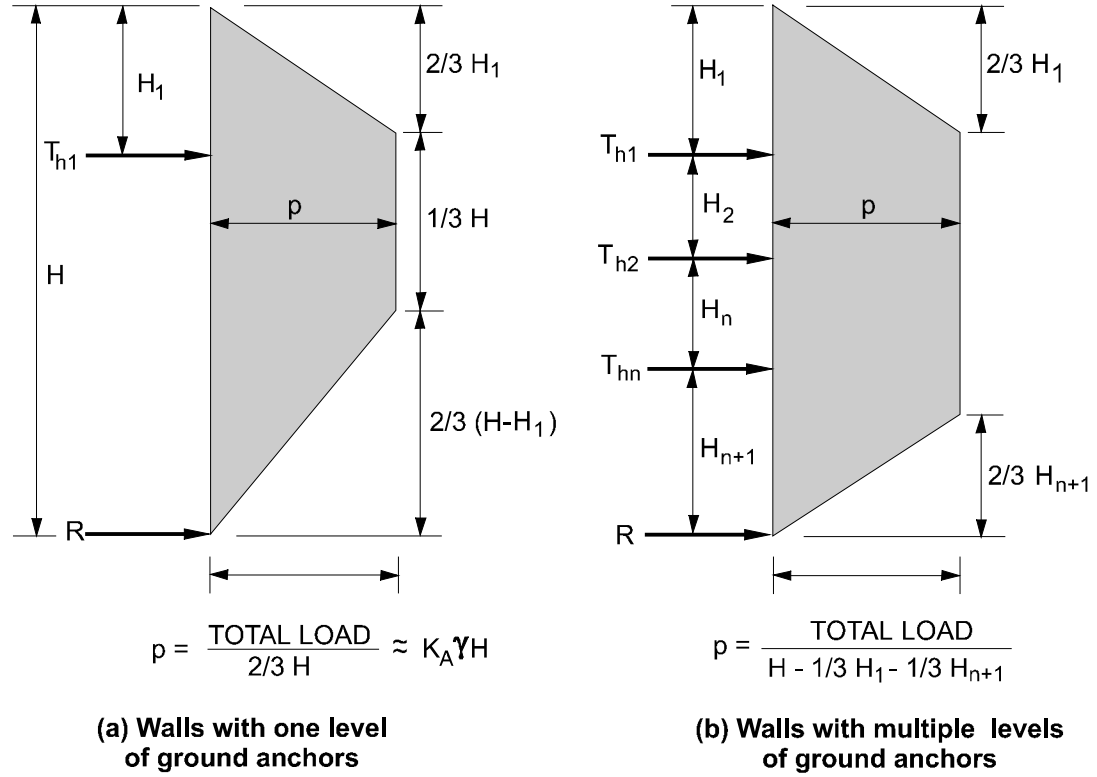
Remarks:

Sample Location or ID			Resistivity @ 15.5 °C (Ohm-cm)			Chloride	Sulfate		pH	ORP	Moisture	Soil Visual Description
Boring	Sample, No.	Depth, ft.	As Rec.	Minimum	Saturated	mg/kg	mg/kg	%		(Redox)	At Test	
						Dry Wt.	Dry Wt.	Dry Wt.		mv	%	
			ASTM G57	Cal 643	ASTM G57	Cal 422-mod.	Cal 417-mod.	Cal 417-mod.	Cal 643	SM 2580B	ASTM D2216	
B-1	1-1	1.5	-	1586	-	94	109	0.0109	7.1	-	16.4	Brown CLAY w/ Sand

Appendix D. Calculations

$$p = 0.65 K_A \gamma H \qquad \text{(Equation 10b)}$$

where ϕ' is the effective stress friction angle of the sand. Using this value of lateral earth pressure, the total lateral earth load from the rectangular apparent earth pressure diagram (figure 23a) for sands is $0.65\ K_a \gamma H^2$. The recommended apparent earth pressure envelope for single level anchored walls and walls with two or more levels of ground anchors is trapezoidal and is shown in figure 24.



