Prepared for the San Mateo County Parks Department
Final for Public Review
2022

GATES +ASSOCIATES

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APPENDICES

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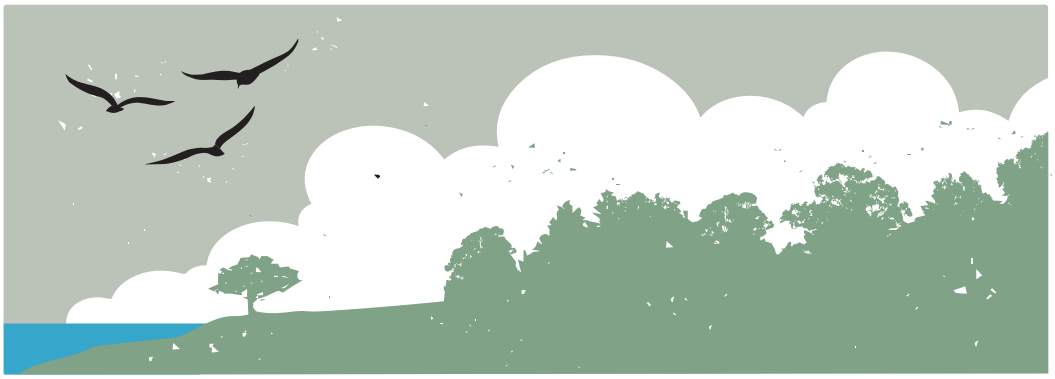
APPENDIX A | BIOLOGICAL ASSESSMENT



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Notes:

1. At the time of report publishing, the park unit was known as Quarry Park.

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Biological Resources Assessment

SAN MATEO COUNTY QUARRY PARK MASTER PLAN PROJECT
EL GRANADA, SAN MATEO COUNTY, CALIFORNIA

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Date:

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Project Number 26342

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LIST OF ACRONYMS AND ABBREVIATIONS

Cal-IPC	California Invasive Plant Council
CCC	California Coastal Commission
CCH	Consortium of California Herbaria
CCR	California Code of Regulations
CDFW	California Department of Fish and Wildlife
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
CFR	Code of Federal Regulations
CNDDB	California Natural Diversity Database
CNPS	California Native Plant Society
Corps	U.S. Army Corps of Engineers
County	San Mateo County
CRLF	California red-legged frog
CWA	Clean Water Act
dBA	A-weighted decibels
EPA	U.S. Environmental Protection Agency
ESHA	Environmentally Sensitive Habitat Area
FAC	Facultative species (equal in wetland or non-wetlands)
FACW	Facultative wetland species (usually found in wetlands)
FE	Federal Endangered
FESA	Federal Endangered Species Act
LCP	Local Coastal Program
MBTA	Migratory Bird Treaty Act
NMFS	National Marine Fisheries Service
NRCS	Natural Resources Conservation Service
OBL	Obligate wetland species (almost always found in wetlands)
OHWM	Ordinary High Water Mark
RWQCB	Regional Water Quality Control Board
SE	State Endangered
SFGS	San Francisco garter snake
SOC	Species of Concern
SSC	Species of Special Concern
TOB	Top of Bank
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WBWG	Western Bat Working Group

1.0 INTRODUCTION

On March 16 and 22, 2017, WRA, Inc. conducted a biological resource assessment of the 539.48-acre Quarry Park property (Study Area) for the Master Plan Project (Project) located in the unincorporated community of El Granada in San Mateo County, California (Figure 1). The Study Area is comprised to several parcels: Quarry Park, Wicklow, Mirada Surf East, and Mirada Surf West. While Quarry Park and Mirada Surf West contain public access features, Wicklow and Mirada Surf East have not been developed. A private, residential in-holding (O'Neill residence) lies within the northern section of the Study Area.

The purpose of the site visit and report is to identify, describe, and map any sensitive habitats, including riparian, wetland, and stream areas, or other Environmental Sensitive Habitat Areas (ESHAs); and "rare, threatened, or endangered" species, which may occur in the Study Area. WRA performed the biological resources assessment in accordance with the San Mateo County (County) Midcoast Local Coastal Program (LCP), including Sections 7.1-7.19. This assessment is based on site conditions observed on the date of the site visit, related information available at the time of the study, and from reviewing past reports completed on the Study Area or adjacent properties. This report also contains an evaluation of potential impacts to special-status species or ESHAs that may occur as a result of the proposed project and potential mitigation measures to compensate for those impacts.

1.1 Description of the Study Area

The Study Area rises from approximately 100 feet in elevation to a maximum elevation of 935 feet above sea level at the northern edge of the Study Area. Mirada Surf West is located adjacent to the Pacific Ocean while the eastern slope of the property drains into the Arroyo de en Medio watershed. The majority of the property is comprised of a series of unnamed drainages that discharge into the community of El Granada.

The Study Area is situated between the Santa Cruz mountain range and the Pacific Ocean. No past development or agriculture fields occurred within the Study Area; however, based on historic aerial imagery, southern portions of the Study Area are mowed regularly (Google Earth 2002-2015). The Study Area is situated in the coastal fog belt where fog is a source of hydrology in the summer and storms provide precipitation in the winter. Average maximum temperature peaks in September at 67 degrees Fahrenheit with average minimum temperature in January at 43 degrees Fahrenheit. Average annual precipitation is 26.98 inches, generally occurring in the from November through March.

The Study Area includes the following biological communities: beaches; Eucalyptus (*Eucalyptus globulus*) grove (non-native woodland); central coast arroyo willow riparian scrub dominated by arroyo willow (*Salix lasiolepis*); developed areas; Monterey cypress (*Hesperocyparis macrocarpa*) stands; Monterey pine (*Pinus radiata*) stands; non-native annual grasslands; non-wetland waters consistent of ephemeral, intermittent, and perennial streams; perennial ponds; northern coastal scrub; and potential seasonal wetlands. Residential neighborhoods, public open space, and schools surround the southeastern portion of the Study Area and undeveloped land occurs to the north, east, and in portions of the northwest.

Figure 1. Study Area Location Map

San Mateo County Quarry Park
Master Plan
San Mateo County, California

wra
ENVIRONMENTAL CONSULTANTS

Map Prepared Date: 3/20/2017
Map Prepared By: mrochelle
Base Source: National Geographic
Data Source(s): WRA

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2.0 REGULATORY BACKGROUND

The following sections explain the regulatory context of the biological assessment, including applicable laws and regulations that were applied to the field investigations and analysis of potential project impacts.

2.1 Special-Status Species

Special-status species include those plants and wildlife species that have been formally listed, are proposed as endangered or threatened, or are candidates for such listing under the federal Endangered Species Act (FESA) or California Endangered Species Act (CESA). These Acts afford protection to both listed and proposed species. In addition, California Department of Fish and Wildlife (CDFW) Species of Special Concern (SSC), and National Marine Fisheries Service (NMFS) Species of Concern (SOC), are species that face extirpation if current population and habitat trends continue. U.S. Fish and Wildlife Service (USFWS) Birds of Conservation Concern, sensitive species included in USFWS Recovery Plans, and CDFW special-status invertebrates are also considered special-status species. Although CDFW Species of Special Concern generally have no special legal status, they are given special consideration under the California Environmental Quality Act (CEQA). In addition to regulations for special-status species, most birds in the United States, including non-status species, are protected by the Migratory Bird Treaty Act (MBTA) of 1918. Under this legislation, destroying active nests, eggs, and young is illegal. Bat species designated as "High Priority" by the Western Bat Working Group (WBWG) qualify for legal protection under Section 15380(d) of the CEQA Guidelines. Species designated "High Priority" are defined as "imperiled or are at high risk of imperilment based on available information on distribution, status, ecology and known threats".

Plant species included within the California Native Plant Society (CNPS) Inventory of Rare and Endangered Plants (Inventory; CNPS 2017a) with California Rare Plant Rank (Rank) of 1, 2, and 3 are also considered special-status plant species and must be considered under the CEQA. Some Rank 4 plant species meet the definitions of Section 1901 Chapter 10 of the Native Plant Protection Act or Sections 2062 and 2067 of the CFGC that outlines CESA. However, the CNPS and the CDFW strongly recommend that these species be fully considered during the preparation of environmental documentation related to the CEQA. This may be particularly appropriate for the type locality of a Rank 4 plant species, for populations at the periphery of a species range, or in areas where the taxon is especially uncommon or has sustained heavy losses, or from populations exhibiting unusual morphology or occurring on unusual substrates. A description of the CNPS Ranks is provided below in Table 1.

Table 1. Description of CNPS Ranks and Threat Codes

California Rare Plant Ranks (formerly known as CNPS Lists)	
Rank 1A	Presumed extirpated in California and either rare or extinct elsewhere
Rank 1B	Rare, threatened, or endangered in California and elsewhere
Rank 2A	Presumed extirpated in California, but common elsewhere
Rank 2B	Rare, threatened, or endangered in California, but common elsewhere
Rank 3	Plants about which more information is needed - A review list
Rank 4	Plants of limited distribution - A watch list

California Rare Plant Ranks (formerly known as CNPS Lists)	
Threat Ranks	
0.1	Seriously threatened in California
0.2	Moderately threatened in California
0.3	Not very threatened in California

Critical Habitat

Critical habitat is a term defined and used in the FESA as a specific geographic area that contains features essential for the conservation of a threatened or endangered species and that may require special management and protection. The FESA requires federal agencies to consult with the USFWS to conserve listed species on their lands and to ensure that any activities or projects they fund, authorize, or carry out will not jeopardize the survival of a threatened or endangered species. In consultation for those species with critical habitat, federal agencies must also ensure that their activities or projects do not adversely modify critical habitat to the point that it will no longer aid in the species' recovery. In many cases, this level of protection is similar to that already provided to species by the FESA "jeopardy standard." However, areas that are currently unoccupied by the species but which are needed for the species' recovery, are protected by the prohibition against adverse modification of critical habitat.

2.2 Sensitive Biological Communities

Sensitive biological communities include habitats that fulfill special functions or have special values, such as wetlands, streams, and riparian habitat. These habitats are regulated under federal regulations (such as the Clean Water Act [CWA]), state regulations (such as the Porter-Cologne Act, the CDFW Streambed Alteration Program, and CEQA), or local ordinances or policies (such as City or County Tree Ordinances, Special Habitat Management Areas, applicable LCPs, and General Plan Elements). Mitigation measures for impacts to these communities are discussed in Section 5 of this report.

Waters of the United States

The U.S. Army Corps of Engineers (Corps) regulates "Waters of the United States" under Section 404 of the Clean Water Act. Waters of the U.S. are defined in the Code of Federal Regulations (CFR) as waters susceptible to use in commerce, including interstate waters and wetlands, all other waters (intrastate waterbodies, including wetlands), and their tributaries (33 CFR 328.3). Potential wetland areas, according to the three criteria used to delineate wetlands as defined in the *Corps of Engineers Wetlands Delineation Manual* (Environmental Laboratory 1987), are identified by the presence of (1) hydrophytic vegetation, (2) hydric soils, and (3) wetland hydrology. Areas that are inundated at a sufficient depth and for a sufficient duration to exclude growth of hydrophytic vegetation are subject to Section 404 jurisdiction as "other waters" and are often characterized by an ordinary high water mark (OHWM). Other waters, for example, generally include lakes, rivers, and streams. The placement of fill material into Waters of the U.S generally requires an individual or nationwide permit from the Corps under Section 404 of the Clean Water Act.

Waters of the State

The term "Waters of the State" is defined by the Porter-Cologne Act as "any surface water or groundwater, including saline waters, within the boundaries of the state." The Regional Water Quality Control Board (RWQCB) protects all waters in its regulatory scope, but has special responsibility for wetlands, riparian areas, and headwaters. These waterbodies have high resource value, are vulnerable to filling, and are not systematically protected by other programs. RWQCB jurisdiction includes "isolated" wetlands and waters that may not be regulated by the Corps under Section 404. "Waters of the State" are regulated by the RWQCB under the State Water Quality Certification Program which regulates discharges of fill and dredged material under Section 401 of the CWA and the Porter-Cologne Water Quality Control Act. Projects that require a Corps 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 determination. If a proposed project does not require a federal permit, but does involve dredge or fill activities that may result in a discharge to "Waters of the State," the RWQCB has the option to regulate the dredge and fill activities under its state authority in the form of Waste Discharge Requirements.

Streams, Lakes, and Riparian Habitat

Streams and lakes, as habitat for fish and wildlife species, are subject to jurisdiction by CDFW under Sections 1600-1616 of the State Fish and Game Code. Alterations to or work within or adjacent to streambeds or lakes generally require a 1602 Lake and Streambed Alteration Agreement. The term stream, which includes creeks and rivers, is defined in the California Code of Regulations (CCR) as follows: "a body of water that flows at least periodically or intermittently through a bed or channel having banks and supports fish or other aquatic life. This includes watercourses having a surface or subsurface flow that supports or has supported riparian vegetation" (14 CCR 1.72). In addition, the term stream can include ephemeral streams, dry washes, watercourses with subsurface flows, canals, aqueducts, irrigation ditches, and other means of water conveyance if they support aquatic life, riparian vegetation, or stream dependent terrestrial wildlife (CDFG ESD 1994). Riparian is defined as, "on, or pertaining to, the banks of a stream;" therefore, riparian vegetation is defined as, "vegetation which occurs in and/or adjacent to a stream and is dependent on, and occurs because of, the stream itself" (CDFG ESD 1994). Removal of riparian vegetation also requires a Section 1602 Lake and Streambed Alteration Agreement from CDFW.

Habitat Restoration and Enhancement Act

The California Assembly Bill No. 2193 (AB2193) establishes Section 1650 of the CFGC, Chapter 6.5. Habitat Restoration and Enhancement Act, which requires the Director of CDFW to approve habitat restoration of enhancement in an expedited process if specific conditions are met. Special conditions include:

- habitat restoration that is voluntary and not required as part of mitigation;
- the project is not part of a regulatory permit for a non-habitat restoration or enhancement construction activity, a regulatory settlement, a regulatory enforcement action, or a court order;
- the project meets the eligibility requirements of the State Water Resources Control Board's Order for Clean Water Act Section 401 General Water Quality Certification for Small Habitat Restoration Projects, or its current equivalent at the time the project proponent submits the

written request, but has not received certification pursuant to that order or its equivalent; and

- the project is consistent with, or identified in, sources that describe best available restoration and enhancement methodologies.

Other Sensitive Biological Communities

Other sensitive biological communities not discussed above include habitats that fulfill special functions or have special values. Natural communities considered sensitive are those identified in local or regional plans, policies, regulations, or by the CDFW. The CDFW ranks sensitive communities as "threatened" or "very threatened" and keeps records of their occurrences in its Natural Diversity Database (CNDDB). Sensitive plant communities are also identified by CDFW on their *List of California Natural Communities Recognized by the CNDDB*. Impacts to sensitive natural communities identified in local or regional plans, policies, regulations or by the CDFW or USFWS must be considered and evaluated under CEQA (CCR: Title 14, Div. 6, Chap. 3, Appendix G). Specific habitats may also be identified as sensitive in City or County General Plans or ordinances.

The California Coastal Commission ESHA Definition

The California Coastal Commission defines an ESHA as follows:

> "*Environmentally sensitive habitat area" means any area in which plant or animal life or their habitats are either rare or especially valuable because of their special nature or role in an ecosystem and which could be easily disturbed or degraded by human activities and developments.* "

California Coastal Commission (CCC) Guidelines contain definitions for specific types of ESHAs, including: wetlands, estuaries, streams and rivers, lakes, open coastal waters and coastal waters, riparian habitats, other resource areas, and special-status species and their habitats. For the purposes of this report, WRA has taken into consideration any areas that may meet the definition of any ESHA defined by the CCC guidelines or the County LCP.