H_1 = Distance from ground surface to uppermost ground anchor

H_{n+1} = Distance from base of excavation to lowermost ground anchor

T_{hi} = Horizontal load in ground anchor i

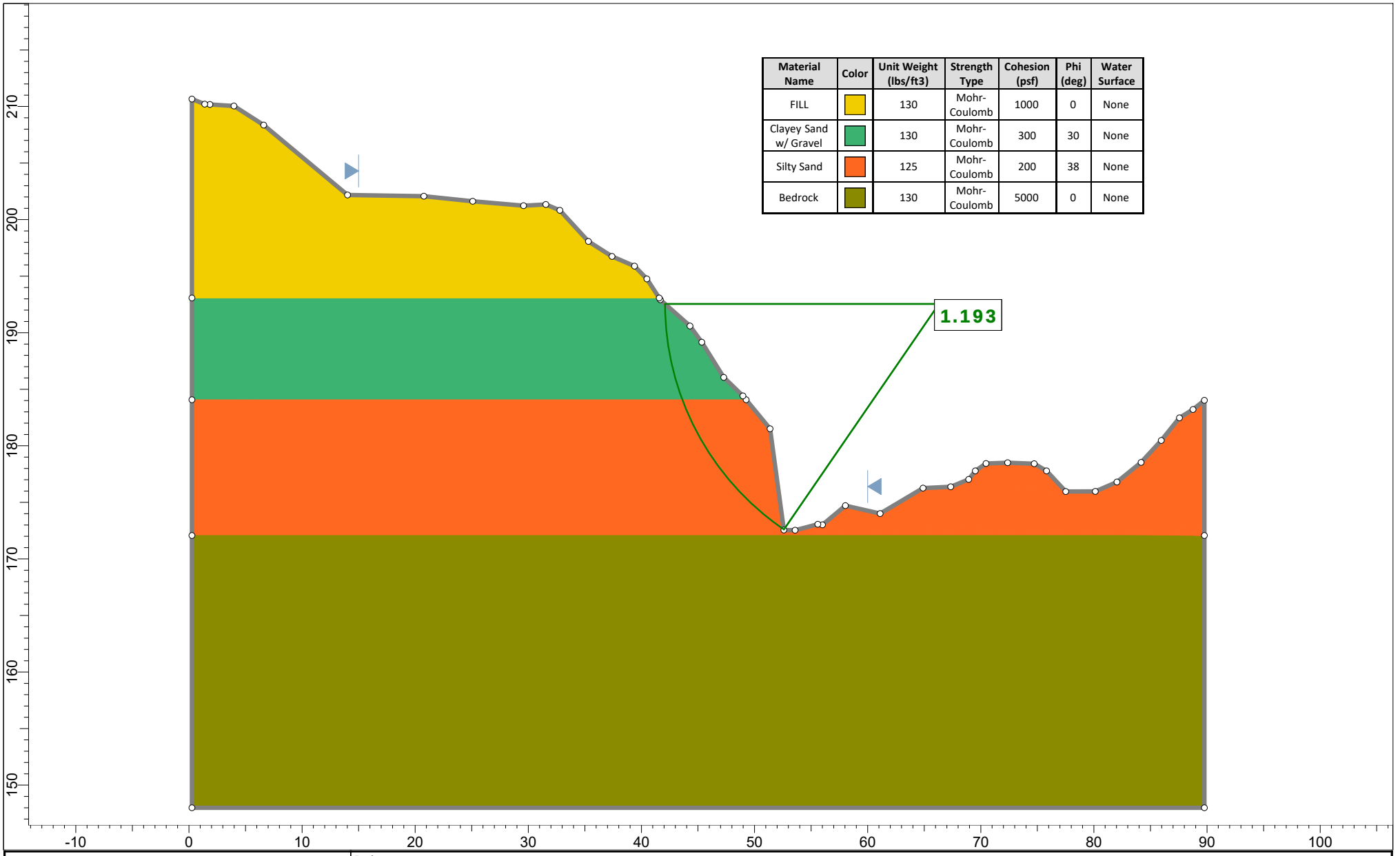
R = Reaction force to be resisted by subgrade (i.e., below base of excavation)

p = Maximum ordinate of diagram

TOTAL LOAD = $0.65\ K_A\ \gamma H^2$

Figure 24. Recommended apparent earth pressure diagram for sands.

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface
FILL		130	Mohr-Coulomb	1000	0	None
Clayey Sand w/ Gravel		130	Mohr-Coulomb	300	30	None
Silty Sand		125	Mohr-Coulomb	200	38	None
Bedrock		130	Mohr-Coulomb	5000	0	None

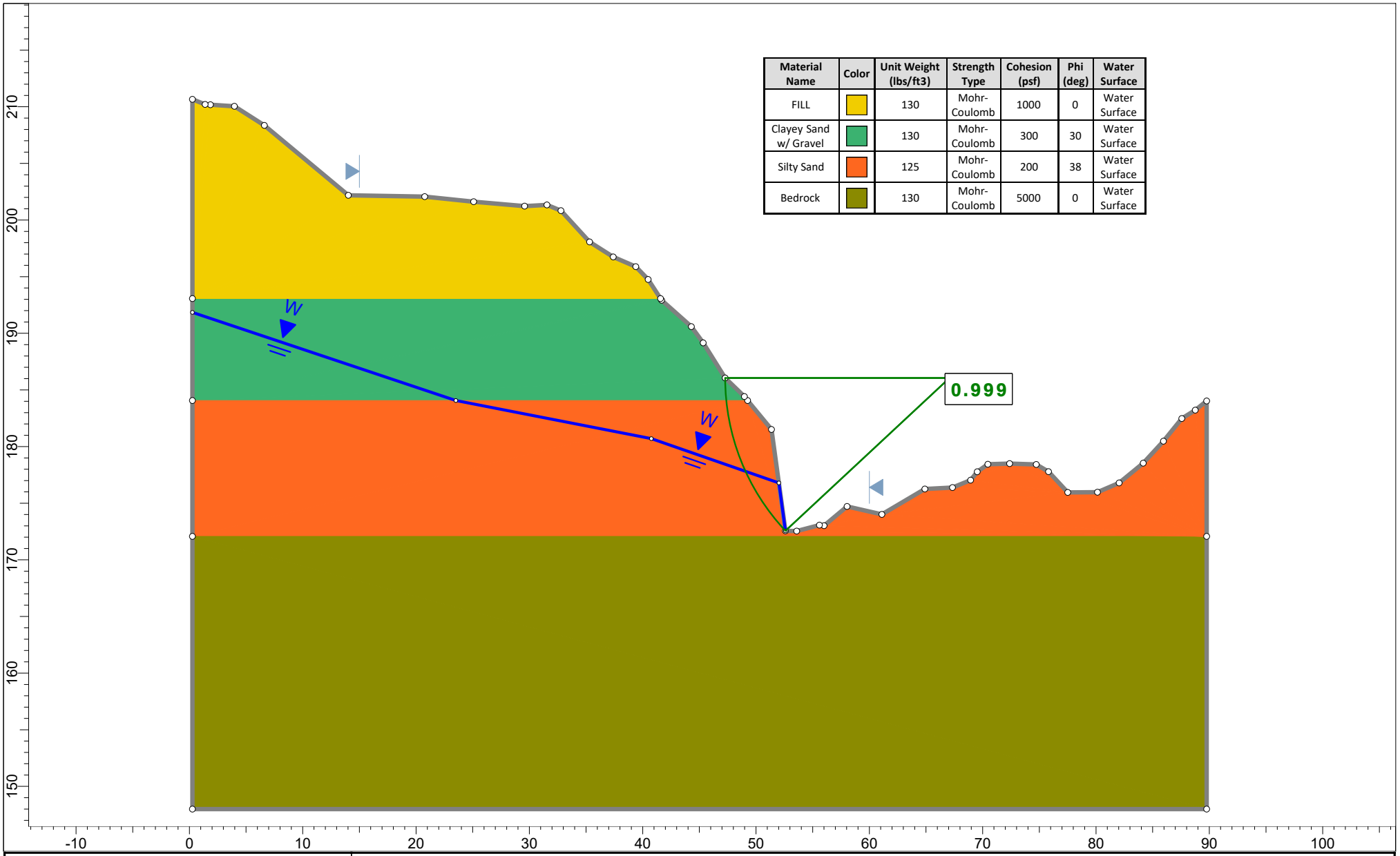


rocscience

SLIDEINTERPRET 9.020

Project	SLIDE - An Interactive Slope Stability Program		
Group	Existing	Scenario	Master Scenario
Drawn By		Company	
Date	3/14/2023, 10:31:19 AM	File Name	Slope Stability-20230411.slmd

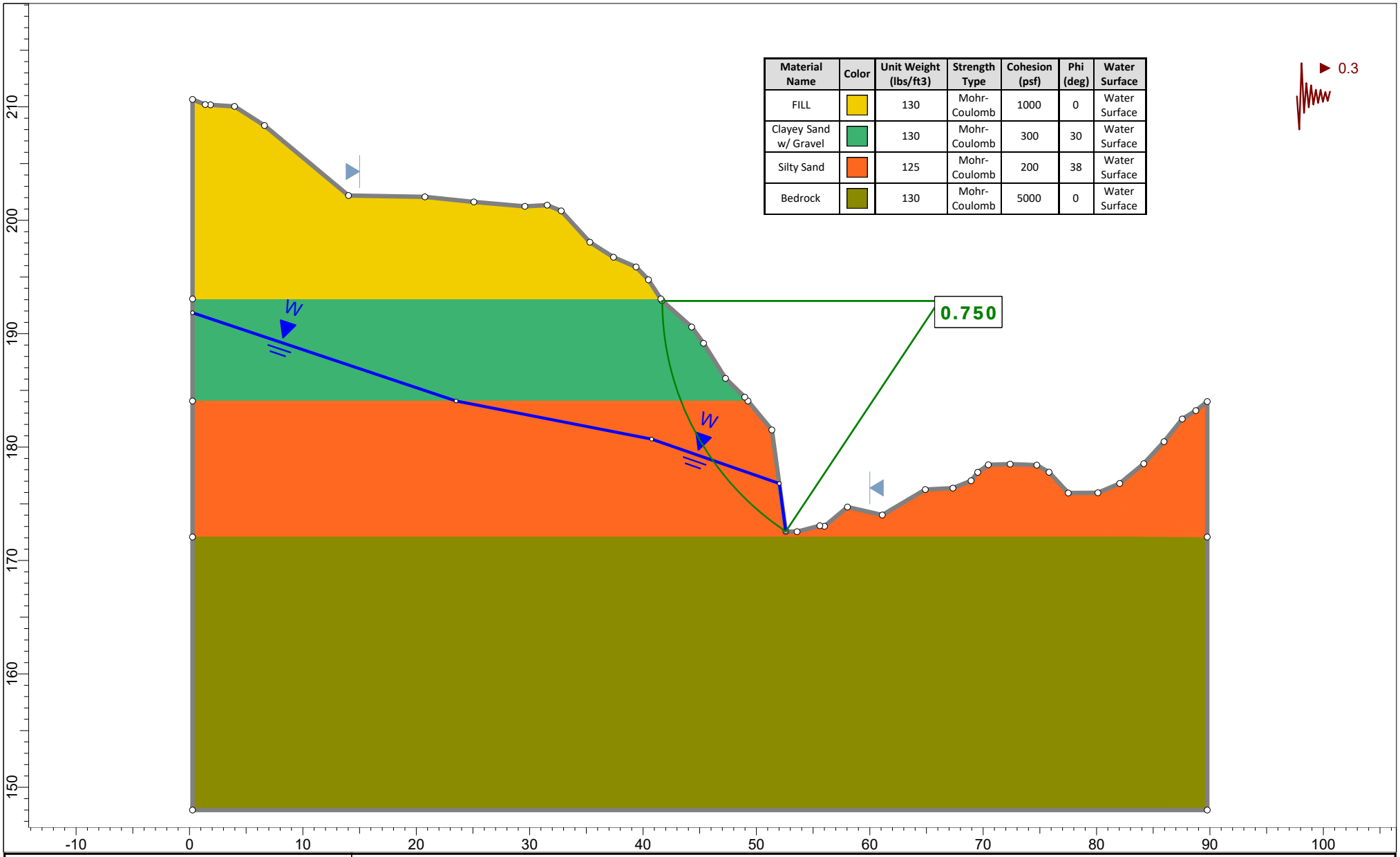
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface
FILL		130	Mohr-Coulomb	1000	0	Water Surface
Clayey Sand w/ Gravel		130	Mohr-Coulomb	300	30	Water Surface
Silty Sand		125	Mohr-Coulomb	200	38	Water Surface
Bedrock		130	Mohr-Coulomb	5000	0	Water Surface



rocscience

SLIDEINTERPRET 9.020

Project	SLIDE - An Interactive Slope Stability Program		
Group	Existing	Scenario	Existing - High GW
Drawn By		Company	
Date	3/14/2023, 10:31:19 AM	File Name	Slope Stability-20230411.slmd