San Mateo County Local Coastal Program and Land Use Plan

The 2013 County LCP identified sensitive habitats to include: riparian corridors, wetlands, marine habitats, sand dunes, sea cliffs, and habitats supporting rare, endangered, and unique species. Further, the County LCP defines sensitive habitats as:

> *…any area which meets one of the following criteria: (1) habitats containing or supporting "rare and endangered" species as defined by the State Fish and Game Commission, (2) all perennial and intermittent streams and their tributaries, (3) coastal tide lands and marshes, (4) coastal and offshore areas containing breeding or nesting sites and coastal areas used by migratory and resident water-associated birds for resting areas and feeding, (5) areas used for scientific study and research concerning fish and wildlife, (6) lakes and ponds and adjacent shore habitat, (7) existing game and wildlife refuges and reserves, and (8) sand dunes.*
>
> San Mateo LCP (2013), Policy 7.1

In areas defined as wetlands, buffer zones must be established according to the following guidelines:

> *Buffer zones shall extend a minimum of 100 feet landward from the outermost line of wetland vegetation. This setback may be reduced to no less than 50 feet only where (1) no alternative development site or design is possible; and (2) adequacy of the alternative setback to protect wetland resources is conclusively demonstrated by a professional biologist to the satisfaction of the County and the State Department of Fish and Game [now Fish and Wildlife]. A larger setback shall be required as necessary to maintain the functional capacity of the wetland ecosystem.*
>
> San Mateo LCP (2013), Policy 7.18

Additionally, the County LCP defines Riparian Corridors as a sensitive habitat, where riparian corridors are defined as:

> *…the "limit of riparian vegetation" (i.e., a line determined by the association of plant and animal species normally found near streams, lakes and other bodies of freshwater: red alder, jaumea, pickleweed, big leaf maple, narrow-leaf cattail, arroyo willow, broadleaf cattail, horsetail, creek dogwood, black cottonwood, and box elder). Such a corridor must contain at least a 50% cover of some combination of the plants listed.*
>
> San Mateo LCP (2013), Policy 7.7

This County LCP further clarifies in Policy 7.8 that riparian corridors be established for all perennial and intermittent streams, lakes, and other bodies of freshwater in the Coastal Zone. Guidelines for establishing buffer zones are described as:

> *a. On both sides of riparian corridors, from the "limit of riparian vegetation" extend buffer zones 50 feet outward for perennial streams and 30 feet outward for intermittent streams.*
> *b. Where no riparian vegetation exists along both sides of riparian corridors, extend buffer zones 50 feet from the predictable high water point for perennial streams and 30 feet from the midpoint of intermittent streams.*
> *c. Along lakes, ponds, and other wet areas, extend buffer zones 100 feet from the high water point except for manmade ponds and reservoirs used for agricultural purposes for which no buffer zone is designated.*
>
> San Mateo LCP (2013), Policy 7.11

The County LCP also requires in Policy 7.48 that any development keep to a minimum the number of native Monterey pine cut in the natural pine habitat near the San Mateo-Santa Cruz County line and allows the commercial cutting of Monterey pine if it perpetuates the long-term viability of stands or prevents environmental degradation. In addition, the County LCP requires in Policy 7.49 that any development within one-half mile of the coast mitigate against the destruction of any California strawberry (*Fragaria vesca*).

3.0 METHODS

On March 16 and 22, 2017, the Study Area was traversed on foot to determine (1) plant communities present within the Study Area, (2) if existing conditions provide suitable habitat for any special-status plant or wildlife species, and (3) if sensitive habitats including ESHA are present. All plant and wildlife species encountered were recorded, and are summarized in Appendix A. Plant nomenclature follows Baldwin et al. (2012), except where noted. For cases in which

taxonomic discrepancies occur between Baldwin et al. and the CNPS Inventory of Rare Plants, precedence was given to the species classification used in the CNPS Inventory.

3.1 Biological Communities

Prior to the site visit, the *Soil Survey of San Mateo Area, California* (NRCS 2015) was examined to determine if any unique soil types that could support sensitive plant communities and/or aquatic features were present in the Study Area. Biological communities present in the Study Area were classified based on existing plant community descriptions described in the *Preliminary Descriptions of the Terrestrial Natural Communities of California* (Holland 1986) and *A Manual of California Vegetation* (Sawyer et al. 2009). However, in some cases it is necessary to identify variants of community types or to describe non-vegetated areas that are not described in the literature. Biological communities were classified as sensitive or non-sensitive as defined by CEQA, the County LCP, and other applicable laws and regulations.

3.1.1 Non-sensitive Biological Communities

Non-sensitive biological communities are those communities that are not afforded special protection under CEQA, and other state, federal, and local laws, regulations and ordinances. These communities may provide suitable habitat for some special-status plant or wildlife species and are this is discussed in Section 4.2 below.

3.1.2 Sensitive Biological Communities

Sensitive biological communities are defined as those communities that are given special protection under CEQA and other applicable federal, state, and local laws, regulations and ordinances. Applicable laws and ordinances are discussed above in Section 2.0. Special methods used to identify sensitive biological communities are discussed below.

Wetlands and Waters

The Study Area was surveyed at a reconnaissance level to determine if any wetlands and waters potentially subject to jurisdiction by the Corps, RWQCB, or CDFW were present. The assessment was based primarily on the presence of wetland plant indicators, but may also include any observed indicators of wetland hydrology as defined by the Corps Manual (Environmental Laboratory 1987) and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region* (Corps 2008). Any potential wetland areas were identified as areas dominated by plant species with a wetland indicator status of obligate wetland (OBL), facultative wetland (FACW), or facultative (FAC) as given on the U.S. Department of Agriculture: National Wetland Plant List (Lichvar 2014). Evidence of wetland hydrology can include evidence such as visible inundation or saturation, surface sediment deposits, algal mats and drift lines, and oxidized root channels. Given that the site visits did not include a routine-level wetland delineation and was only reconnaissance level, soils were not examined in the field as part of this assessment.

Other Sensitive Biological Communities

The Study Area was evaluated for the presence of other sensitive biological communities, including riparian areas, sensitive plant communities recognized by CDFW, significant areas of native plants, and other ESHAs. These sensitive biological communities were mapped and are described in Section 4.1.2 below.

3.2 Special-Status Species

3.2.1 Literature Review

Potential occurrence of special-status species in the Study Area was evaluated by first determining which special-status species occur in the vicinity of the Study Area through a literature and database search. Database searches for known occurrences of special-status species focused on the Half Moon Bay and Montara Mountain 7.5-minute U.S. Geological Survey (USGS) quadrangles. The following sources were reviewed to determine which special-status plant and wildlife species have been documented to occur in the vicinity of the Study Area:

- CNDDB records (CDFW 2017)
- USFWS Information for Planning and Conservation Species (USFWS 2017a)
- CNPS Inventory records (CNPS 2017a)
- Consortium of California Herbaria (CCH 2017)
- California Department of Fish and Game publication "California's Wildlife, Volumes I-III" (Zeiner et al. 1990)
- A Field Guide to Western Reptiles and Amphibians (Stebbins and McGinnis 2012)
- California Amphibian and Reptile Species of Special Concern (Thomson et al 2016)
- California Bird Species of Special Concern (Shuford and Gardali 2008)
- USFWS Critical Habitat Mapper (USFWS 2017b)
- Western Bat Working Group, species accounts (WBWG 2017)
- San Mateo County Local Coastal Program (County of San Mateo 1998, 2013)

3.2.2 Site Assessment

On March 16 and 22, 2017, WRA surveyed the Study Area to search for suitable habitats for species identified in the literature review as occurring in the vicinity. The potential for each special-status species to occur in the Study Area was then evaluated according to the following criteria:

o No Potential. Habitat on and adjacent to the site is clearly unsuitable for the species requirements (foraging, breeding, cover, substrate, elevation, hydrology, plant community, site history, disturbance regime).

o Unlikely. Few of the habitat components meeting the species requirements are present, and/or the majority of habitat on and adjacent to the site is unsuitable or of very poor quality. The species is not likely to be found on the site.

o Moderate Potential. Some of the habitat components meeting the species requirements are present, and/or only some of the habitat on or adjacent to the site is unsuitable. The species has a moderate probability of being found on the site.

o High Potential. All of the habitat components meeting the species requirements are present and/or most of the habitat on or adjacent to the site is highly suitable. The species has a high probability of being found on the site.

o Present. Species is observed on the site or has been recorded (i.e. CNDDB, other reports) on the site recently.

The site assessment was intended to identify the presence or absence of suitable habitat for each special-status species known to occur in the vicinity in order to determine its potential to occur in the Study Area. The site visit does not constitute protocol-level surveys and was not intended to determine the actual presence or absence of a species; however, if a special-status species was observed during the site visit, its presence was recorded and is discussed. Appendix B presents the evaluation of potential for occurrence of each special-status plant and wildlife species known to occur in the vicinity of the Study Area with their habitat requirements, potential for occurrence, and rationale for the classification based on criteria listed above. Recommendations for further surveys are made in Section 5.0 below for species with a moderate or high potential to occur in the Study Area.

4.0 RESULTS

The following sections present the results and discussion of the biological assessment within the Study Area.

4.1 Biological Communities

Non-sensitive biological communities in the Study Area include Eucalyptus grove, developed areas, Monterey cypress stands, Monterey pine stands, non-native annual grassland, and northern coastal scrub. Seven ESHAs occur within the Study Area: beaches; central coast arroyo willow riparian scrub; ephemeral, intermittent, and perennial streams; perennial ponds; and potential seasonal wetlands (Figure 2). Photographs of biological communities within the Study Area are included in Appendix C. Descriptions for each biological community are contained in the following sections. Acreage summations for biological communities are detailed in Table 2.

Table 2. Biological Communities within the Study Area

Biological Community[1]	Natural Community[3]	Acres/ Linear Feet
Non-Sensitive[4]		
Eucalyptus groves[2]	Eucalyptus groves (*Eucalyptus* [*globulus, camaldulensis*] Semi-Natural Woodland Alliance)	325.00 ac
Developed[2]	N/A	4.07 ac
Monterey cypress stands	Monterey cypress stands (*Hesperocyparis* [*Callitropsis*] *macrocarpa* Woodland Special Stands)	1.03 ac
Monterey pine stands	Monterey pine stands (*Pinus radiata* Forest Alliance)	3.51 ac
Non-native [annual] grassland	Wild oats grassland (*Avena* [*barbata, fatua*] Herbaceous Stands)	48.02 ac
Northern coastal scrub	Coyote brush scrub (*Baccharis pilularis* Shrubland Alliance)	126.15 ac
Sensitive[4]		
Beaches[2] (ESHA)	N/A	1.92 ac
Central coast arroyo willow riparian scrub (ESHA)	Arroyo willow thickets (*Salix lasiolepis* Shrubland Alliance)	23.74 ac
Ephemeral, intermittent, and perennial streams[2] (ESHA)	N/A	0.53 ac/ 21,768 lf
Perennial Ponds[2] (ESHA)	N/A	1.49 ac
Potential seasonal wetland[2] (ESHA)	Western rush marshes (*Juncus patens* Provisional Herbaceous Alliance)	4.02 ac
	TOTAL	539.48 ac

[1]Holland (1986)
[2]Biological community not described in Holland (1986)
[3]Sawyer et al. (2009)
[4]Determination based on the *List of California Terrestrial Natural Communities* (CDFG 2010) and the *San Mateo County Local Coastal Program* (County 1998)

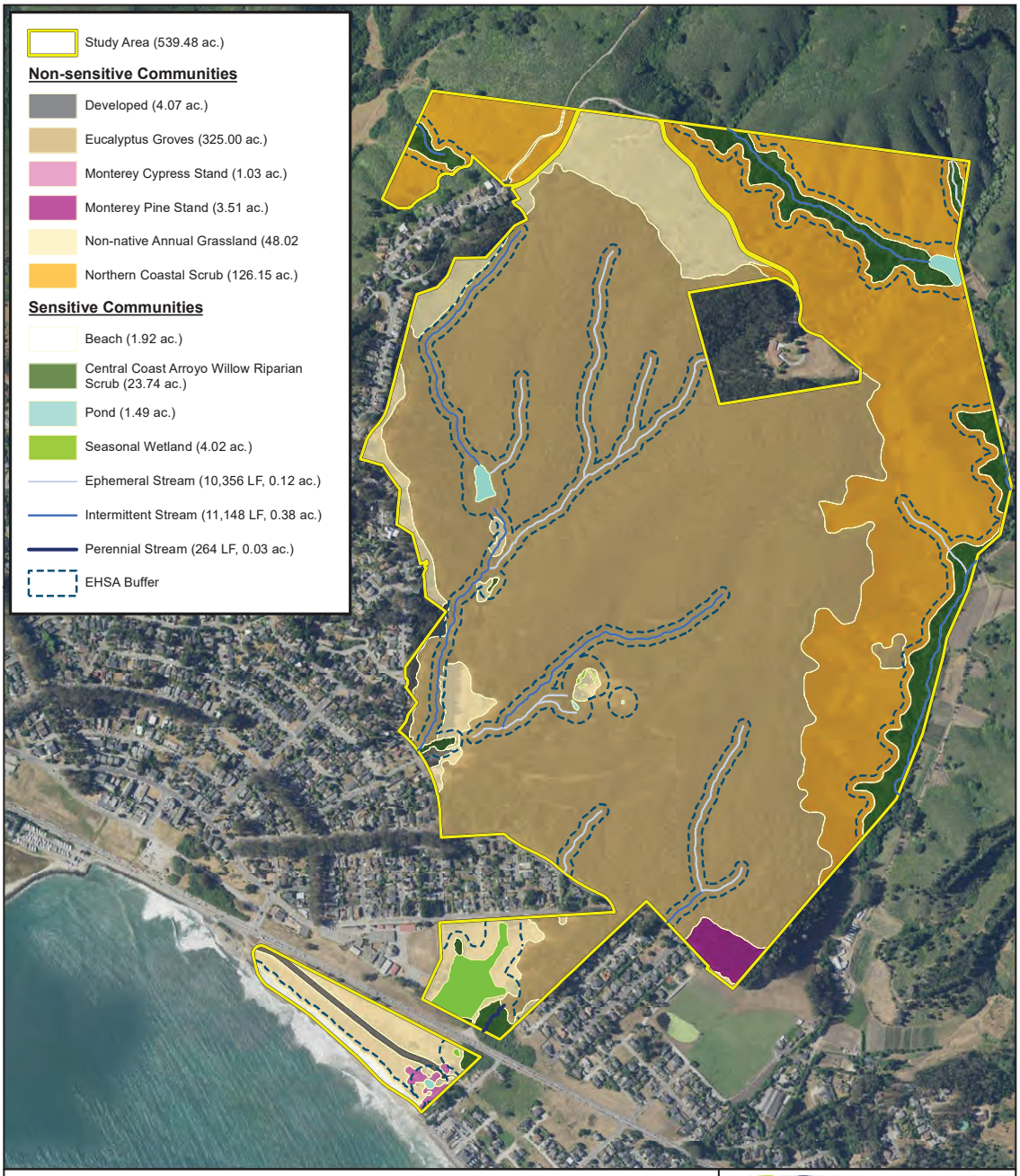

Figure 2. Biological Communities within the Study Area

San Mateo County Quarry Park Master Plan
San Mateo County, California

Map Prepared Date: 5/2/2018
Map Prepared By: mrochelle
Base Source: Esri Streaming - NAIP 2016
Data Source(s): WR

Path: L:\Acad 2000 Files\26000\26342\GIS\ArcMap\BioComm with ESHA.mxd

4.1.1 Non-Sensitive Biological Communities

The Study Area is dominated by biological communities considered non-sensitive under CEQA. These biological communities include Eucalyptus groves, developed areas (roadways and utility structures), Monterey cypress stands, Monterey pine stands, non-native annual grasslands, and northern coastal scrub.

Eucalyptus Groves

Eucalyptus groves are known from the Coast Ranges and Central Valley, typically as planted woodlands and shelterbelts to buffer coastal winds and provide shade. These groves are not described in Holland (1986), but are included in Sawyer et al. (2009) describes Eucalyptus groves as *Eucalyptus globulus* Semi-Natural Woodland Stands. This vegetation alliance is dominated by one of several eucalyptus species (*Eucalyptus* spp.), which are not native to North America. Eucalyptus groves are frequently situated in rural and semi-urbanized settings, along streams, and coastal hills and prairies.

Within the Study Area, Eucalyptus grove is the dominant plant community present in the Quarry Park and occupies approximately 325.00 acres. The overstory is composed of Eucalyptus with the occasional Monterey pine and Douglas-fir (*Pseudotsuga menziesii*). As is typical of Eucalyptus groves because of allelopathic chemicals in fallen leaves and branches, the understory is low-growing and composed predominately of non-native, weedy species such as cape ivy (*Delairea odorata*), bur clover (*Medicago polymorpha*), bristly ox-tongue (*Helminthotheca* [*Picris*] *echioides*) with few native species such as red elderberry (*Sambucus racemosa* var. *racemosa*) and poison oak (*Toxicodendron diversilobum*). Within Eucalyptus grove within the Study Area, an extensive informal trail network exists consisting of dirt paths. Individual plants of California strawberry were observed scattered throughout the understory of the Eucalyptus grove within the Study Area at higher elevations.

Developed

The Study Area contains approximately 4.07 acres of developed areas composed of multiple-use paved trails and roadways. While an extensive informal trail network consisting of dirt pathways exists within the Eucalyptus grove, this was not mapped separately due to its extensive nature, pervious surfaces, and coverage by Eucalyptus overstory in most areas.

Monterey Cypress Stands

A small stand of Monterey cypress, totaling 1.03 acres occurs within Mirada Surf West in the southeastern portion of the Study Area. Monterey cypress is native only to the Monterey peninsula where it grows on rocky, granitic soils of coastal headlands and bluffs subject to nearly constant onshore winds (Holland 1986). Only two natural stands have been documented, but Monterey cypress has been planted throughout coastal California for its capacity to serve as a windbreak and it has become naturalized.

The California Invasive Plant Council (Cal-IPC) has rated Monterey cypress as “limited” for its ability to invade wildlands (Cal-IPC 2006). The Cal-IPC reports that even “limited” species are invasive and should be of concern to land managers and while ratings represent cumulative impacts statewide, a plant whose statewide impacts are categorized as “limited” may have more severe impacts in a particular region.