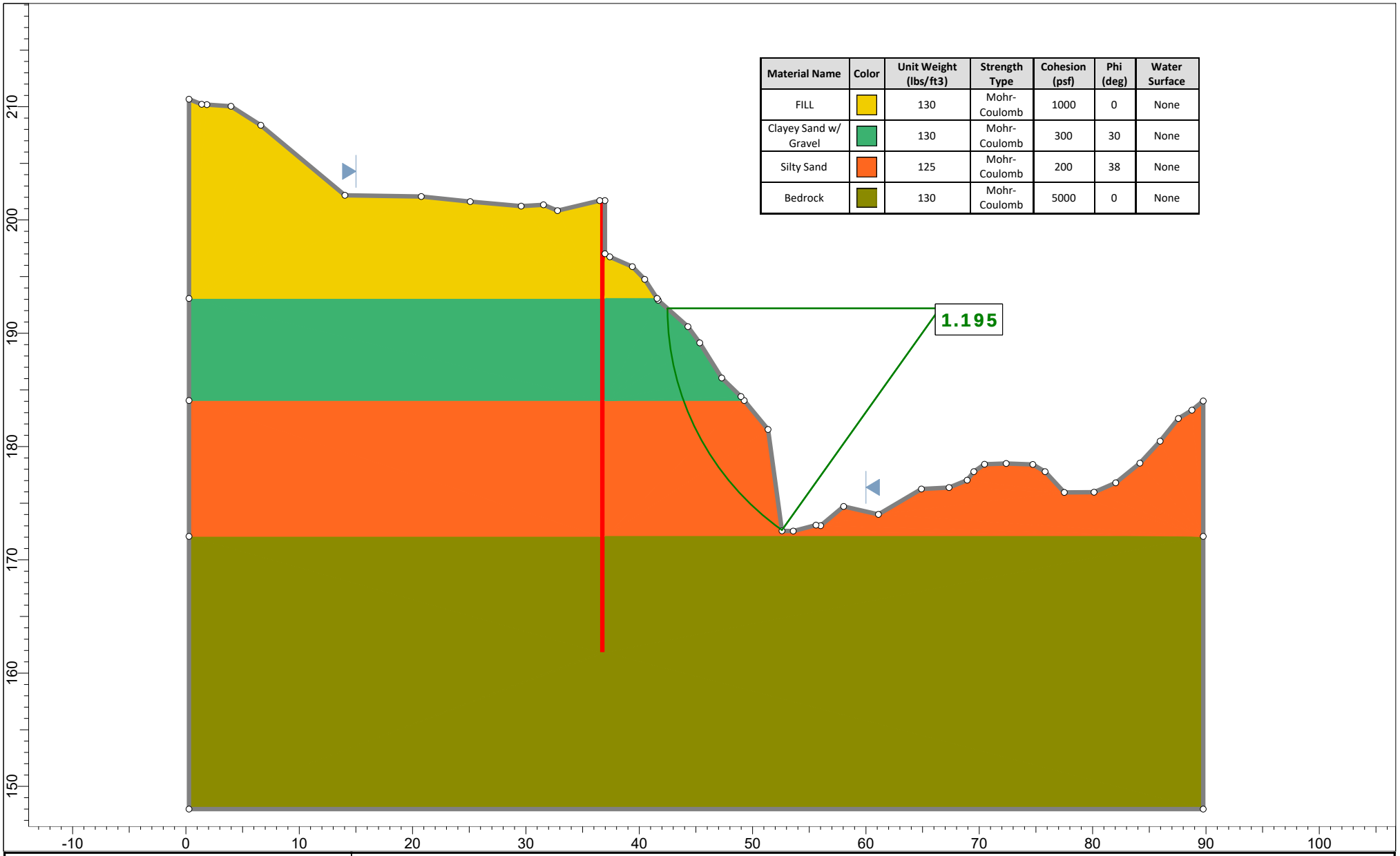


rocscience

SLIDEINTERPRET 9.020

Project	SLIDE - An Interactive Slope Stability Program		
Group	Existing	Scenario	Existing - Seismic
Drawn By		Company	
Date	3/14/2023, 10:31:19 AM	File Name	Slope Stability-20230411.slmd

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface
FILL		130	Mohr-Coulomb	1000	0	None
Clayey Sand w/ Gravel		130	Mohr-Coulomb	300	30	None
Silty Sand		125	Mohr-Coulomb	200	38	None
Bedrock		130	Mohr-Coulomb	5000	0	None

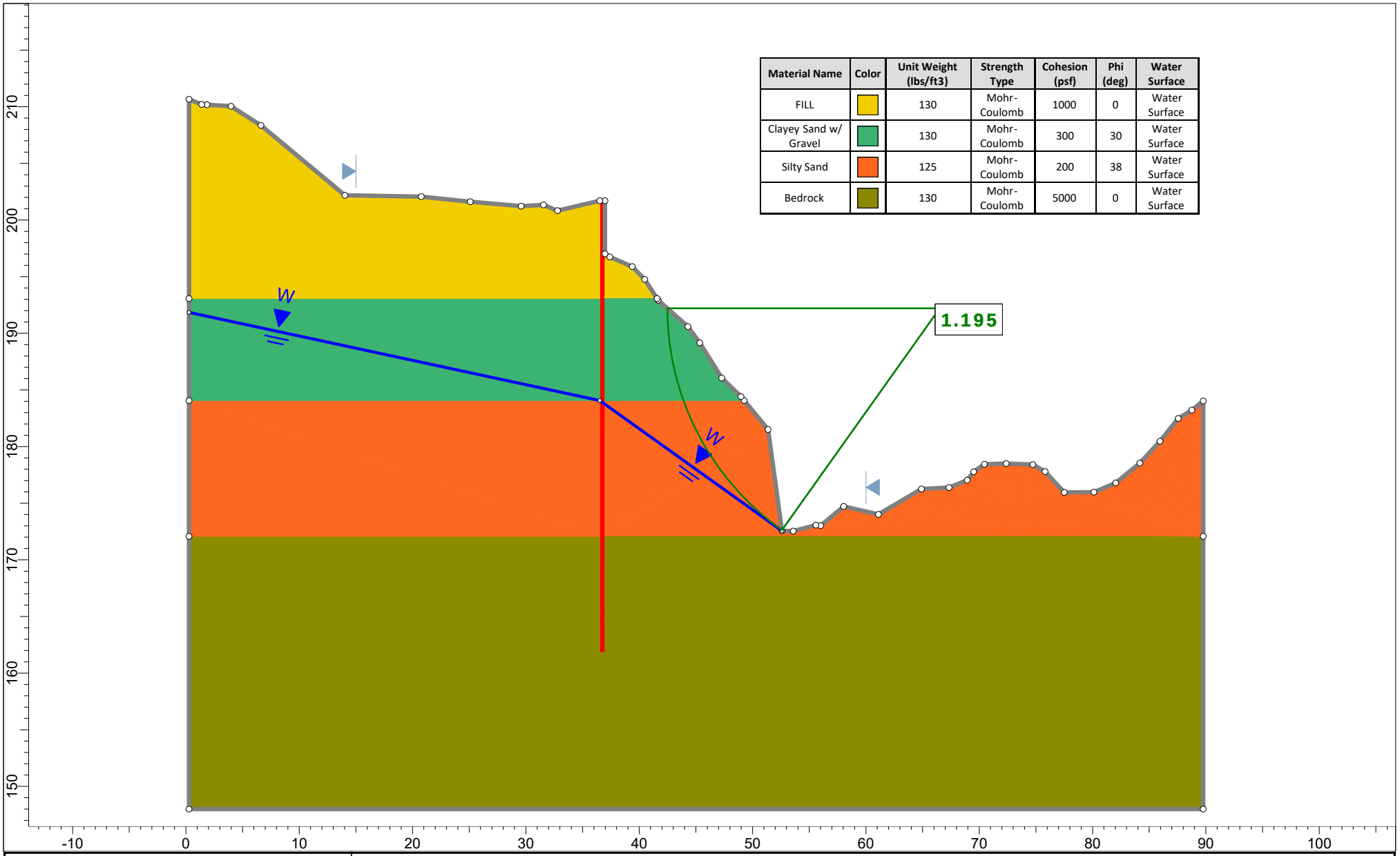


rocscience

SLIDEINTERPRET 9.020

Project	SLIDE - An Interactive Slope Stability Program		
Group	Retaining Wall - Level Backfill	Scenario	Master Scenario
Drawn By		Company	
Date	3/14/2023, 10:31:19 AM	File Name	Slope Stability-20230411.slmd