Sawyer (2009) has recognized this biological community as Monterey Cypress stands (*Callitropsis macrocarpa* Woodland Special Stands), which are planted for wind protection and as ornamental trees near roadsides, driveways, and homesteads. Native stands of this alliance that occur on the Monterey peninsula are given G1 S1 status due to their rarity; however, stands outside of the native range are not ranked and naturalized stands extend from Humboldt County to Santa Barbara County (Sawyer et al. 2009).

In the Study Area, Monterey cypress stands occurs in association with the coastal trail area. The shrub layer is depauperate due to a dense canopy cover and leaf litter. A small perennial pond with facultative and obligate wetland plants occurs in the understory of this stand is described in more detail in Section 4.1.2 below.

Monterey Pine Stands

The southeastern portion of Quarry Park within the Study Area includes approximately 3.51 acres of Monterey pine stands. In this community, the canopy is dominated by Monterey pine, coast live oak (*Quercus agrifolia*), Douglas-fir, Monterey cypress, and other similar species. The shrub layer ranges from open to continuous, and the herbaceous layer ranges from sparse to abundant. Monterey pine is rated by Cal-IPC as limited for its ability to invade wildlands (Cal-IPC 2006).

Sawyer (2009) describes Monterey pine stands as the *Pinus radiata* Forest Alliance (Rarity Ranking G1 S1.2), which is planted throughout the state and worldwide, but only natural stands are considered rare, which exist in three disjunct areas in mainland California: near Año Nuevo, on the Monterey Peninsula, and at Cambria. Soils are typically well drained, and the stands typically occur between 0-300 meters elevation. Monterey pine is only protected under the County LCP by the San Mateo-Santa Cruz County line border and is therefore not protected within the Study Area.

Non-Native Annual Grassland

Approximately 48.02 acres of the Study Area contain non-native annual grassland habitat. This community occurs both in Quarry Park and Mirada Surf East and West. Holland describes non-native grassland as a dense to sparse cover of non-native annual grasses with flowering culms 0.2-1-meter-high and often associated with numerous species of showy-flowered annual forbs. This community often occurs on fine-textured, usually clay soils, that are moist, or saturated during the winter rainy season and very dry during the summer and fall. Sawyer (2009) describes this community as wild oats grasslands (*Avena* [*barbata, fatua*] Semi-Natural Herbaceous Stands, no rarity ranking), which are dominated by the cool-season annual grass and occur in most habitats in California. Non-native grasslands typically contain elements of other non-native grasses.

In the Study Area, non-native annual grassland occurs in Quarry Park, Mirada Surf East and West and occupies flat, open areas and is dominated by slender oat (*Avena barbata*), Italian ryegrass (*Festuca perennis* [*Lolium multiflorum*]), ripgut brome (*Bromus diandrus*), and bristly ox-tongue with few native species.

Northern Coastal Scrub

Within the Study Area in Quarry Park, relatively undisturbed northern coastal scrub occupies approximately 126.15 acres on mid- to high-slopes on north to west-facing aspects, predominantly underlain by rocky loam substrate. Holland (1986) describes northern coastal scrub as a community type having low shrubs with dense covering in scattered grassy openings on shallow,

rocky soils. Sawyer (2009) describes this community as coyote brush scrub (*Baccharis pilularis* Shrubland Alliance), which is known from the outer Coast Ranges and Sierra Nevada Foothills from Del Norte County south to San Diego County. This vegetation community is typically located on river mouths, riparian areas, terraces, stabilized dunes, coastal bluffs, open hillsides, and ridgelines on all aspects underlain by variable substrate of sand to clay (Sawyer et al. 2009).

The tree layer is minimal in this community with isolated individuals of red alder (*Alnus rubra)* and individual blue gum trees occurring in eastern portions of Quarry Park. The dominant species in the shrub layer include coyote brush (*Baccharis pilularis* ssp. *consanguinea*), red elderberry, wax myrtle (*Morella californica*), thimbleberry (*Rubus parviflorus*), and blue blossom (*Ceanothus thyrsiflorus* var. *thyrsiflorus*), with coyote brush comprising greater than 50 percent relative cover in this stratum. The herbaceous layer is dominated by poison oak, soft chess (*Bromus hordeaceus*), dog-tail grass (*Cynosurus echinatus*), and Italian thistle (*Carduus pycnocephalus*). Individual plants of California strawberry were observed scattered within northern coastal scrub in the Study Area.

4.1.2 Environmentally Sensitive Habitat Areas (ESHAs)

The Study Area contains seven natural communities considered sensitive by the Corps, RWQCB, CDFW, CCC, and County LCP, and would therefore be considered sensitive under CEQA. These communities include beaches; central coast arroyo willow riparian scrub; ephemeral, intermittent, and perennial streams; perennial ponds; and potential seasonal wetlands.

Beaches

Mirada Surf West within the Study Area includes approximately 1.92 acres of beaches. Beaches consist of barren, mobile sand accumulations whose size and shape are determined by abiotic factors such as wind, rather than by stabilizing vegetation. Sawyer et al. (2009) does not describe this community. The closest Holland association to beaches is active coastal dunes, which occur along the Pacific Ocean where sandy beaches are present and coastal headlands are absent. The CCC and County LCP regulate beaches and this community is therefore considered sensitive under CEQA.

Central Coast Arroyo Willow Riparian Scrub

Within the Quarry Park, Mirada Surf East and West in the Study Area, approximately 23.74 acres of central coast arroyo willow riparian scrub occurs in the southern portion adjacent to a perennial blue-line stream, and in the north along Arroyo de en Medio and along Deer Creek within the Mirada Surf West property. The canopy is dense and nearly impenetrable and is dominated by arroyo willow with occasional red alder trees. California blackberry (*Rubus ursinus*), stinging nettle (*Urtica dioica* ssp. *holosericea*), panicled bulrush (*Scirpus microcarpus*), and Pacific rush (*Juncus effusus*) comprise the intermittent shrub and herb layers.

Holland (1986) describes this central coast arroyo willow riparian scrub as occurring in areas of open to nearly impenetrable willow shrubs associated with a stream or mouth of streams, occurring near the coast in the South Coast Ranges. This community is described by Sawyer (2009) as arroyo willow thickets (*Salix lasiolepis* Shrubland Alliance, Rarity Ranking G4 S4), which occurs throughout much of California along streams, seeps and drainages. The canopy is dominated by arroyo willow, forming an open to continuous layer with a variable herbaceous layer. Soils are relatively fine-grained sand and gravel bars from alluvial deposition. Central coast arroyo willow riparian scrub is considered an ESHA within the Coastal Zone. The RWQCB, CDFW, CCC, and County LCP regulate riparian communities and this community is therefore considered sensitive under CEQA.Ephemeral, Intermittent, and Perennial Streams

Streams are not described by Holland (1986) or Sawyer (2009). Approximately 0.53 acre (21,768 linear feet) of ephemeral, intermittent, and perennial streams were observed within Quarry Park and Mirada Surf East in the Study Area and are depicted on Figure 2.

Ephemeral Streams

Approximately 0.12 acre (10,356 linear feet) of ephemeral streams and 0.38 acre (11,148 linear feet) of intermittent streams occur within the Study Area. Ephemeral and intermittent streams contained obvious signs of bank scour and ranged in width from approximately 1 foot to 3 feet, respectively. Vegetation associated with these streams include blue gum with occasional plants species such as poison oak and thimbleberry and is similar to the vegetation present along perennial stream discussed below.

Intermittent Streams

Three intermittent USGS dashed blue-line streams exist within the eastern and western portions of the Study Area. The unnamed USGS dashed blue-line intermittent stream trending north-south in the western portion of the Study Area had obvious signs of scouring and debris deposition within the streambed and an unvegetated gravel bed. This unnamed stream had widths varying from 5 to 7 feet with flowing water. Dominant vegetation associated with the stream is comprised of species including blue gum, red elderberry, and poison oak.

The USGS dashed blue-line stream, named Arroyo de en Medio, occurs along the northern and eastern portions of the Study Area and was dominated by arroyo willow and red alder. The USGS dashed blue-line stream, named Deer Creek, occurs along the northwestern portion of the Study Area and had similar riparian species composition. Central Coast Arroyo Willow Riparian Scrub associated with streams is discussed above in more detail.

Perennial Streams

An unnamed perennial stream was observed within the southern portion of the Study Area in Mirada Surf East, totaling approximately 0.03 acre (264 linear feet). The perennial stream was observed with flowing water and obvious signs of bank scour. The stream was approximately 14 inches deep and 3 to 5 feet wide. Vegetation associated with the perennial drainage was dominated by central coast arroyo willow riparian scrub, as described above, and the tree canopy was dominated by arroyo willow. Upstream portions of this perennial drainage are conveyed subsurface and subsurface flows likely include a local underground stormwater conveyance system from areas adjacent to the Study Area. Central coast arroyo willow riparian scrub habitat associated with this perennial stream is discussed above in more detail. The Corps, RWQCB,

CCC and County LCP regulate non-wetland waters including ephemeral, perennial, and intermittent streams and this community is therefore considered sensitive under CEQA.

Ponds

Five ponds occupy 1.49 acres of the Study Area throughout Quarry Park and Mirada Surf East and West. These features include a large sediment basin located in-line with the unnamed intermittent drainage in the western portion of Quarry Park within the Study Area and a historically created stock pond from a stream impoundment that is to the Arroyo de en Medio stream channel in the northeastern portion of Quarry Park. In the western portion of the Study Area, Eucalyptus groves surround the perennial sediment pond while the vegetation around the perennial stockpond associated with Arroyo de en Medio includes central coast arroyo willow riparian scrub composed of arroyo willow and red alders. Although man-made, these features are potentially jurisdictional as an impoundment of potentially jurisdictional non-wetland waters (Arroyo de en Medio). Additionally, two smaller seasonal ponds exist within Eucalyptus groves centrally in Quarry Park and one occurs under Monterey cypress stands in the southern extent of Mirada Surf West. The Corps, RWQCB, CCC, and County LCP regulate ponds and thus, this community is therefore considered sensitive under CEQA.

Seasonal Wetland

Approximately 4.02 acres of potentially seasonal wetland habitat is present within Quarry Park and Mirada Surf East and West of the Study Area. As described by Holland (1986), potential seasonal wetlands are comprised of mostly perennial herbs, especially sedges and grasses, usually forming complete cover, growing throughout the year in areas with mild winters. This community type occurs scattered throughout California and is most common in mesic grasslands. Sawyer (2009) best describes potential seasonal wetlands within the Study Area as western rush marshes (*Juncus patens* Provisional Herbaceous Alliance, Rarity Ranking G4 S4), which occur on seasonally saturated soils on flats, depressions, or gentle slopes. Seasonal wetlands contain continuous to intermittent cover of western rush with commonly associated facultative wetland plants such as Italian ryegrass, velvet grass (*Holcus lanatus*), willow-leaved dock (*Rumex crassus*), and subterraneum clover (*Trifolium subterraneum*).

In the Study Area, this biological community occurs as potential seasonal wetland depressions within the non-native annual grassland of the former quarry floor located centrally in Quarry Park and within the northeast portion of Mirada Surf West. Seasonal wetlands also occur as a large potential seasonal wetland meadow in Mirada Surf East, north of Highway 1 and south of the Eucalyptus grove. The potential seasonal wetland depressions within the Eucalyptus groves were dominated by western rush (*Juncus patens*) with co-dominants including brown headed rush (*Juncus phaeocephalus* var. *phaeocephalus*), subterraneum clover, and buckhorn plantain (*Plantago coronopus*). For the potential seasonal wetland meadow in the southern portion of the Study Area, dominant species present include clustered field sedge (*Carex praegracilis*), western rush, and willow-leaved dock along with bristly ox-tongue and non-native grasses. An additional potential seasonal wetland depression was observed in the southeastern portion of the Study Area and is comprised predominately of willow-leaved dock and water pepper (*Persicaria hydropiperoides*) as well as species similar to the other potential wetlands. The Corps, RWQCB, CCC and County LCP regulate wetlands and this community is therefore considered sensitive under CEQA.

4.2 Special-Status Species

4.2.1 Plants

Based upon a review of the resources and databases given in Section 3.2.1, 45 special-status plant species have been documented in the vicinity of the Study Area, of which seven special-status species have a high or moderate potential to occur within the Study Area (Figure 3). The remaining species are unlikely or have no potential to occur due to lack of suitable habitat within the Study Area, such as serpentine soils, woodlands, or high quality meadows and seeps.

Appendix B summarizes the potential for occurrence for each special-status plant species occurring in the Half Moon Bay and Montara Mountain USGS 7.5-minute quadrangles. Plants observed during the site visit are listed in Appendix A. No special-status species were observed during the site visits conducted on March 16 or 22, 2017; however, these did not constitute protocol-level rare plant surveys.

Special-status plant species that have a high or moderate potential to occur in the Study Area are discussed below and include:

- Bent-flowered fiddleneck (*Amsinckia lunaris*);
- Western leatherwood (*Dirca occidentalis*);
- Marin checker lily (*Fritillaria lanceolata* var. *tristulis*);
- Perennial goldfields (*Lasthenia californica* ssp. *macrantha*);
- San Mateo tree lupine (*Lupinus arboreus* var. *eximius*);
- Oregon polemonium (*Polemonium carneum*); and,
- Hickman's cinquefoil (*Potentilla hickmanii*).

These special-status plant species have potential to occur within the northern coastal scrub habitat and the central coast arroyo willow riparian scrub habitats located in Quarry Park. Figure 2 depicts the location of habitats with potential to support these species. Appropriately timed rare plant surveys for these species should be timed through completing two surveys: one in late-winter (February) and mid- to late-spring (April to May).

<u>High Potential</u>

San Mateo tree lupine (*Lupinus arboreus* var. *eximius*), Rank 3.2. San Mateo tree lupine is a shrub in the pea family (Fabaceae). This species typically occurs in chaparral and coastal scrub habitats at elevations ranging from 300 to 1,800 feet (90 to 550 meters). It typically blooms between April and July and has been recorded in San Mateo and Sonoma counties. Observed associated species include California coffeeberry (*Frangula californica*), poison oak, and elderberry (*Sambucus* sp.), all of which were observed within the northern coastal scrub habitat within the Study Area.

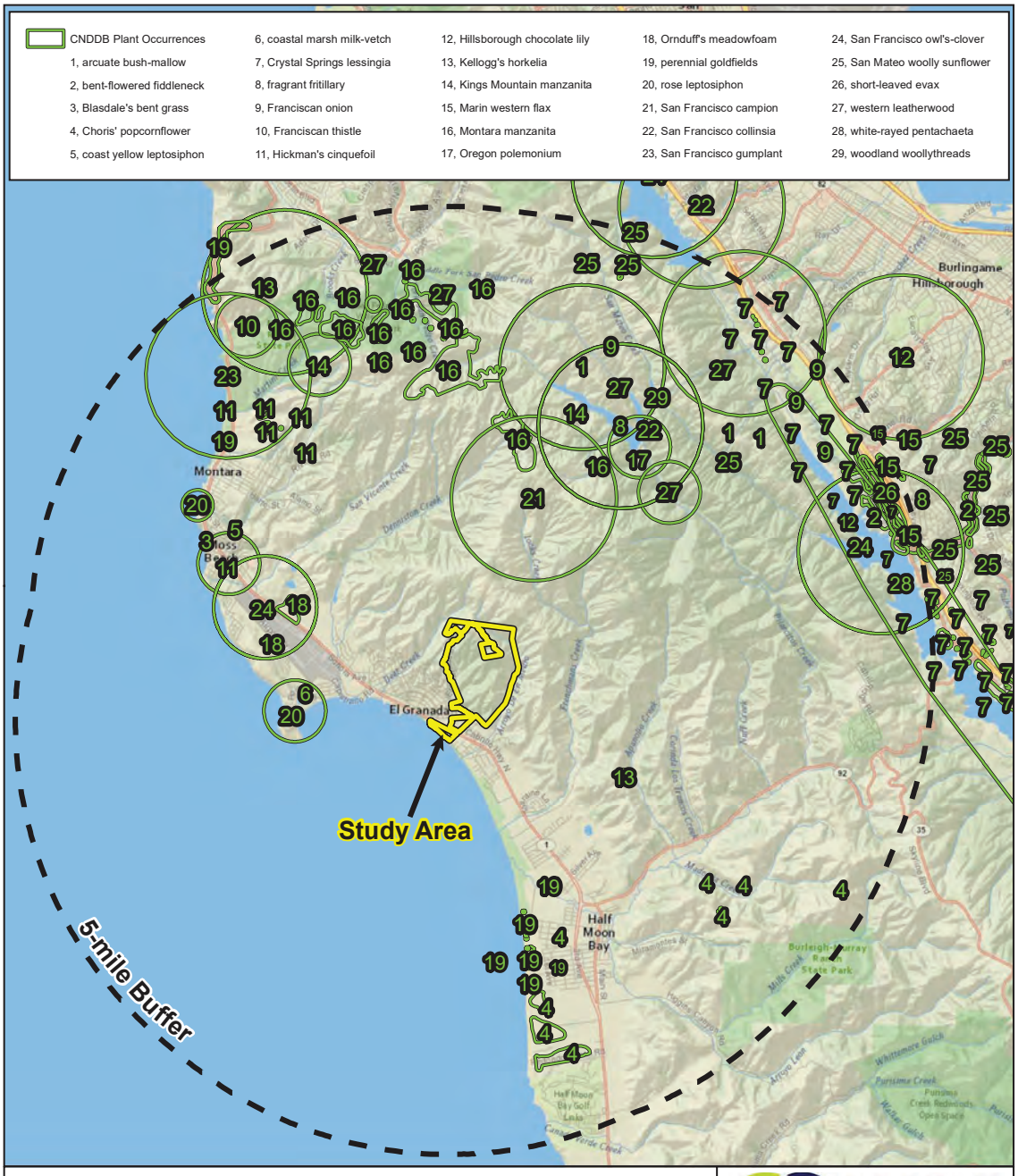

Figure 3. Special-status Plant Species within a 5-Mile Radius of the Study Area

San Mateo County Quarry Park Master Plan
San Mateo County, California

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Map Prepared Date: 3/21/2017
Map Prepared By: mrochelle
Base Source: National Geographic
Data Source(s): CNDDB March 2017

Path: L:\Acad 2000 Files\26000\26342\GIS\ArcMap\CNDDB Plants.mxd

An unknown, shrubby species of lupine was observed in the Study Area that has vegetative characteristics consistent with both San Mateo tree lupine and silver lupine (*Lupinus albifrons*), a common native species. The observed lupine shrubs were not flowering at the time of the March 2017 site visit and were therefore not identifiable to species. The shrubby lupine was observed along margins of the northern coastal scrub within the Study Area. Given the presence of coastal scrub vegetation, there is high potential that some of the shrubby lupines observed in the Study Area may be San Mateo tree lupine.

Moderate Potential

Bent-flowered fiddleneck (*Amsinckia lunaris*). Rank 1B.2. Bent-flowered fiddleneck is an annual forb in the forget-me-not family (Boraginaceae) that blooms from March to June. It typically occurs in open areas within cismontane woodland, valley and foothill grassland, and coastal bluff scrub habitat often underlain by clay substrate at elevations ranging from 10 to 1625 feet (CDFW 2017, CNPS 2017a, Jepson Flora Project 2017). Typical associated species include coast live oak, blue oak (*Quercus douglasii*), California juniper (*Juniperus californicus*), buck brush (*Ceanothus cuneatus*), poison oak, miniature lupine (*Lupinus bicolor*), foothill lotus (*Acmispon brachycarpus*), calf lotus (*A. wrangelianus*), fringe pod (*Thysanocarpus curvipes*), q-tips (*Micropus californicus*), cream cups (*Platystemon californicus*), slender tarweed (*Madia gracilis*), common yarrow (*Achillea millefolium*), goldenback fern (*Pentagramma triangularis*), one-sided bluegrass (*Poa secunda*), woolly sunflower (*Eriophyllum lanatum*), and slender wild oat (*Avena barbata*) (CDFW 2017).

The nearest documented occurrence of bent-flowered fiddleneck is from 2008, in grassland on the east side of Crystal Springs Reservoir (CDFW 2017). Bent-flowered fiddleneck has a moderate potential to occur in the northern coastal scrub community within the Study Area due to the presence of suitable substrate and open grassy areas.

Western leatherwood (*Dirca occidentalis*), Rank 1B.2. Western leatherwood is a deciduous shrub in the Daphne family (Thymelaeaceae) that blooms from January to April, but is typically identifiable via vegetative structures into late spring and/or early summer. It typically occurs on brushy, mesic slopes in partial shade in broadleaf upland forest, chaparral, closed-cone coniferous forest, cismontane woodland, North Coast coniferous forest, riparian forest, and riparian woodland habitat at elevations range from 165 to 1285 feet (CDFW 2017, CNPS 2017a, Jepson Flora Project 2017). Observed associated species include coast live oak, California bay (*Umbellularia californica*), Pacific madrone (*Arbutus menziesii*), California coffeeberry, poison oak, toyon (*Heteromeles arbutifolia*), California buckeye (*Aesculus californicus*), California hazelnut (*Corylus cornuta*), coyote brush, yerba buena (*Clinopodium douglasii*), sword fern (*Polystichum munitum*), Pacific sanicle (*Sanicula crassicaulis*), and Douglas iris (*Iris douglasiana*) (CDFW 2017).

The nearest occurrence is from 1975, in Douglas-fir forest on San Francisco Public Utilities District property, approximately 3.5 miles east of the Study Area (CDFW 2017). Western leatherwood has a moderate potential to occur in the northern coastal scrub and riparian communities in the Quarry Park portion of the Study Area due to the presence of relatively undisturbed brushy and shaded slopes and associated species.

Marin checker-lily (*Fritillaria lanceolata* var. *tristulis*), Rank 1B.1. Marin checker-lily is a perennial herb in the lily family (Liliaceae) that blooms from February to May. It typically occurs in coastal bluff scrub, coastal prairie, and coastal scrub habitats at elevations ranging from 50 to 500 feet (15 to 150 meters; CNPS 2017a). Observed associated species include coyote brush, soap

plant (*Chlorogalum pomeridianum*), poison oak, strawberry (*Fragaria* sp.), plantain (*Plantago* sp.), ripgut brome, and filaree (*Erodium* sp.) (CCH 2017).

The nearest documented occurrence is located within the USGS Montara Mountain quad along Lower Crystal Springs Reservoir approximately 5.5 miles to the northeast of the Study Area, but the exact location and date of the observation are not listed (CNDDB 2017). Marin checker-lily has moderate potential to occur in the northern coastal scrub community due to of the presence of all associated species listed above and suitable openings in this habitat.

Perennial goldfields (*Lasthenia californica* ssp. *macrantha*). Rank 1B.2. Perennial goldfields are annual to perennial forbs in the sunflower family (Asteraceae) that bloom from January to November. It typically occurs on mesas, benches, and bluff faces in coastal bluff scrub, coastal dune, and coastal scrub at elevations from 15 to 1,690 (CDFW 2017, CNPS 2017). Observed associated species include coyote brush, poison oak, California blackberry, brownie thistle (*Cirsium quercetorum*), Douglas iris, sea lettuce (*Dudleya farinosa*), California buttercup (*Ranunculus californicus*), Pacific reed grass (*Calamagrostis nutkaensis*), Italian ryegrass, selfheal (*Prunella vulgaris*), English plantain (*Plantago lanceolata*), dwarf checkerbloom (*Sidalcea malviflora*), beach strawberry (*Fragaria chiloensis*), narrow-leaf mule's-ears (*Wyethia angustifolia*), coast angelica (*Angelica hendersonii*), soap plant, and coast coyote thistle (*Eryngium armatum*) (CDFW 2017).

The nearest documented occurrence of this species is from 2015 near Pescadero, and is located 18.4 miles southeast of the Study Area (CDFW 2017). Perennial goldfields have a moderate potential to occur in the northern coastal scrub community due to the presence of associated species such as coyote brush, poison oak, and California blackberry and suitable openings in this habitat.

Oregon polemonium (*Polemonium carneum*), Rank 2B.2. Oregon polemonium is a perennial herb in the family Polemoniaceae. It occurs in coastal prairie, coastal scrub, and lower montane coniferous forest. Oregon polemonium is recorded from 0 to 1830 meters in elevation in Del Norte, Siskiyou, Humboldt, Sonoma, Marin, Alameda, San Francisco, and San Mateo counties. It blooms between April and September. Observed associated species include coyote brush, California sagebrush (*Artemisia californica*), blue-eyed grass (*Sisyrinchium* sp.), native grasses, and non-native annual grasses (CDFW 2017).

The nearest documented occurrence of this species is from 1916 near the Pilarcitos Dam, and is located 4 miles northeast of the Study Area (CDFW 2017). Oregon polemonium has a moderate potential to occur within the Study Area in northern coastal scrub because of the close proximity of the nearest occurrence and the presence of suitable northern coastal scrub habitat.

Hickman's cinquefoil *(Potentilla hickmanii)*, FE, SE, Rank 1B.2. Hickman's cinquefoil is a perennial herb in the family Rosaceae. It occurs in coastal bluff scrub, closed-cone coniferous forest, vernally mesic meadows and seeps, and freshwater marshes and swamps. It is recorded from 10 to 149 meters in elevation in Monterey, San Mateo, and Sonoma counties. It blooms between April and August. Observed associated species include native and non-native grasses including California oatgrass (*Danthonia californica*), silver hairgrass (*Aira caryophyllea*), little quaking grass (*Briza minor*) as well as English plantain (*Plantago lanceolata*), and rough cat's ear (*Hypochaeris radicata*) (CDFW 2017).

The nearest documented occurrence of this species is from 2008 over 4 miles northwest from the Study Area near Montara State Beach. Hickman's cinquefoil has a moderate potential to occur within the Study Area due to the presence of suitable northern coastal scrub habitat.

4.2.2 Wildlife

Based upon a review of the resources and databases given in Section 3.4.1, 57 special-status wildlife species have been documented in the vicinity of the Study Area. Appendix B summarizes the potential for each of these species to occur in the Study Area. Any wildlife species documented in the CNDDB within 5 miles of the Study Area are shown in Figure 4. Of the 57 special-status wildlife species documented in the vicinity of the Study Area, two are present in the Study Area and seven have a moderate or high potential to occur within the Study Area. The majority of species have no potential or are unlikely to occur due to a lack of suitable habitat components such as:

- offshore islands;
- marine waters;
- caves, mines or abandoned buildings;
- suitable cavity bearing trees; or,
- the Study Area is outside of the known range for the species.

Special-status plant species that have a high or moderate potential to occur in the Study Area are discussed below and include:

- San Francisco dusky-footed woodrat (*Neotoma fuscipes annectens*);
- White-tailed kite (*Elanus leucurus*);
- Allen's hummingbird (*Selasphorus sasin*);
- Olive-sided flycatcher (*Contopus cooperi)*;
- Saltmarsh common yellowthroat (*Geothlypis trichas sinuosa*);
- California red-legged frog (*Rana draytonii*);
- San Francisco garter snake (*Thamnophis sirtalis tetrataenia*); and,
- Monarch butterfly (*Danaus plexippus*); and,
- San Francisco tree lupine moth (*Grapholita edwardsiana*)

Present

Allen's hummingbird (*Selasphorus sasin*). USFWS Bird of Conservation Concern. Allen's hummingbird, common in many portions of its range, is a summer resident along the majority of California's coast and a year-round resident in portions of coastal southern California and the Channel Islands. Breeding occurs in association with the coastal fog belt, and typical habitats used include coastal scrub, riparian, woodland and forest edges, and eucalyptus and cypress groves (Mitchell 2000). This species feeds on nectar, as well as insects and spiders.

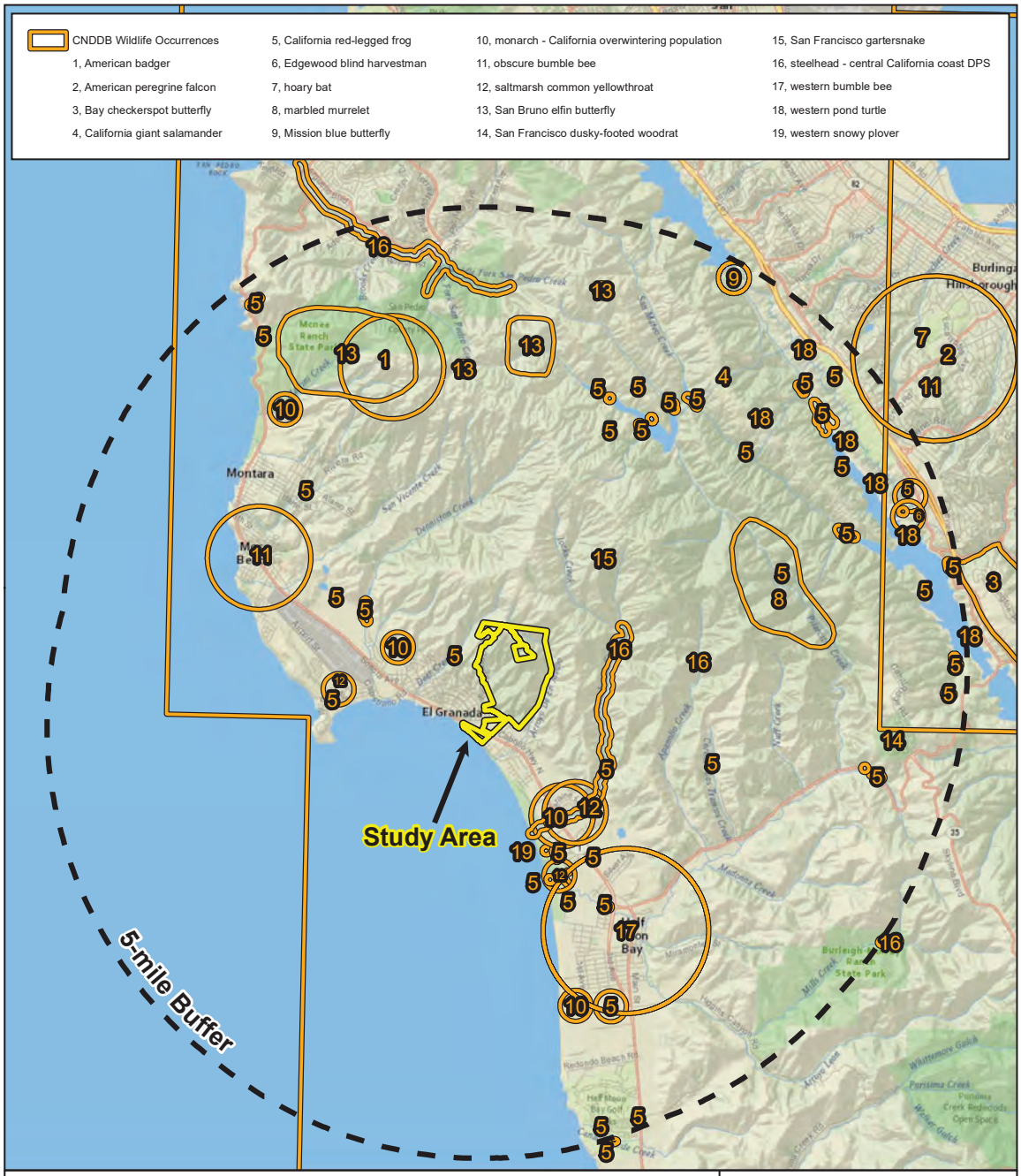

Figure 4. Special-status Wildlife Species within a 5-Mile Radius of the Study Area

San Mateo County Quarry Park
Master Plan
San Mateo County, California

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ENVIRONMENTAL CONSULTANTS

Map Prepared Date: 3/20/2017
Map Prepared By: mrochelle
Base Source: National Geographic
Data Source(s): CNDDB March 2017

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There are a variety of suitable habitats for this species within the Study Area including northern coastal scrub and blue gum grove. Additionally, the Study Area is in close proximity to a variety of rich natural and landscaped foraging habitats. Allen's hummingbird has been observed within the Study Area, and is therefore considered present throughout the Study Area (Arechiga 2017).

San Francisco dusky-footed woodrat (*Neotoma fuscipes annectens*). CDFW Species of Special Concern. This subspecies of the dusky-footed woodrat occurs in the Coast Ranges between San Francisco Bay and the Salinas River (Matocq 2003). Occupied habitats are variable and include forest, woodland, riparian areas, and chaparral. Woodrats feed on woody plants, but will also consume fungi, grasses, flowers, and acorns. Foraging occurs on the ground and in bushes and trees. This species constructs robust stick houses/nests in areas with moderate cover and a well-developed understory containing woody debris. Breeding takes place from December to September. Individuals are active year-round and generally nocturnal.

While the species does not typically inhabit Eucalyptus groves, thick sections of willow scrub and riparian corridors are generally preferred habitats for the species. Nests constructed by this species were observed in these habitats. Because nests constructed by this species were observed in multiple locations throughout the Study Area, and suitable habitats are present in various locations, this species is considered present throughout the Study Area.

<u>High Potential</u>

California red-legged frog (*Rana draytonii; CRLF*), Federal Threatened Species, CDFW Species of Special Concern. California red-legged frog (CRLF) is dependent on suitable aquatic, estivation, and upland habitat. During periods of wet weather, starting with the first rainfall in late fall, red-legged frogs disperse away from their estivation sites to seek suitable breeding habitat. Aquatic and breeding habitat is characterized by dense, shrubby, riparian vegetation and deep, still or slow-moving water. Breeding occurs between late November and late April. California red-legged frogs estivate (period of inactivity) during the dry months in small mammal burrows, moist leaf litter, incised stream channels, and large cracks in the bottom of dried ponds.

There are four physical and biological features that are considered to be essential for the conservation or survival of a species. The features for the CRLF include: aquatic breeding habitat; non-breeding aquatic habitat; upland habitat; and dispersal habitat (USFWS 2010a).