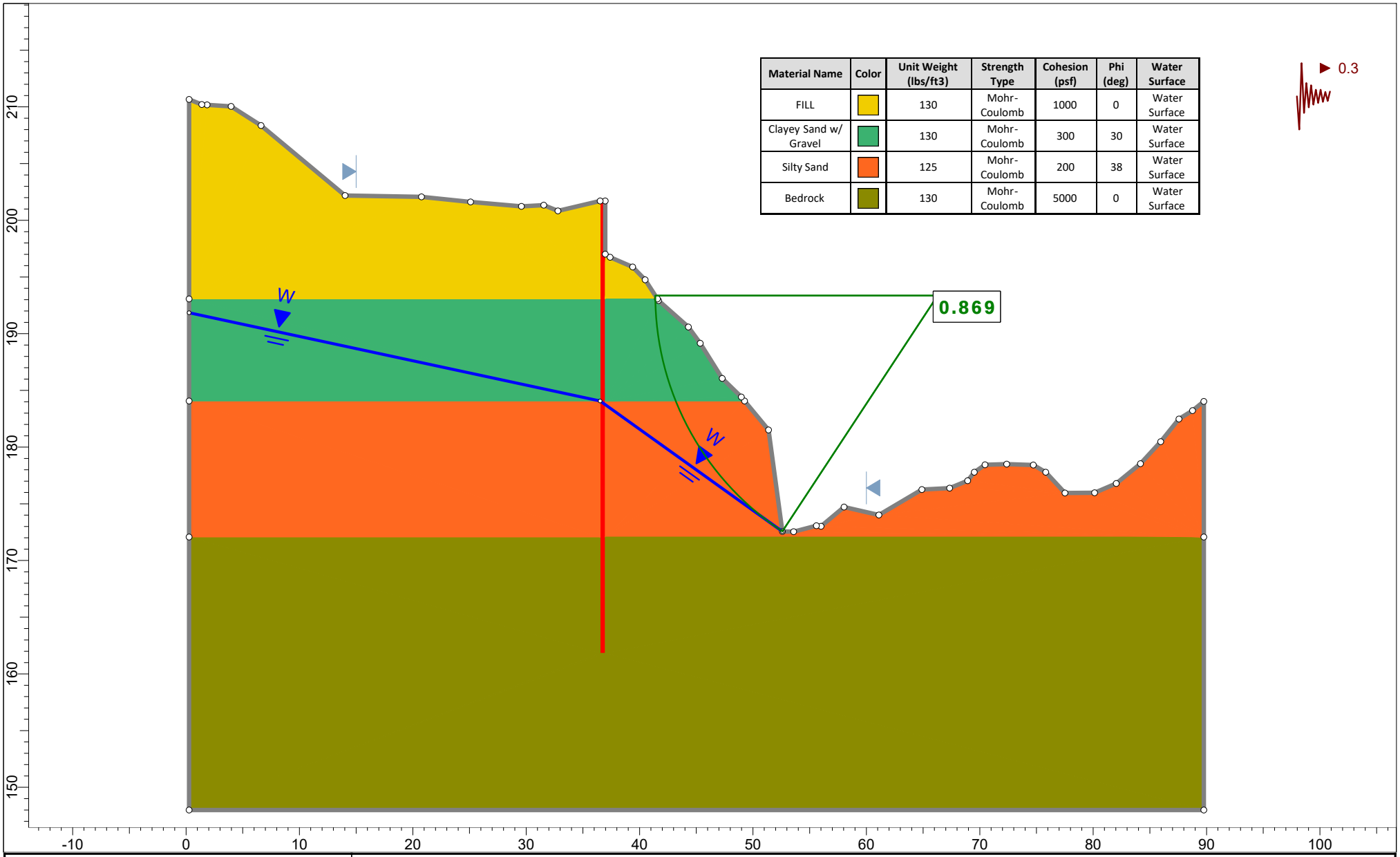
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface
FILL		130	Mohr-Coulomb	1000	0	Water Surface
Clayey Sand w/ Gravel		130	Mohr-Coulomb	300	30	Water Surface
Silty Sand		125	Mohr-Coulomb	200	38	Water Surface
Bedrock		130	Mohr-Coulomb	5000	0	Water Surface