Aquatic breeding habitat consists of low-gradient fresh water bodies, including natural and manmade (e.g. stock) ponds, backwaters within streams and creeks, marshes, lagoons, and dune ponds. It does not include deep water habitat, such as lakes and reservoirs. Aquatic breeding habitat must hold water for a minimum of 20 weeks in most years. This is the average amount of time needed for egg, larvae, and tadpole development and metamorphosis so that juveniles can become capable of surviving in upland habitats (USFWS 2010a). Aquatic non-breeding habitat may or may not hold water long enough for this species to hatch and complete its aquatic life cycle, but it provides shelter, foraging, predator avoidance, and aquatic dispersal for juvenile and adult CRLF. These waterbodies include plunge pools within intermittent creeks; seeps; water refugia during high water flows; and springs of sufficient flow to withstand the summer dry period. The CRLF can use large cracks in the bottom of dried ponds as refugia to maintain moisture and avoid heat and solar exposure (Alvarez 2004). Non-breeding aquatic features enable CRLF to survive drought periods, and disperse to other aquatic breeding habitat (USFWS 2010a).

Upland habitats include areas within 300 feet of aquatic and riparian habitat and are comprised of grasslands, woodlands, and/or vegetation that provide shelter, forage, and predator avoidance.

These upland features provide breeding, non-breeding, feeding, and sheltering habitat for juvenile and adult frogs (e.g., shelter, shade, moisture, cooler temperatures, a prey base, foraging opportunities, and areas for predator avoidance). Upland habitat can include structural features such as boulders, rocks and organic debris (e.g. downed trees, logs), as well as small mammal burrows and moist leaf litter (USFWS 2010a).

Dispersal habitat includes accessible upland or riparian habitats between occupied locations within 0.7 mile of each other that allow for movement between these sites. Dispersal habitat includes various natural and altered habitats such as agricultural fields, which do not contain barriers to dispersal. Moderate- to high-density urban or industrial developments, large reservoirs, and heavily traveled roads without bridges or culverts are considered barriers to dispersal (USFWS 2010a). Although CRLF is highly aquatic, this species has been documented to make overland movements of several hundred meters and up to one mile during a winter-spring wet season in Northern California (Bulger et al. 2003, Fellers and Kleeman 2007) and 2,860 meters (1.8 miles) in the central California coast (Rathbun and Schneider 2001). Frogs traveling along water courses can exceeded these distances.

Within the Study Area, a number of ponds were observed which were of sufficient size and depth to support reproduction by the species. Smaller ponds, intermittent streams and wetlands are also present and may provide suitable non-breeding aquatic, as well as dispersal habitat for the species. Thick underbrush, moist leaf litter, and downed trees within the site may provide suitable upland habitat during various life stages. Additionally, this species has been observed in Deer Creek and Frenchman's Creek (CDFW 2017) in upper portions of the watershed.

Although the lower portions of the Arroyo de en Medio are intermittent and do not provide optimal habitat for CRLF, the upper portion above the impoundment does provide suitable habitat and no barriers are present between nearby occurrences. Due to the presence of all of the physical and biological features required to sustain the species, and the documented presence within the surrounding landscape, the species is assumed to be present within the Study Area.

Moderate Potential

White-tailed kite (*Elanus leucurus*). CDFW Fully Protected Species. The white-tailed kite is resident in open to semi-open habitats throughout the lower elevations of California, including grasslands, savannahs, woodlands, agricultural areas and wetlands. Vegetative structure and prey availability seem to be more important habitat elements than associations with specific plants or vegetative communities (Dunk 1995). Nests are constructed mostly of twigs and placed in trees, often at habitat edges. Nest trees are highly variable in size, structure, and immediate surroundings, ranging from shrubs to trees greater than 150 feet tall (Dunk 1995). This species preys upon a variety of small mammals, as well as other vertebrates and invertebrates.

While grassland and foraging habitats are only present in small patches near the southeastern edges of the Study Area, farmlands just outside of the Study Area along Arroyo de en Medio and Deer Creek may provide adequate foraging opportunities to support the species. Additionally, tall trees throughout the Study Area may provide suitable structures to support nesting by the species. Due to the presence of suitable nesting substrates and the presence of suitable foraging grounds, this species has a moderate potential to occur.

Olive-sided flycatcher (*Contopus cooperi).* CDFW Species of Special Concern. USFWS Bird of Conservation Concern. This species if found within the coniferous forest biome, most often associated with forest openings, forest edges near natural openings (e.g. meadows, canyons,

rivers) or human-made openings (e.g., harvest units), or open to semi-open forest stands (Altman 2000).

Although this species typically nests in more protected areas from the coastline, large blue gum trees throughout the Study Area may provide suitable nesting habitat. The habitat mosaic of northern coastal scrub, forests, and wetland vegetation in the Study Area is also suitable foraging habitat. Because of the presence of suitable nesting and foraging habitat, this species has a moderate potential to occur within the Study Area.

San Francisco (saltmarsh) common yellowthroat (*Geothlypis trichas sinuosa*), USFWS Bird of Conservation Concern, CDFW Species of Special Concern. This subspecies of the common yellowthroat is found in freshwater marshes, coastal swales, riparian thickets, brackish marshes, and saltwater marshes. Their breeding range extends from Tomales Bay in the north, Carquinez Strait to the east, and Santa Cruz County to the south. This species requires thick, continuous cover such as tall grasses, tule patches, or riparian vegetation down to the water surface for foraging and prefers willows for nesting (Gardali and Evans 2008).

Throughout most of the Study Area, the lack of dense ground cover makes the area unsuitable for nesting by the species. However, two small sections of willow thickets in the seasonal wetland habitat along Highway 1 at the southeastern edge of the Study Area may be suitable to support the species. This species can also use the adjacent grasslands to supplement foraging opportunities in this area. Therefore, while these thickets are small and bisected by Highway 1, they may potentially support nesting by the species.

San Francisco Garter Snake (*Thamnophis sirtalis tetrataenia*), Federal Endangered, State Endangered, CDFW Fully Protected. Historically, San Francisco garter snake (SFGS) occurred in scattered wetland areas on the San Francisco Peninsula. This species was historically documented from approximately the San Francisco County line south along the eastern and western bases of the Santa Cruz Mountains, at least to the Upper Crystal Springs Reservoir, and along the coast south to Año Nuevo Point, San Mateo County, and Waddell Creek, Santa Cruz County. The preferred habitat of SFGS is a densely vegetated pond near an open hillside where they can sun themselves, feed, and find cover in rodent burrows; however, considerably less ideal habitats can be successfully occupied (USFWS 2006).

There are two significant components to SFGS habitat: 1) ponds that support CRLF, American bullfrog (*Lithobates catesbeiana*), or the Pacific chorus frog (*Pseudacris regilla*) and 2) surrounding upland that supports Botta's pocket gopher (*Thomomys bottae*) and California meadow vole (*Microtus californicus*) (USFWS 2006). Ranid frogs are an obligate component of the SFGS's diet (USFWS 2006).

The Study Area is composed primarily of thick Eucalyptus groves. The heavy overstory of Eucalyptus groves throughout most of the Study Area makes ponds and other aquatic features in these areas less likely to support the species due to limited basking habitat. However, along upper Arroyo de en Medio above the impoundments, ponds containing CRLF (SFGS's primary food source), as well as exposed sunny slopes suitable for basking and heavily vegetated ponds or creeks are present. Together, such features are preferred habitat for SFGS. The species has also been documented to the north and south of the Study Area (CDFW 2017). While suitable habitat is limited to the areas along Arroyo de en Medio, the presence of this habitat and documented occurrences surrounding the Study Area make it likely that the species would be present.

Therefore, this species has been evaluated to have a moderate potential to occur, especially along Arroyo de en Medio.

Monarch Butterfly (*Danaus plexippus*). CDFW Special Status Invertebrate. This large, showy butterfly is found throughout the United States, southern Canada, and Central America. It also occurs in parts of South America and other continents. In North America, this species spends spring and summer months breeding and foraging across much of its range. The monarch butterfly generally uses milkweed (*Asclepias spp*.) for both breeding and nectaring, although nectar may also be obtained from a variety of additional plant species. From August to October, monarchs will migrate thousands of miles to winter roost sites located along the California coast and central Mexico. At roost sites, monarchs will congregate in thousands or millions on a tree or group of trees (Opler et al. 2011). Western monarchs prefer overwintering habitat comprised of a relatively dense grove of trees with some understory, located near water and nectar sources and protected from the wind by topographic landforms or trees (Sakai and Calvert 1991). Winter roost sites are often on south, southwest, or west facing slopes which may provide more favorable temperature regimes and wind protection (Leong et al. 2004). Monarch butterflies typically arrive in mid-October to overwintering sites along the California coast and remain until late February or March (Jepsen et al. 2015).

This Study Area is primarily comprised of Eucalyptus groves, which is known to be used by the species for winter roosting. Additionally, the aspects typically favored are south and southwest facing slopes, which comprise the majority of the Study Area. Lastly, the area supports a variety of wild and landscaped (urban) plants to provide nectar, as well as ponds wetlands and seeps suitable for watering. Due to these factors, the species has a moderate potential to use the Study Area as winter roosting habitat.

San Francisco tree lupine moth (*Grapholita edwardsiana*). LCP. San Francisco tree lupine moth was proposed for federal threatened status in 1978, just prior to the authoring of the LCP. However, its status was never elevated and it is currently not a listed species. The species occurs only on sandy northern peninsula sites and is associated with its larval host plant, tree lupine (*Lupinus arboreus*). Little is known about the species' ecology; however, the initial concern that led to the proposal of federal threatened status in 1978 was largely due to the degradation and loss of the sandy dune system of the host plant, tree lupine (USFWS 1978). However, later research showed that the tree lupine host plants recovered well from habitat disturbance and in some instances may have expanded their initial range, presumably to the benefit of the San Francisco tree lupine moth (USFWS 1986). The grassland habitat in the Study Area may contain large numbers of tree lupines. Although little is known about the reproductive strategy, current numbers of this species, or where it occurs, San Francisco tree lupine moth was determined to have a moderate potential to occur in areas which tree lupine may be present.

Unlikely Potential

The following FESA and CESA-listed species are known to occur in the greater vicinity of the Study Area but have been determined to be unlikely to occur. Species that are discussed have been documented within 5-miles of the Study Area, though current habitat conditions are such that their presence is not supported. Despite the determination that these species are unlikely to be found within the Study Area, they are discussed for completeness.

San Bruno Elfin Butterfly (*Callophrys mossii bayensis*), Federal Endangered. San Bruno elfin butterfly inhabits coastal mountains near San Francisco Bay, in the fog belt of steep north-

facing slopes that receive little direct sunlight. It lives near prolific growths of the larval food plant, broadleaf stonecrop (*Sedum spathulifolium*), which is a low-growing succulent associated with rocky outcrops (often in the shade) that occur on steep, mainly north-facing slopes in coastal scrub from 200 to 5,000 feet elevation (Black and Vaughan 2005a). The San Bruno elfin is restricted to a few small populations, the largest of which occurs on San Bruno Mountain. Its habitat has been diminished by quarrying, off-road recreation, and urban development (Black and Vaughan 2005a).

While several occurrences of this species have been recorded approximately 3.5 miles north of the Study Area (CDFW 2017), the aspect of the topography within the Study Area make it unlikely that the species will occur. This butterfly occurs only on north facing slopes that receive little direct sunlight, which moderates weather conditions (USFWS 2010b). All of the occurrences for this species in the area have been recorded on northern aspect slopes which maintain some level of shading throughout the day (CDFW 2017). These slopes provide favorable conditions for both the butterfly and its host plant. Slope aspects within the Study Area face almost entirely east, west or southward, with full exposure to offshore winds and higher levels of sunlight than the species typically tolerates. Additionally, the majority of the Study Area is comprised of Eucalyptus groves, which does not support the species or its host plants. Because the distribution of this species is fairly well know as well as being limited in range, and aspects of the Study Area are primarily east, west or south, which provides conditions unfavorable to the butterfly or its host plant, this species is unlikely to occur.

Mission Blue Butterfly (*Plebejus icarioides missionensis*), Federal Endangered. Mission blue butterfly persists in small populations in San Francisco, San Mateo, and Marin Counties. The majority of the remaining mission blues are found on San Bruno Mountain in San Mateo County. This species inhabits coastal grasslands in the fog belt of the coastal range from 690 to 1,180 feet in elevation. Three species of lupine serve as larval food plants: silver lupine, summer lupine (*L. formosus*), and many-colored lupine (*L. variicolor*). Adults feed on hairy false goldenaster (*Heterotheca villosa*), bluedicks (*Dichelostemma capitatum*), and seaside buckwheat (*Eriogonum latifolium*) (Black and Vaughan 2005b).

This species is also only known to occur in northern San Mateo County (San Bruno Mountain, Sweeney Ridge, and Milagra Ridge), San Francisco County (Twin Peaks), and in Marin County, all of which are far from the Study Area (Wayne and Weiss 2009, USFWS 2010b). The nearest documented occurrence of this species is approximately 5-miles northwest of the Study Area near Crystal Springs Reservoir (CDFW 2017), and nearest known population is on Sweeney Ridge over 4 miles north. The maximum known travel distance of this species is 2,500 meters (about 1.5 miles) (USFWS 2010) and open patches of grassland are rare between the nearest known occupied habitat and the Study Area. This species primarily occurs in coastal grasslands along ridgelines and requires three species of lupine as host plants. Although grassland habitat and potential host plants are present, the distance from known populations and lack of connectivity through grassland patches reduces potential for mission blue butterfly to be present. Therefore, because the Study Area is not within the known distribution of the species, grassland habitat typical of this species is not present, and does not contain the elevation gradients or typical habitats used by this species, mission blue is unlikely to be present.

5.0 SUMMARY AND RECOMMENDATIONS

The following sections present recommendations for future studies and/or measures to avoid or reduce impacts to special-status species and sensitive habitats. Seven ESHAs occur within the Study Area:

- ephemeral streams potentially subject to the jurisdictional of the Corps, RWQCB, CDFW, CCC, and County LCP;
- intermittent streams potentially subject to the jurisdictional of the Corps, RWQCB, CDFW, CCC, and County LCP;
- perennial streams potentially subject to the jurisdictional of the Corps, RWQCB, CDFW, CCC, and County LCP;
- ponds potentially subject to the jurisdictional of the Corps, RWQCB, CDFW, CCC, and County LCP;
- seasonal wetlands potentially subject to the jurisdictional of the Corps, RWQCB, CDFW, CCC, and County LCP;
- central coast arroyo willow riparian scrub potentially subject to the jurisdiction of the CDFW, CCC, and County LCP; and,
- beaches potentially subject to the jurisdiction of the CCC and County LCP.

No special-status plant species were observed during the March 16 or 22, 2017 site visits; however, these did not constitute protocol-level rare plant surveys. Seven special-status plant species have been identified with moderate to high potential to occur within the Study Area. Two special-status wildlife species are present and seven have a moderate to high potential to occur within the Study Area. The following sections present recommendations for future studies and/or measures to avoid or reduce impacts to sensitive habitats and special-status wildlife with potential to occur in the Study Area.

5.1 Biological Communities

The CCC and County LCP generally prohibit land use or development that would have significant adverse impact on ESHAs. The County LCP defines specific criteria for allowable development areas in ESHAs, requires ESHA impacts to be minimized to the maximum extent feasible through siting and design, requires that mitigation measures implemented where impacts to ESHAs may occur. However, permitted uses allowed within ESHAs include the following: education and research, trails and scenic overlooks on public lands, and fish and wildlife management. As mentioned, ESHAs within the Study Area include central coast arroyo willow riparian scrub; ephemeral, intermittent, and perennial streams; perennial ponds; and potential seasonal wetlands.

5.1.1 Wetlands

Seasonal wetlands are subject to the jurisdiction to the Corps, RWQCB, CCC, and County LCP. Impacts directly to potential seasonal wetlands within the Study Area would require a Corps Section 404 Permit, a RWQCB Section 401 Water Quality Certification, and a coastal development permit (CDP) through the CCC and County. Further, work within buffers of potential seasonal wetlands may also require a CDP through the CCC and County.

A 100-foot minimum buffer is typically required surrounding wetlands (as well as ponds) by the County LCP code. However, specific permitted uses, including trails, are allowed within these buffer areas. As such, while trail development activities may occur within the 100-foot buffer surrounding a wetland, the following standards are recommended to minimize adverse effects (Section 7.17, San Mateo County LCP):

- All paths be elevated so as not to impede movement of water;
- All construction takes place during daytime hours;

- All outdoor lighting be kept at a distance away from the wetland sufficient not to affect the wildlife;
- Motorized machinery be kept to less than 45 dBA at the wetland boundary;
- All construction which alters wetland vegetation be required to replace vegetation;
- No herbicides be used in wetlands unless specifically approved by the county Agricultural commissioner and CDFW; and,
- All projects be reviewed by CDFW and RWQCB to determine appropriate mitigation measures.

5.1.2 Non-Wetland Waters

The Study Area contains non-wetland waters including ephemeral, intermittent, and perennial streams and perennial ponds, which are potentially subject to regulation by the following agencies: the Corps, the RWQCB, the CDFW, and the County LCP. Temporary and permanent impacts to federal-protected waters (below the ordinary high water mark [OHWM] of the stream or pond) in the Study Area will require a Corps Section 404 Permit, and a RWQCB Section 401 Water Quality Certification. Any work below top of bank (TOB) of a stream will require a Section 1602 Lake and Streambed Alteration Agreement from CDFW and a Section 401 Water Quality Certification from the RWQCB. Additionally, work within established ESHA buffers of streams may require a CDP through the CCC and County.

Best management practices should be used to lessen potential impacts to sensitive habitats. This includes the use of silt fencing, wattles, and other appropriate stormwater pollution prevention measures. Permitting agencies may require a mitigation and monitoring plan to restore or replace temporary and permanent impacts to non-wetland waters.

5.1.3 Riparian Habitat

In addition to streams and lakes, the CDFW and RWQCB regulate riparian vegetation. Removal of riparian vegetation also requires a Section 1602 Lake and Streambed Alteration Agreement from CDFW and Section 401 Water Quality Certification from the RWQCB. Both CDFW and RWQCB jurisdiction typically extends to the TOB or the outer edge of riparian vegetation, whichever is further from the stream.

Potential impacts to riparian vegetation could occur through riparian vegetation removal or project-related encroachment into riparian habitat. To ensure that potential impacts to riparian vegetation are avoided, exclusion and/or silt fencing should be placed around all riparian vegetation that will be preserved and this fencing shall remain in place for the duration of construction. If removal of riparian vegetation is proposed, mitigation for impacts may be required from both the CDFW and RWQCB.

5.1.4 General Avoidance Measures

Below, general avoidance measures to reduce potential impacts to sensitive habitats and specific performance criteria for ESHAs are described:

- Site grading and trail development activities should be restricted between approximately May 1 and December 31. Site grading during these dryer months will reduce the possibility of soil erosion and sediments flowing into natural habitats.

- Install temporary silt fencing along the perimeter of ESHAs where land disturbing activities will occur to protect potential ESHAs.

- Soil disturbance in the 100-foot buffer zone around the wetland areas (see Section 5.1.1) should be minimized as much as possible. This will reduce the impact to existing soils and vegetation that will remain as natural habitat within the buffer zone and reduce the potential for soil erosion. Perimeter erosion and sediment control measures (i.e. silt fencing, straw waddles) should be installed within the buffer zone area as an extra precaution to reduce the possibility of sediments entering the adjacent potential ESHAs.

- Solid materials, including wood, masonry/rock, glass, paper, or other materials should not be stored or placed in the 100-foot wetland buffer zone to the extent practicable. Solid waste materials should be properly disposed of off-site. Fluid materials, including concrete, wash water, fuels, lubricants, or other fluid materials used during construction should not be disposed of on-site and should be stored or confined as necessary to prevent spillage into natural habitats. If a spill of such materials occurs, the area should be cleaned and contaminated materials disposed of properly. The affected area should be restored to its natural condition.

5.2 Special-Status Plant Species

Of the 45 special-status plant species known to occur in the vicinity of the Study Area, seven were determined to have a high to moderate potential to occur in the Study Area. Prior to any project construction work, protocol-level rare plant surveys are recommended during appropriate blooming periods for species determined to have potential to occur including: bent-flowered fiddleneck, western leatherwood, Marin checker lily, perennial goldfields, San Mateo tree lupine, Oregon polemonium, and Hickman's cinquefoil. If the presence of any special-status plant species is confirmed during surveys, buffers may be required to ensure plant individuals are not impacted from project work. If complete avoidance to special-status species is infeasible, mitigation may be required by the Corps, CDFW, the CCC, and the County.

Additionally, while not considered a Federal, State, or CNPS-ranked special-status plant species, California strawberry was observed scattered throughout Eucalyptus grove, northern coastal scrub, and potential seasonal wetlands in the Study Area. Policy 7.49 of the County LCP requires that any development within one-half mile of the coast mitigate against the destruction of California strawberry through:

a) Prevent any development, trampling, or other destructive activity which would destroy the plant; or,
b) After determining specifically if the plants involved are of particular value, successfully transplant them or have them successfully transplanted to some other suitable site.

Determination of the importance of the plants can only be made by a professional doing work in strawberry breeding.

5.3 Special-Status Wildlife Species

Of the 58 special-status wildlife species documented in the vicinity, two are present and seven were determined to have potential to occur within the Study Area. Most of the species found in the review of background literature occur in habitats not found in the Study Area. General recommendations for species or groups of similar species are listed below.

5.3.1 San Francisco Dusky-footed Woodrat

Woodrat nests were observed in various forested habitats (e.g. riparian, willow and blue gum) throughout the Study Area. If project activities are to occur within such habitats, the measures below are recommended to minimize impacts to San Francisco dusky-footed woodrat.

- Prior to working in forested or scrub habitats, a pre-construction survey within the work area is recommended to identify any existing San Francisco dusky-footed woodrat nests to be impacted.
- If woodrat nests are identified in the vicinity of the project activities and can be avoided, a non-disturbance buffer of 75 feet should be implemented around the outermost boundary of the nest.
- Woodrat houses that cannot be avoided should be dismantled by hand under the supervision of a biologist. If young are encountered during the dismantling process, the material should be placed back on the house and the house would then remain unmolested for three weeks in order to give the young enough time to mature and leave the house. After that time, the nest dismantling process may begin again. Nest material should be scattered to suitable adjacent areas (riparian, woodland, scrub) that will not be impacted.

5.3.2 Special-Status and Non-special-status Nesting Birds

Special-status bird species with potential to nest within the Study Area include white-tailed kite, olive-sided flycatcher, and Allen's hummingbird. In addition, most common native bird species are also protected by the Migratory Bird Treaty Act (MBTA) during the nesting season. The following avoidance and minimization measures are recommended to be incorporated to any proposed project within the Study Area to avoid impacts to special-status bird species and birds protected under the MBTA.

- If project activities are conducted during the nesting season (February 15 – August 31), a pre-construction nesting bird survey should be performed no more than 14 days prior to initial ground disturbance to avoid impacting active nests, eggs, and/or young.
- If the survey identifies any active nest, an exclusion buffer should be established for protection of the nest and young. The qualified biologist should establish a buffer appropriate for the species and location of the nest if it is necessary. The buffer should be maintained until all young have fledged. Buffer distance varies based on species and conditions at the site, but typically range between 25 up to 500 feet.
- Impacts to nesting birds can be avoided if potential activities are initiated outside of the nesting season (September 1 – January 31). During this time period, no pre-construction bird surveys are recommended.

5.3.3 CRLF and SFGS

California red-legged frog and SFGS are both likely to inhabit upper Arroyo de en Medio within the Study Area. CRLF may also inhabit ponds and streams throughout the rest of the Study Area, but SFGS is unlikely in areas outside of Arroyo de en Medio because of the absence of preferred habitat components. Because of the suitability of some habitats within the Study Area to support both species, and considering measures for both species are similar, recommendations for CRLF and SFGS are discussed below.

- All ground disturbance activities should be restricted to the dry season (April 15 through October 15) or when suitable habitats have dried in order to reduce the potential for CRLF and SFGS to occur within non-ponded habitats of the Study Area.
- A qualified biologist should survey the work site immediately before the onset of vegetation clearing or ground disturbance activities to verify if species are present and all habitats are dry. If CRLF are found and do not move out of the work area on their own, the USFWS should be contacted to determine if relocation is appropriate. In making this determination, the USFWS will consider if an appropriate relocation site exists. If the USFWS approves moving animals, a USFWS-approved biologist will be allowed sufficient time to move them from the work site before work activities begin. Any SFGS shall be allowed to leave the work area on their own, and shall be monitored as practical by the biologist to ensure they do not reenter the work area.
- Prior to the start of ground-disturbing activities, all construction personnel should receive training on listed species and their habitats by a qualified biologist. The importance of these species and their habitat will be described to all employees as well as the minimization and avoidance measures that are to be implemented as part of the project. An educational brochure containing color photographs of all listed species in the work area will be distributed to all employees working within the Study Area. The original list of employees who attend the training sessions will be maintained by the contractor and be made available for review by the USFWS and the CDFW upon request.
- The contractor shall designate a person or employee to monitor on-site compliance with all minimization measures. The on-site monitor(s) will be on-site daily for the duration of work, including vegetation removal, grading, and clean-up activities.
- Any vehicles and equipment associated with work-activities should be parked or staged only within a designated staging area at the end of each workday or when not in use in order to minimize habitat disturbance or water quality degradation.
- If appropriate, wildlife exclusion fencing should be erected and maintained around the perimeter of the Limit of Work area, including the project construction staging areas and access routes, to prevent SFGS and CRLF from entering the site overnight. Any wetland areas within the Limit of Work area should also be protected by silt fencing.
- Vehicle access points may have a temporary silt fence gate, which is opened to allow construction vehicle access while the contractor's trained personnel is present. At night the seal on the temporary gate should be augmented by sandbags to prevent species from entering the area beneath the gate. Installation of fencing will be performed under the supervision of a USFWS-approved biologist.
- No work should occur within 48 hours of a rain event (over 0.25 inch in a 24-hour period). Following a rain event, a qualified biologist will resurvey the work area immediately before reinitiating ground disturbance activities to verify if species are present. If CRLF or SFGS are observed, then the steps previously described for the initial pre-construction survey shall be followed.

- Plastic monofilament netting (erosion control matting), rolled erosion control materials, or similar material shall not be used at the Study Area because CRLF, SFGS, and other species may become entangled or trapped in it. Any erosion control materials used should be made of tightly woven fiber netting or similar material to ensure that the CRLF and SFGS are not trapped. This limitation should be communicated to the contractor prior to the start of work.
- No trash shall be deposited on the site during construction activities. All trash shall be placed in trash receptacles with secure lids, stored in vehicles, and removed nightly from the Study Area.
- Refueling or maintenance of equipment should be conducted at least 50 feet from any wetlands, waters or designated ESHAs.
- CRLF and SFGS may take refuge in cavity-like or den-like structures such as pipes and may enter stored pipes and become trapped. Therefore, all construction pipes, culverts, or similar materials, which are stored at the site for one or more nights, will be either securely capped or thoroughly inspected by the on-site monitor and/or the construction foreman/manager before the pipe is used or moved in any way. It is also recommended these materials are stored within the staging areas either in developed areas or within wildlife exclusion fencing.
- The on-site monitor and/or construction foreman/manager shall ensure that all excavated steep-walled holes or trenches more than one foot deep are completely covered at the close of each working day by covering holes with plywood or similar materials, and covering the edges of those materials with dirt to prevent access by wildlife. Alternatively, holes may be augmented with one or more escape ramps constructed of earth fill or wooden planks. Any ramps installed should be approved by the on-site biologist. Before such holes or trenches are filled, they will be thoroughly inspected for trapped animals by the on-site biologist and/or construction foreman/manager.
- If at any time a trapped CRLF or SFGS is discovered by the on-site biologist or anyone else, work in the immediate area should cease as soon as it is safe to do so, and the animal shall be allowed to passively leave the work area on its own. Steps outlined above shall be followed if the animal does not, or cannot leave the area on its own.

5.3.4 Monarch Butterfly

Monarch butterfly has potential to roost in the Eucalyptus groves throughout the Study Area during the winter. Foraging habitat is also present in the Study Area. WRA recommends the following measures be implemented to avoid impacts to monarch butterfly winter-roost sites.

- If the Project will remove or trim trees during the winter roost season (October 1 through March 15), then a pre-construction survey for roosting monarch butterflies should be conducted within 7 days of tree removal or trimming activities.
- If monarch butterflies are detected roosting in trees to be removed or trimmed, then consultation with CDFW may be required to determine how and when to proceed with activities and if additional mitigation measures are required.
- If tree removal or trimming is conducted March 16 through September 31, then no pre-construction surveys for roosting monarch butterflies are necessary.

6.0 REFERENCES

Alvarez, J. A. 2004. Rana aurora draytonii (California red-legged frog) Microhabitat. Herpetological Review 35:162-163.

Arechiga, R. 2017. Personal communication with San Mateo County Parks on July 10, 2017.

Baldwin, BG, DH Goldman, DJ Keil, R Patterson, TJ Rosatti, and DH Wilken (eds.). 2012. The Jepson Manual: Vascular Plants of California, second edition. University of California Press, Berkeley, CA.

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.

Black, S. H., and D. M. Vaughan. 2005a. Species Profile: *Icaricia icarioides missionensis*. In Shepherd, M. D., D. M. Vaughan, and S. H. Black (Eds). Red List of Pollinator Insects of North America. CD-ROM Version 1 (May 2005). Portland, OR: The Xerces Society for Invertebrate Conservation.

Black, S. H., and D. M. Vaughan. 2005b. Species Profile: Icaricia icarioides missionensis. In Shepherd, M. D., D. M. Vaughan, and S. H. Black (Eds). Red List of Pollinator Insects of North America. CD-ROM Version 1 (May 2005). Portland, OR: The Xerces Society for Invertebrate Conservation.

Bulger J. B., J. S. Norman, And R. B. Seymour. 2003. Terrestrial Activity and Conservation Of Adult California Red-Legged Frogs Rana aurora draytonii In Coastal Forests And Grasslands. Biological Conservation, 110:85.-95.

[CCH] Consortium of California Herbaria. 2017. Data provided by the participants of the Consortium of California Herbaria. Available at: http://ucjeps.berkeley.edu/consortium. Accessed: May 2017.

[CDFG] California Department of Fish and Game, Biogeographic Data Branch. 2010. List of California Terrestrial Natural Communities Recognized by The California Natural Diversity Database.

[CDFG] California Department of Fish and Game, Environmental Services Division (ESD). 1994. A Field Guide to Lake and Streambed Alteration Agreements, Sections 1600-1607, California Fish and Game Code.

[CDFW] California Department of Fish and Wildlife, Biogeographic Data Branch. 2017. California Natural Diversity Database (CNDDB). Sacramento Field Office.

[CNPS] California Native Plant Society. 2017a. Inventory of Rare and Endangered Plants (online edition, v8-02). California Native Plant Society, Sacramento, California. Available online: http://www.rareplants.cnps.org/

County of San Mateo. 2013. Local Coastal Program Policies. June 2013.

County of San Mateo. 1998. Local Coastal Program. June 1998.

Dunk, J. R. 1995. White-tailed Kite (*Elanus leucurus*). In The Birds of North America, No. 178 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, and the American Ornithologists' Union, Washington, D.C.

Environmental Laboratory. 1987. Corps of Engineers Wetlands Delineation Manual. Department of the Army, Waterways Experiment Station, Vicksburg, Mississippi 39180-0631.

Fellers, G.M. and P.M. Kleeman. 2007. California red-legged frog (Rana draytonii) movement and habitat use: Implications for conservation. Journal of Herpetology 41(2): 276-286.

Gardali, T. and J. Evens. 2008. San Francisco Common Yellowthroat (*Geothlypis trichas sinuosa).* In: Shuford , W. D. and T. Gardali, eds. California Bird Species of Special Concern: A ranked assessment of species, subspecies, and distinct populations of birds of immediate conservation concern in California. Studies of Western Birds 1. Western Field Ornithologists, Camarillo, California, and California Department of Fish and Game, Sacramento.

Google Earth. 2017. Aerial Imagery 2002-2017. Accessed March 2017.

Holland, R. F. 1986. Preliminary Descriptions of the Terrestrial Natural Communities of California. Prepared for the California Department of Fish and Game, Sacramento, California.

Jepsen, S., D.F. Schweitzer, B. Young, N. Sears, M. Omes, and S. Hoffman Black. 2015. Conservation Status and Ecology of the Monarch Butterfly in the United States. Prepared for the U.S. Forest Service. Xerces Society for Invertebrate Conservation, Portland, OR.

Leong, K.L.H., W.H. Sakai, W. Bremer, D. Feuerstein, and G. Yoshimura. 2004. Analysis of the pattern of distribution and abundance of monarch overwintering sites along the California coastline. Pages 177-185 in The Monarch Butterfly: Biology and Conservation, K. Oberhauser and M. Solensky (eds). Cornell University Press, Ithaca, NY.

Lichvar, R.W., M. Butterwick, N.C. Melvin, and W.N. Kirchner. 2014. The National Wetland Plant List: 2014 Update of Wetland Ratings. Phytoneuron 2014-41: 1-42.

Matocq, M. Dusky-footed Woodrats (Neotoma fuscipes) at Hastings: A Research Tradition. Hastings Natural History Reserve http://www.hastingsreserve.org/Woodrats, 2003.

Mitchell, D. E. 2000. Allen's Hummingbird (*Selasphorus sasin*). In: The birds of North America (A. Poole, and F. Gill, eds.), no. 501. The Birds of North America Inc., Philadelphia, PA.

NRCS. Web Soil Survey: San Mateo County. Available online: http://websoilsurvey.nrcs.usda.gov/. Accessed September 2015.

Opler, PA, K Lotts, and T Naberhaus, coordinators. 2011. Butterflies and Moths of North America. Bozeman, MT: Big Sky Institute. <http://www.butterfliesandmoths.org/species/Danaus-plexippus> Accessed August 21, 2011.