rocscience

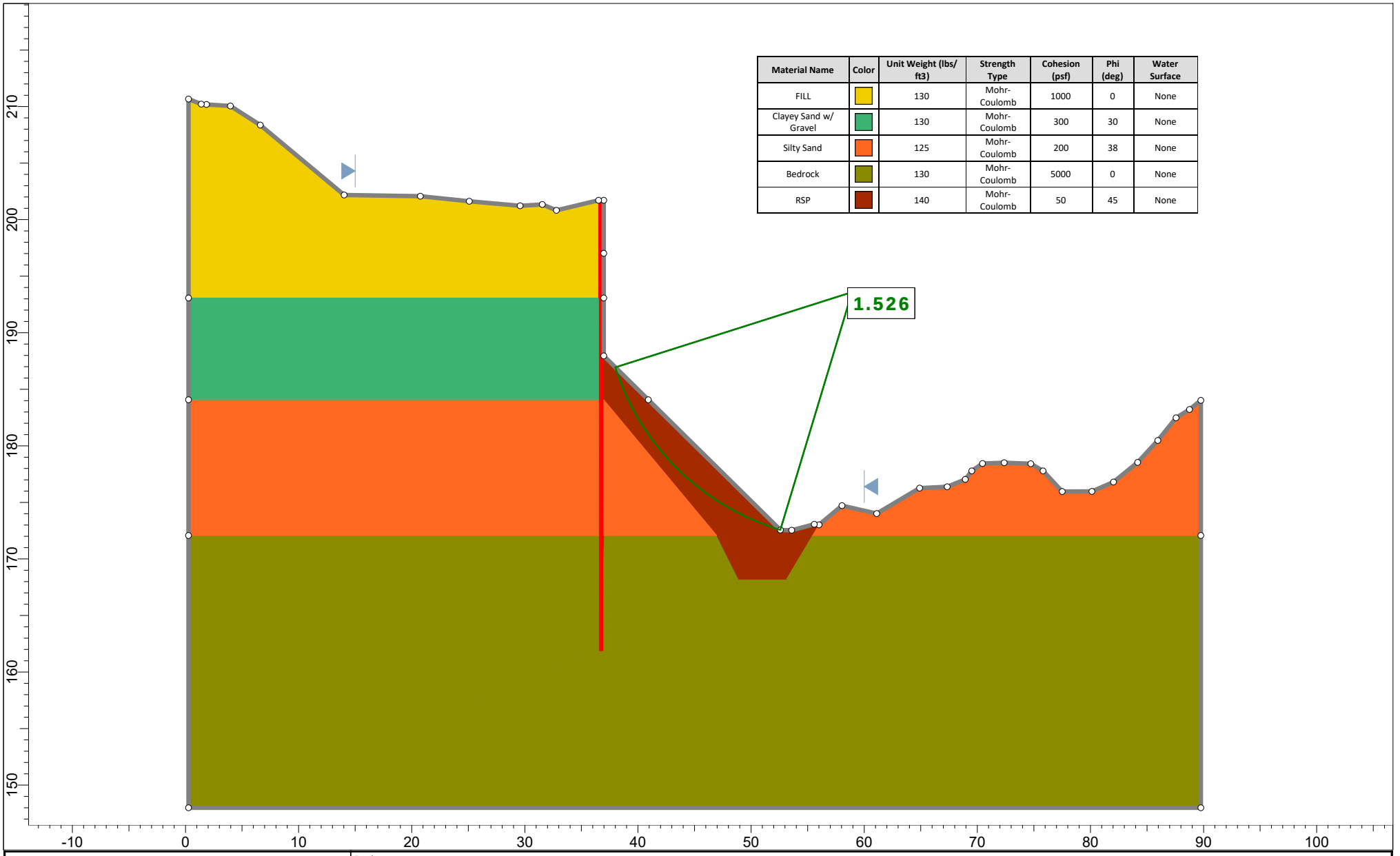
SLIDEINTERPRET 9.020

Project	SLIDE - An Interactive Slope Stability Program		
Group	Retaining Wall - Level Backfill	Scenario	Retaining Wall - High GW
Drawn By		Company	
Date	3/14/2023, 10:31:19 AM	File Name	Slope Stability-20230411.slmd



rocscience	Project	SLIDE - An Interactive Slope Stability Program	
	Group	Retaining Wall - Level Backfill	Scenario: Retaining Wall - Seismic
	Drawn By		Company
SLIDEINTERPRET 9.020	Date	3/14/2023, 10:31:19 AM	File Name: Slope Stability-20230411.slmd

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface
FILL		130	Mohr-Coulomb	1000	0	None
Clayey Sand w/ Gravel		130	Mohr-Coulomb	300	30	None
Silty Sand		125	Mohr-Coulomb	200	38	None
Bedrock		130	Mohr-Coulomb	5000	0	None
RSP		140	Mohr-Coulomb	50	45	None

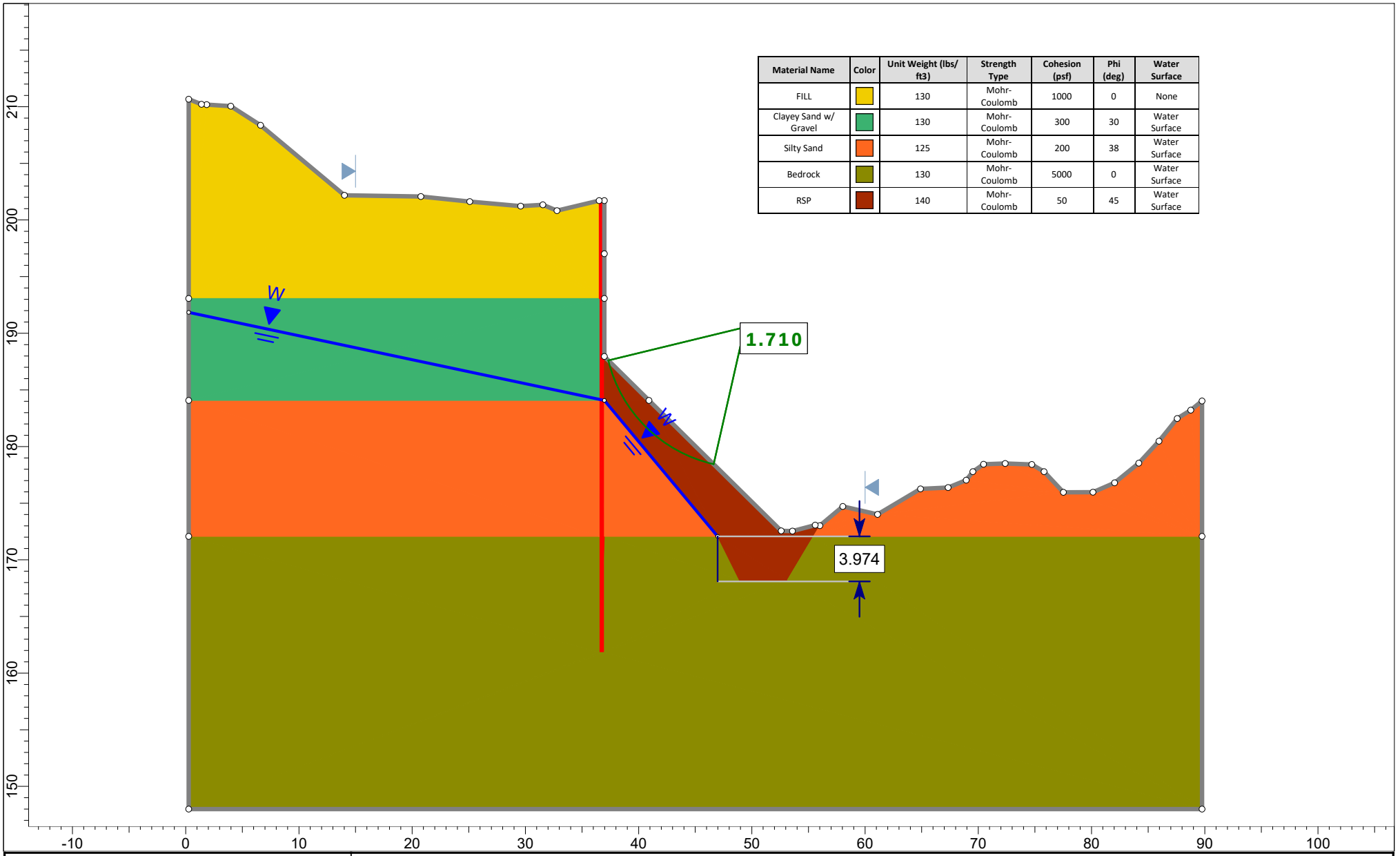


rocscience

SLIDEINTERPRET 9.020

Project	SLIDE - An Interactive Slope Stability Program		
Group	Wall w/ RSP - Level Backfill	Scenario	Master Scenario
Drawn By		Company	
Date	3/14/2023, 10:31:19 AM	File Name	Slope Stability-20230411.slmd