Rathbun, G.B. and J. Schneider. 2001. Translocation of California red-legged frogs (Rana aurora draytonii). Wildlife Society Bulletin 29(4): 1300-1303.

Sakai, W and W Calvert. 1991. Statewide Monarch Butterfly Management Plan for the State of California Department of Parks and Recreation Final Report. Life Sciences Department,

Santa Monica College, 1900 Pico Blvd., Santa Monica, CA 90405.

Sawyer, J. O. and T. Keeler-Wolf. 2009. A Manual of California Vegetation. California Native Plant Society, Sacramento, California.

Shuford, WD, and T Gardali (eds). 2008. California Bird Species of Special Concern: A ranked assessment of species, subspecies, and distinct populations of birds of immediate conservation concern in California. Studies of Western Birds 1. Western Field Ornithologists, Camarillo, California, and CDFG, Sacramento.

Stebbins, Robert C., and Samuel M. McGinnis. 2012. Field Guide to Amphibians and Reptiles of California: Revised Edition. University of California Press.

Thomson, Robert C., Amber N. Wright, H. Bradley Shaffer. 2016. California Amphibian and Reptile Species of Special Concern. University of California Press. 408 pages.

[USFWS] U.S. Fish and Wildlife Service. 1978. Endangered and Threatened Wildlife and Plants: Proposed Endangered or Threatened Status or Critical Habitat for 10 Butterflies or Moths. Federal Register, Vol. 43, No. 128. 28938-28945.

[USFWS] U.S. Fish and Wildlife Service. 1986. Endangered and Threatened Wildlife and Plants; Findings on Pending Petitions and Description of Progress on Listing Actions. Federal Register, Vol. 51, No. 6. 996-999.

[USFWS] U.S. Fish and Wildlife Service. 2006. San Francisco Garter Snake (*Thamnophis sirtalis tetrataenia*) 5-Year Review: Summary and Evaluation. Sacramento Fish and Wildlife Office. USFWS. 2015. Quadrangle Species Lists, Sacramento Fish and Wildlife Service.

[USFWS] U.S. Fish and Wildlife Service. 2010a. Endangered and Threatened Wildlife and Plants: Revised Designation of Critical Habitat for California Red-legged Frog; Final Rule. Federal Register, Vol. 75, No. 51. 12815-12959.

[USFWS] U.S. Fish and Wildlife Service. 2010b. San Bruno elfin butterfly (*Callophrys mossii bayensis*) and Mission blue butterfly (*Icaricia icarioides missionensis*) 5-year review: summary and evaluation, pp. 39. Sacramento Fish and Wildlife Field Office, U.S. Fish and Wildlife.

[USFWS] U.S. Fish and Wildlife Service. 2017a. IPaC - Information for Planning and Conservation Trust Resource Report. Sacramento Fish and Wildlife Office. Available online: http://ecos.fws.gov/ipac/. Most recently accessed March 2017.

[USFWS] U.S. Fish and Wildlife Service. 2017b. ECOS – Environmental Conservation Online System. U.S. FWS Threatened & Endangered Species Active Critical Habitat Report. Sacramento Fish and Wildlife Office. Available onlinehttps://ecos.fws.gov/ecp/report /table/critical-habitat.html. Most recently accessed March 2017.

[USFWS] U.S. Fish and Wildlife Service. 2017c. Myrtle's Silverspot Butterfly Species Information Available Online at: https://www.fws.gov/sacramento/es_species/Accounts/ Invertebrates/es_myrtle-silverspot-butterfly.htm. Most recently accessed: March 2017.

[Corps] United States Army Corps of Engineers. 2008. Regional Supplement to the Corps of

Engineers Wetland Delineation Manual: Arid West Region (Version 2.0), ed. J.S. Wakeley, R.W. Lichvar, and C.V. Noble. ERDC/EL TR-08-28. Vicksburg, MS: U.S. Army Engineer Research and Development Center.

Wayne L., and S. B. Weiss. 2009. Recovery Action Plan For The Mission Blue Butterfly *(Icaricia icarioides missionensis*) At Twin Peaks Natural Area.

[WBWG] Western Bat Working Group. 2017. Species accounts. Prepared by: Betsy C. Bolster. Available online at: http://wbwg.org/western-bat-species/

WRA. August 2015. Wetland Delineation Report, Midcoast Multimodal Trail Project. Prepared for San Mateo County.

Zeiner, D. C., W. F. Laudenslayer, Jr., K. E. Mayer, and M. White. 1990. California's Wildlife, Volume I-III: Amphibians and Reptiles, Birds, Mammals. California Statewide Wildlife Habitat Relationships System, California Department of Fish and Game, Sacramento.

APPENDIX A

LIST OF OBSERVED PLANT AND ANIMAL SPECIES

Appendix A-1. Plant Species Observed within the Project Area.

Scientific Name	Common Name	Origin	Form	CAL-IPC Status
Acacia dealbata	Silver wattle	non-native (invasive)	tree, shrub	Moderate
Acacia melanoxylon	Blackwood acacia	non-native (invasive)	tree	Limited
Achillea millefolium	Yarrow	native	perennial herb	-
Allium triquetrum	White flowered onion	non-native (invasive)	perennial herb (bulb)	-
Alnus rubra	Red alder	native	tree, shrub	-
Anthoxanthum odoratum	Sweet vernal grass	non-native (invasive)	annual, perennial grass	Moderate
Artemisia californica	Coastal sage brush	native	shrub	-
Artemisia douglasiana	California mugwort	native	perennial herb	-
Athyrium filix-femina var. cyclosorum	Western lady fern	native	fern	-
Avena barbata	Slim oat	non-native (invasive)	annual, perennial grass	Moderate
Baccharis pilularis ssp. consanguinea	Coyote brush	native	shrub	-
Briza maxima	Rattlesnake grass	non-native (invasive)	annual grass	Limited
Bromus carinatus var. marginatus	Mountain brome	native	perennial grass	-
Bromus diandrus	Ripgut brome	non-native (invasive)	annual grass	Moderate
Cardamine californica	Bitter cress	native	perennial herb	-
Cardamine oligosperma	Idaho bittercress	native	annual, perennial herb	-
Carduus pycnocephalus ssp. pycnocephalus	Italian thistle	non-native (invasive)	annual herb	Moderate
Carex harfordii	Monterey sedge	native	perennial grasslike herb	-
Carex praegracilis	Field sedge	native	perennial grasslike herb	-
Ceanothus foliosus var. foliosus	Wavy leaved ceanothus	native	shrub	-
Ceanothus thyrsiflorus var. thyrsiflorus	Blue blossom	native	tree, shrub	-
Cerastium fontanum ssp. vulgare	Common chickweed	non-native	perennial herb	-
Chasmanthe floribunda	Chasmanthe	non-native	perennial herb	-
Chlorogalum pomeridianum var. pomeridianum	Common soaproot	native	perennial herb	-

A-1.1

Scientific Name	Common Name	Origin	Form	CAL-IPC Status
Cirsium vulgare	Bullthistle	non-native (invasive)	perennial herb	Moderate
Claytonia perfoliata ssp. perfoliata	Claytonia	native	annual herb	-
Clinopodium douglasii	Yerba buena	native	perennial herb	-
Conium maculatum	Poison hemlock	non-native (invasive)	perennial herb	Moderate
Cornus sericea ssp. sericea	Red osier dogwood	native	shrub	-
Cortaderia selloana	Pampas grass	non-native (invasive)	perennial grass	High
Cotoneaster pannosus	Woolly cotoneaster	non-native (invasive)	shrub	Moderate
Crassula ovata	Jade plant	non-native	annual herb	-
Crassula tillaea	Mediterranean pygmy weed	non-native	annual herb	-
Crocosmia ×crocosmiiflora	-	-	-	-
Cynosurus cristatus	Crested dogtail grass	non-native	perennial grass	-
Cyperus eragrostis	Tall cyperus	native	perennial grasslike herb	-
Delairea odorata	Cape ivy	non-native (invasive)	perennial herb	High
Echium candicans	Pride of madeira	non-native (invasive)	shrub	Limited
Ehrharta erecta	Upright veldt grass	non-native (invasive)	perennial grass	Moderate
Epilobium brachycarpum	Willow herb	native	annual herb	-
Erigeron canadensis	Canada horseweed	native	annual herb	-
Eriophyllum staechadifolium	Lizard tail	native	perennial herb	-
Erodium cicutarium	Coastal heron's bill	non-native (invasive)	annual herb	Limited
Eschscholzia californica	California poppy	native	annual, perennial herb	-
Eucalyptus globulus	Blue gum	non-native (invasive)	tree	Limited
Euphorbia lathyris	Gopher plant	non-native (invasive)	annual, perennial herb	-
Euphorbia peplus	Petty spurge	non-native	annual herb	-
Festuca arundinacea	Reed fescue	non-native (invasive)	perennial grass	Moderate
Festuca myuros	Rattail sixweeks grass	non-native (invasive)	annual grass	-
Festuca perennis	Italian rye grass	non-native	annual, perennial grass	-

Scientific Name	Common Name	Origin	Form	CAL-IPC Status
Foeniculum vulgare	Fennel	non-native (invasive)	perennial herb	High
Fragaria vesca	Wild strawberry	native	perennial herb	-
Frangula californica ssp. californica	California coffeeberry	native	shrub	-
Fumaria parviflora	Fine leaved fumitory	non-native	annual herb	-
Galium aparine	Cleavers	native	annual herb	-
Gamochaeta ustulata	Featherweed	native	perennial herb	-
Genista monspessulana	French broom	non-native (invasive)	shrub	High
Geranium dissectum	Wild geranium	non-native (invasive)	annual herb	Limited
Geranium molle	Crane's bill geranium	non-native (invasive)	annual, perennial herb	-
Hedera helix	English ivy	non-native (invasive)	vine, shrub	-
Helminthotheca echioides	Bristly ox-tongue	non-native (invasive)	annual, perennial herb	Limited
Heracleum maximum	Common cowparsnip	native	perennial herb	-
Hesperocyparis macrocarpa	Monterey cypress	native	tree	-
Hirschfeldia incana	Mustard	non-native (invasive)	perennial herb	Moderate
Holcus lanatus	Common velvetgrass	non-native (invasive)	perennial grass	Moderate
Holodiscus discolor var. discolor	Oceanspray	native	shrub	-
Hordeum murinum ssp. leporinum	Farmer's foxtail	non-native (invasive)	annual grass	Moderate
Hypochaeris radicata	Hairy cats ear	non-native (invasive)	perennial herb	Moderate
Juncus bufonius var. bufonius	Toad rush	native	annual grasslike herb	-
Juncus patens	Rush	native	perennial grasslike herb	-
Juncus phaeocephalus var. phaeocephalus	Brown headed rush	native	perennial grasslike herb	-
Lactuca serriola	Prickly lettuce	non-native (invasive)	annual herb	-
Lathyrus vestitus var. vestitus	Hillside pea	native	perennial herb	-
Leucanthemum maximum	Shasta daisy	non-native	annual, perennial herb	-
Linum bienne	Flax	non-native	annual herb	-
Lobularia maritima	Sweet alyssum	non-native (invasive)	perennial herb	Limited

Scientific Name	Common Name	Origin	Form	CAL-IPC Status
Lonicera involucrata var. ledebourii	Coast twinberry	native	shrub	-
Lotus corniculatus	Bird's foot trefoil	non-native (invasive)	perennial herb	-
Lupinus sp.	-	-	-	-
Luzula subsessilis	Pacific woodrush	native	perennial grasslike herb	-
Lysimachia arvensis	Scarlet pimpernel	non-native	annual herb	-
Lythrum hyssopifolia	Hyssop loosestrife	non-native	annual, perennial herb	-
Malva nicaeensis	Bull mallow	non-native	annual herb	-
Malva sylvestris	High mallow	non-native	perennial herb	-
Marah fabacea	California man-root	native	perennial herb, vine	-
Matricaria chamomilla	German chamomile	non-native	annual herb	-
Medicago polymorpha	California burclover	non-native (invasive)	annual herb	Limited
Melilotus albus	White sweetclover	non-native (invasive)	annual, biennial herb	-
Mimulus aurantiacus var. aurantiacus	Sticky monkeyflower	native	shrub	-
Morella californica	California wax myrtle	native	shrub	-
Myoporum laetum	Ngaio tree	non-native (invasive)	tree, shrub	Moderate
Oemleria cerasiformis	Oso berry	native	shrub	-
Oxalis pes-caprae	Bermuda buttercup	non-native (invasive)	perennial herb	Moderate
Parentucellia viscosa	Yellow parentucellia	non-native (invasive)	annual herb	Limited
Persicaria hydropiperoides	Water pepper	native	perennial herb	-
Phacelia californica	Rock phacelia	native	perennial herb	-
Phalaris aquatica	Harding grass	non-native (invasive)	perennial grass	Moderate
Pinus contorta ssp. contorta	Shore pine	native	tree	-
Pinus radiata	Monterey pine	native	tree	-
Plantago coronopus	Cut leaf plantain	non-native (invasive)	annual herb	-
Plantago lanceolata	Ribwort	non-native (invasive)	perennial herb	Limited
Poa annua	Annual blue grass	non-native	annual grass	-
Polystichum munitum	Western sword fern	native	fern	-

Scientific Name	Common Name	Origin	Form	CAL-IPC Status
Prosartes smithii	Largeflower fairybells	native	perennial herb	-
Prunella vulgaris var. lanceolata	Mountain selfheal	native	perennial herb	-
Pseudotsuga menziesii var. menziesii	Douglas fir	native	tree	-
Pteridium aquilinum var. pubescens	Western bracken fern	native	fern	-
Pyracantha angustifolia	Firethorn	non-native (invasive)	shrub	-
Raphanus sativus	Jointed charlock	non-native (invasive)	annual, biennial herb	Limited
Ribes menziesii var. menziesii	Canyon gooseberry	native	shrub	-
Ribes sanguineum var. sanguineum	Red flowering currant	native	shrub	-
Rubus armeniacus	Himalayan blackberry	non-native (invasive)	shrub	High
Rubus parviflorus	Thimbleberry	native	vine, shrub	-
Rubus ursinus	California blackberry	native	vine, shrub	-
Rumex acetosella	Sheep sorrel	non-native (invasive)	perennial herb	Moderate
Rumex crassus	Willow leaved dock	native	perennial herb	-
Salix laevigata	Polished willow	native	tree	-
Salix lasiolepis	Arroyo willow	native	tree, shrub	-
Sambucus racemosa var. racemosa	Red elderberry	native	shrub	-
Sanicula crassicaulis	Pacific sanicle	native	perennial herb	-
Scirpus microcarpus	Mountain bog bulrush	native	perennial grasslike herb	-
Scrophularia californica	California bee plant	native	perennial herb	-
Senecio minimus	Coastal burnweed	non-native (invasive)	annual, perennial herb	-
Senecio vulgaris	Common groundsel	non-native	annual herb	-
Sequoia sempervirens	Coast redwood	native	tree	-
Sidalcea malviflora ssp. malviflora	Checker mallow	native	perennial herb (rhizomatous)	-
Silene gallica	Common catchfly	non-native	annual herb	-
Silybum marianum	Milk thistle	non-native (invasive)	annual, perennial herb	Limited
Sisyrinchium bellum	Blue eyed grass	native	perennial herb	-

Appendix A-2. Wildlife Species Observed in the Study Area.

Scientific Name	Common Name
Mammals	
Odocoileus hemionus columbianus	blacktailed deer
Neotoma fuscipes annectens	San Francisco dusky-footed woodrat
Canis latrans	coyote
Amphibians	
Taricha torosa	California newt
Rana draytonii	California red-legged frog
Birds	
Fulica americana	American coot
Corvus brachyrhynchos	American crow
Calypte anna	Anna's hummingbird
Bucephala albeola	bufflehead
Aphelocoma californica	California scrub jay
Branta canadensis	Canada goose
Poecile rufescens	chestnut-backed chickadee
Junco hyemalis	dark-eyed junco
Spinus psaltria	lesser goldfinch
Anas platyrhynchos	mallard
Melospiza melodia	song sparrow
Cyanocitta stelleri	Steller's jay
Chamaea fasciata	wrentit

APPENDIX B

POTENTIAL FOR SPECIAL-STATUS PLANT AND WILDLIFE SPECIES TO OCCUR IN THE STUDY AREA

Appendix B. Potential for special-status plant and wildlife species to occur in the Study Area. List compiled from the California Natural Diversity Database (CDFW 2017), U.S. Fish and Wildlife Service Species Lists (2017), and California Native Plant Society Rare and Endangered Plant Inventory (CNPS 2017a) database searches for the San Mateo and Half Moon Bay USGS 7.5-minute quadrangles.