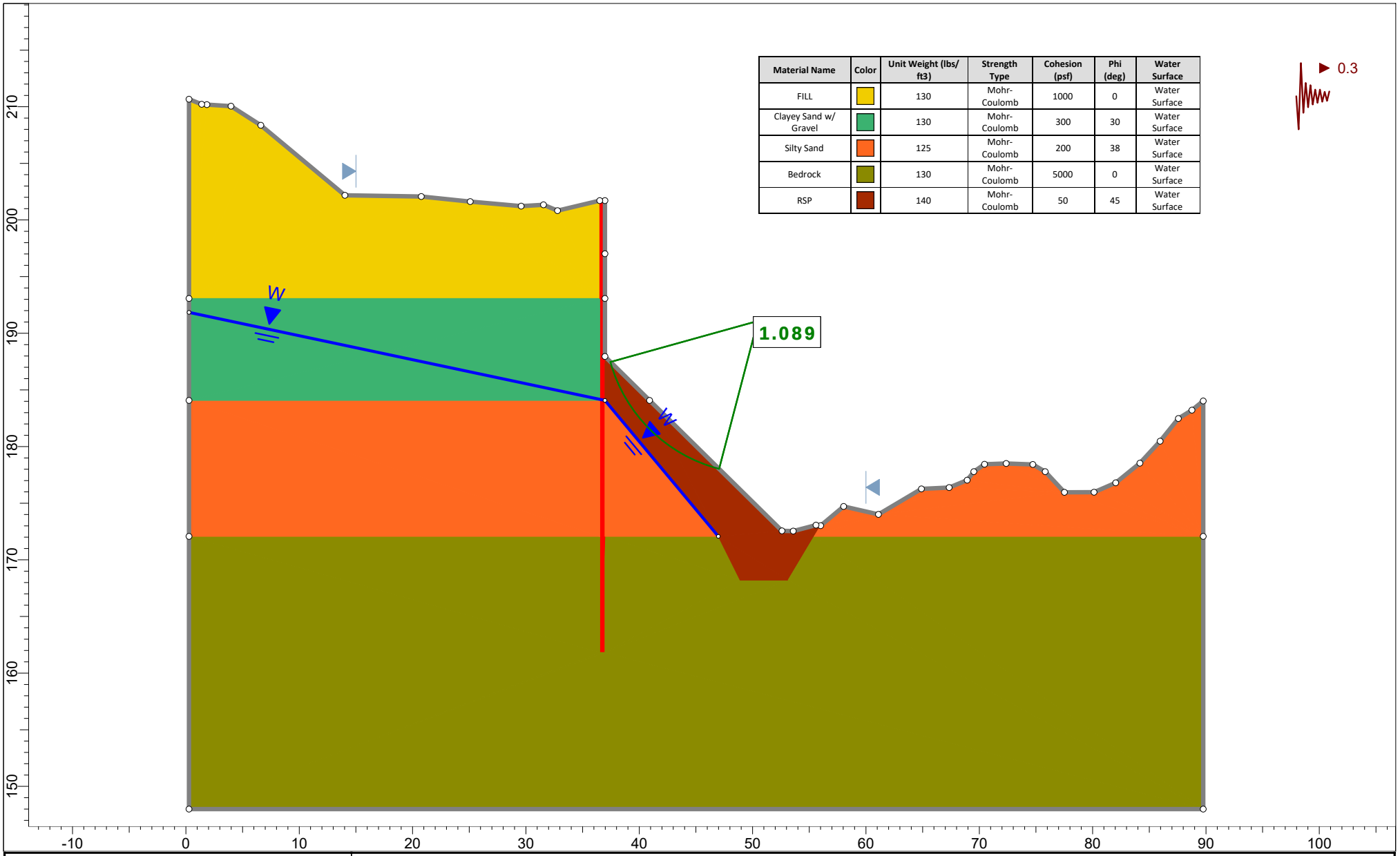
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface
FILL		130	Mohr-Coulomb	1000	0	None
Clayey Sand w/ Gravel		130	Mohr-Coulomb	300	30	Water Surface
Silty Sand		125	Mohr-Coulomb	200	38	Water Surface
Bedrock		130	Mohr-Coulomb	5000	0	Water Surface
RSP		140	Mohr-Coulomb	50	45	Water Surface



rocscience

SLIDEINTERPRET 9.020

Project	SLIDE - An Interactive Slope Stability Program		
Group	Wall w/ RSP - Level Backfill	Scenario	Wall w/ RSP - High GW
Drawn By		Company	
Date	3/14/2023, 10:31:19 AM	File Name	Slope Stability-20230411.slmd



rocscience	*Project*	SLIDE - An Interactive Slope Stability Program	
	Group	Wall w/ RSP - Level Backfill	*Scenario* Wall w/ RSP - Seismic
	Drawn By		*Company*
	Date	3/14/2023, 10:31:19 AM	*File Name* Slope Stability-20230411.slmd

SLIDEINTERPRET 9.020