SPECIES	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE**	RECOMMENDATIONS
Plants				
Blasdale's bent grass *Agrostis blasdalei*	Rank 1B.2	Coastal bluff scrub, coastal dunes, coastal prairie. Elevation ranges from 20 to 490 feet (5 to 150 meters). Blooms May-Jul.	**Unlikely.** While northern coastal scrub within the Study Area has some grassy areas, no rocky areas with sparse vegetation exist that could support this species.	No further actions are recommended for this species.
Franciscan onion *Allium peninsulare* var. *franciscanum*	Rank 1B.2	Cismontane woodland, valley and foothill grassland/clay, volcanic, often serpentine. Elevation ranges from 170 to 980 feet (52 to 300 meters). Blooms (Apr), May-Jun.	**No Potential.** The Study Area does not contain clay, volcanic, or serpentine substrates.	No further actions are recommended for this species.
bent-flowered fiddleneck *Amsinckia lunaris*	Rank 1B.2	Coastal bluff scrub, cismontane woodland, valley and foothill grassland. Elevation ranges from 10 to 1640 feet (3 to 500 meters). Blooms Mar-Jun.	**Moderate Potential.** While northern coastal scrub within the Study Area has some grassy areas, no rocky areas with sparse vegetation exist that could support this species.	Seasonally appropriate surveys are recommended for this species.
coast rockcress *Arabis blepharophylla*	Rank 4.3	Broad-leafed upland forest, coastal bluff scrub, coastal prairie, coastal scrub/rocky. Elevation ranges from 10 to 3610 feet (3 to 1100 meters). Blooms Feb-May.	**Unlikely.** Rocky substrate is not present within the Study Area.	No further actions are recommended for this species.

SPECIES	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE**	RECOMMENDATIONS
Montara manzanita *Arctostaphylos montaraensis*	Rank 1B.2	Chaparral (maritime), coastal scrub. Elevation ranges from 260 to 1640 feet (80 to 500 meters). Blooms Jan-Mar.	**Unlikely.** Although the Study Area contains northern coastal scrub, this species typically occurs on granite and sandstone outcrops (Jepson Flora Project 2017), which are not present in Study Area. No *Arctostaphylos* species were observed in the Study Area.	No further actions are recommended for this species.
Kings Mountain manzanita *Arctostaphylos regismontana*	Rank 1B.2	Broad-leafed upland forest, chaparral, north coast coniferous forest/granitic or sandstone. Elevation ranges from 1000 to 2400 feet (305 to 730 meters). Blooms Jan-Apr.	**Unlikely.** This species is known to occur on granitic or sandstone outcrops (CDFW 2017), which are not present in the Study Area. No *Arctostaphylos* species were observed in the Study Area.	No further actions are recommended for this species.
ocean bluff milk-vetch *Astragalus nuttallii var. nuttallii*	Rank 4.2	Coastal bluff scrub, coastal dunes. Elevation ranges from 10 to 390 feet (3 to 120 meters). Blooms Jan-Nov.	**Unlikely.** While the Study Area contains coastal bluff scrub, the habitat is disturbed and likely does not represent typical habitat for the species. Additionally, the Study Area does not contain coastal dunes.	No further actions are recommended for this species.
coastal marsh milk-vetch *Astragalus pycnostachyus var. pycnostachyus*	Rank 1B.2	Coastal dunes (mesic), coastal scrub, marshes and swamps (coastal salt, streamsides). Elevation ranges from 0 to 100 feet (0 to 30 meters). Blooms Apr-Oct.	**Unlikely.** The Study Area does not contain coastal dunes or salt marshes.	No further actions are recommended for this species.
johnny-nip *Castilleja ambigua var. ambigua*	Rank 4.2	Coastal bluff scrub, coastal prairie, coastal scrub, marshes and swamps, valley and foothill grassland, vernal pools margins. Elevation ranges from 0 to 1430 feet (0 to 435 meters). Blooms Mar-Aug.	**Unlikely**. While the Study Area contains coastal bluff scrub and coastal prairie, the habitat is disturbed and likely does not represent typical habitat for the species.	No further actions are recommended for this species.

SPECIES	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE**	RECOMMENDATIONS
pappose tarplant *Centromadia parryi ssp. parryi*	Rank 1B.2	Chaparral, coastal prairie, meadows and seeps, marshes and swamps (coastal salt), valley and foothill grassland (vernally mesic)/often alkaline. Elevation ranges from 0 to 1380 feet (0 to 420 meters). Blooms May-Nov.	**Unlikely.** The Study Area does not contain chaparral, coastal prairie, meadows, and seeps with sufficient inundation dominated by perennial graminoids, marsh and swamp, or alkaline habitats.	No further actions are recommended for this species.
San Francisco Bay spineflower *Chorizanthe cuspidata var. cuspidata*	Rank 1B.2	Coastal bluff scrub, coastal dunes, coastal prairie, coastal scrub/sandy. Elevation ranges from 10 to 710 feet (3 to 215 meters). Blooms Apr-Jul (Aug).	**Unlikely.** The Study Area does not contain highly sandy substrates, such as dunes.	No further actions are recommended for this species.
Franciscan thistle *Cirsium andrewsii*	Rank 1B.2	Broad-leafed upland forest, coastal bluff scrub, coastal prairie, coastal scrub/mesic, sometimes serpentine. Elevation ranges from 0 to 490 feet (0 to 150 meters). Blooms Mar-Jul.	**Unlikely**. The Study Area does not contain serpentine substrates suitable to support this species.	No further actions are recommended for this species.
San Francisco collinsia *Collinsia multicolor*	Rank 1B.2	Closed-cone coniferous forest, coastal scrub/sometimes serpentine. Elevation ranges from 100 to 820 feet (30 to 250 meters). Blooms (Feb), Mar-May.	**Unlikely.** This species is known from serpentine or decomposed shale mixed with humus substrates (CDFW 2017), which are not present in the Study Area.	No further actions are recommended for this species.
clustered lady's-slipper *Cypripedium fasciculatum*	Rank 4.2	Lower montane coniferous forest, north coast coniferous forest/usually serpentine seeps and streambanks. Elevation ranges from 330 to 7990 feet (100 to 2435 meters). Blooms Mar-Aug.	**Unlikely.** The Study Area does not contain serpentine seeps or moist streambanks in coniferous forest.	No further actions are recommended for this species.

SPECIES	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE**	RECOMMENDATIONS
western leatherwood *Dirca occidentalis*	Rank 1B.2	Broad-leafed upland forest, closed-cone coniferous forest, chaparral, cismontane woodland, north coast coniferous forest, riparian forest, riparian woodland/mesic. Elevation ranges from 80 to 1390 feet (25 to 425 meters). Blooms Jan-Mar (Apr).	**Moderate Potential.** The Study Area contains potentially suitable riparian and northern coastal scrub habitats. Additionally, a known occurrence is within 3-miles of the Study Area.	Seasonally appropriate surveys are recommended for this species.
California bottle-brush grass *Elymus californicus*	Rank 4.3	Broad-leafed upland forest, cismontane woodland, north coast coniferous forest, riparian woodland. Elevation ranges from 50 to 1540 feet (15 to 470 meters). Blooms May-Aug (Nov).	**Unlikely.** The Study Area does not contain woodland, coniferous forest and is not underlain with sandy humic soil with known associated species.	No further actions are recommended for this species.
San Mateo woolly sunflower *Eriophyllum latilobum*	FE, SE, Rank 1B.1	Cismontane woodland (often serpentine, on road cuts). Elevation ranges from 150 to 490 feet (45 to 150 meters). Blooms May-Jun.	**Unlikely**. The Study Area does not contain woodland habitat or road cuts on serpentine.	No further actions are recommended for this species.
San Francisco wallflower *Erysimum franciscanum*	Rank 4.2	Chaparral, coastal dunes, coastal scrub, valley and foothill grassland/often serpentine or granitic, sometimes roadsides. Elevation ranges from 0 to 1800 feet (0 to 550 meters). Blooms Mar-Jun.	**Unlikely.** Although the Study Area contains northern coastal scrub and open, grassy areas, this species typically occurs in rocky, thin soils, loose sand, or serpentine substrate, none of which are present in the Study Area.	No further actions are recommended for this species.
Hillsborough chocolate lily *Fritillaria biflora var. ineziana*	Rank 1B.1	Cismontane woodland, valley and foothill grassland/serpentine. Elevation ranges from 490 to 490 feet (150 to 150 meters). Blooms Mar-Apr.	**No Potential.** The Study Area does not contain serpentine substrate.	No further actions are recommended for this species.

SPECIES	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE**	RECOMMENDATIONS
Marin checker lily *Fritillaria lanceolata var. tristulis*	Rank 1B.1	Coastal bluff scrub, coastal prairie, coastal scrub. Elevation ranges from 50 to 490 feet (15 to 150 meters). Blooms Feb-May.	**Moderate Potential.** The Study Area contains potentially suitable open, grassy areas in the northern coastal scrub community.	Seasonally appropriate surveys are recommended for this species.
fragrant fritillary *Fritillaria liliacea*	Rank 1B.2	Cismontane woodland, coastal prairie, coastal scrub, valley and foothill grassland/often serpentine. Elevation ranges from 10 to 1350 feet (3 to 410 meters). Blooms Feb-Apr.	**Unlikely.** Although the Study Area contains open, scrubby areas, this species typically occurs on serpentine and/or heavy clay soils, which are not present in the Study Area.	No further actions are recommended for this species.
San Francisco gumplant *Grindelia hirsutula var. maritima*	Rank 3.2	Coastal bluff scrub, coastal scrub, valley and foothill grassland/sandy or serpentine. Elevation ranges from 50 to 1310 feet (15 to 400 meters). Blooms Jun-Sep.	**Unlikely.** The Study Area does not contain serpentine or highly sandy substrates, such as dunes.	No further actions are recommended for this species.
short-leaved evax *Hesperevax sparsiflora var. brevifolia*	Rank 1B.2	Coastal bluff scrub (sandy), coastal dunes, coastal prairie. Elevation ranges from 0 to 710 feet (0 to 215 meters). Blooms Mar-Jun.	**Unlikely**. While the Study Area contains coastal prairie and scrub, this species typically occurs on sandy soils, which are not present in the Study Area.	No further actions are recommended for this species.
Kellogg's horkelia *Horkelia cuneata var. sericea*	Rank 1B.1	Closed-cone coniferous forest, chaparral (maritime), coastal dunes, coastal scrub/sandy or gravelly, openings. Elevation ranges from 30 to 660 feet (10 to 200 meters). Blooms Apr-Sep.	**Unlikely**. While the Study Area contains coastal prairie and scrub, this species typically occurs on sandy soils, which are not present in the Study Area.	No further actions are recommended for this species.
Point Reyes horkelia *Horkelia marinensis*	Rank 1B.2	Coastal dunes, coastal prairie, coastal scrub/sandy. Elevation ranges from 20 to 2480 feet (5 to 755 meters). Blooms May-Sep.	**Unlikely**. While the Study Area contains coastal prairie and scrub, this species typically occurs on sandy soils, which are not present in the Study Area.	No further actions are recommended for this species.

SPECIES	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE**	RECOMMENDATIONS
coast iris *Iris longipetala*	Rank 4.2	Coastal prairie, lower montane coniferous forest, meadows and seeps/mesic. Elevation ranges from 0 to 1970 feet (0 to 600 meters). Blooms Mar-May.	**Unlikely**. While the Study Area contains coastal prairie, this species typically occurs on heavy soils which is absent in the Study Area.	No further actions are recommended for this species.
perennial goldfields *Lasthenia californica ssp. macrantha*	Rank 1B.2	Coastal bluff scrub, coastal dunes, coastal scrub. Elevation ranges from 20 to 1710 feet (5 to 520 meters). Blooms Jan-Nov.	**Moderate Potential.** The Study Area contains potentially suitable open, grassy areas in the northern coastal scrub community. Additionally, there are several occurrences within 5 miles of the Study Area.	Seasonally appropriate surveys are recommended for this species.
coast yellow leptosiphon *Leptosiphon croceus*	SC, Rank 1B.1	Coastal bluff scrub, coastal prairie. Elevation ranges from 30 to 490 feet (10 to 150 meters). Blooms Apr-May.	**Unlikely**. While the Study Area contains bluff scrub and coastal prairie, the Study Area is disturbed and lacks any known associated species.	No further actions are recommended for this species.
rose leptosiphon *Leptosiphon rosaceus*	Rank 1B.1	Coastal bluff scrub. Elevation ranges from 0 to 330 feet (0 to 100 meters). Blooms Apr-Jul.	**Unlikely**. While the Study Area contains bluff scrub and coastal prairie, the Study Area is disturbed and lacks any known associated species.	No further actions are recommended for this species.
Crystal Springs lessingia *Lessingia arachnoidea*	Rank 1B.2	Cismontane woodland, coastal scrub, valley, and foothill grassland/serpentine, often roadsides. Elevation ranges from 200 to 660 feet (60 to 200 meters). Blooms Jul-Oct.	**No Potential.** The Study Area does not contain serpentine substrate.	No further actions are recommended for this species.

SPECIES	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE**	RECOMMENDATIONS
woolly-headed lessingia *Lessingia hololeuca*	Rank 3	Broad-leafed upland forest, coastal scrub, lower montane coniferous forest, valley and foothill grassland/clay, serpentine. Elevation ranges from 50 to 1000 feet (15 to 305 meters). Blooms Jun-Oct.	**No Potential.** The Study Area does not contain serpentine or clay substrate.	No further actions are recommended for this species.
Ornduff's meadowfoam *Limnanthes douglasii ssp. ornduffii*	Rank 1B.1	Meadows and seeps/agricultural fields. Elevation ranges from 30 to 70 feet (10 to 20 meters). Blooms Nov-May.	**Unlikely.** This highly restricted species is known only from current and former agricultural fields on the coastal terrace in El Granada. Although the Study Area has disturbed, seasonally wet areas, the historical and modern land management practices are substantially different from those used in agricultural fields.	No further actions are recommended for this species.
San Mateo tree lupine *Lupinus arboreus var. eximius*	Rank 3.2	Chaparral, coastal scrub. Elevation ranges from 300 to 1800 feet (90 to 550 meters). Blooms Apr-Jul.	**High Potential.** Scattered vegetative shrub lupines were observed along the perimeter of the northern coastal scrub. None of the shrubby lupines were blooming, and as a result, they could not be identified to species. San Mateo tree lupine has been observed nearby (pers. comm.) in similar habitat to what is present in the Study Area.	Seasonally appropriate surveys are recommended for this species.

SPECIES	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE**	RECOMMENDATIONS
Indian Valley bush-mallow *Malacothamnus aboriginum*	Rank 1B.2	Chaparral, cismontane woodland/rocky, granitic, often in burned areas. Elevation ranges from 490 to 5580 feet (150 to 1700 meters). Blooms Apr-Oct.	**No Potential.** The Study Area does not contain rocky substrate or sandy bare soil (CDFW 2017).	No further actions are recommended for this species.
arcuate bush-mallow *Malacothamnus arcuatus*	Rank 1B.2	Chaparral, cismontane woodland. Elevation ranges from 50 to 1160 feet (15 to 355 meters). Blooms Apr-Sep.	**No Potential.** The Study Area does not contain chaparral or cismontane woodland habitats with gravelly alluvium substrate (CDFW 2017).	No further actions are recommended for this species.
Davidson's bush-mallow *Malacothamnus davidsonii*	Rank 1B.2	Chaparral, cismontane woodland, coastal scrub, riparian woodland. Elevation ranges from 610 to 2810 feet (185 to 855 meters). Blooms Jun-Jan.	**Unlikely.** The Study Area does not contain sandy washes within chaparral, cismontane woodland, or riparian woodland habitats. Although the Study Area contains northern coastal scrub habitat, this species occurs in sandy washes (CDFW 2017), which are not present in the Study Area.	No further actions are recommended for this species.
Hall's bush-mallow *Malacothamnus hallii*	Rank 1B.2	Chaparral, coastal scrub. Elevation ranges from 30 to 2490 feet (10 to 760 meters). Blooms May-Sep (Oct).	**Unlikely.** This species typically occurs in open chaparral habitat, often on serpentine substrate, and this habitat and substrate are not present in the Study Area.	No further actions are recommended for this species.

SPECIES	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE**	RECOMMENDATIONS
woodland woolythreads *Monolopia gracilens*	Rank 1B.2	Broad-leafed upland forest (openings), chaparral (openings), cismontane woodland, north coast coniferous forest (openings), valley and foothill grassland/serpentine. Elevation ranges from 330 to 3940 feet (100 to 1200 meters). Blooms (Feb), Mar-Jul.	**Unlikely.** This species typically occurs on serpentine substrate and/or in chaparral habitat. There is a documented occurrence approximately 3 miles northeast of the Study Area (CDFW 2017), but the occurrence consists of two historical observations (from 1893 and 1946) with very limited location and habitat information. Mapped soils in the vicinity of that occurrence are primarily serpentine or acidic soils derived from sedimentary sources, and such substrate is not present in the Study Area.	No further actions are recommended for this species.
white-rayed pentachaeta *Pentachaeta bellidiflora*	FE, SE, Rank 1B.1	Cismontane woodland, valley and foothill grassland (often serpentine). Elevation ranges from 110 to 2030 feet (35 to 620 meters). Blooms Mar-May.	**Unlikely.** The Study Area does not contain cismontane woodland or grassland underlain by soils derived from serpentine bedrock.	No further actions are recommended for this species.
Choris' popcornflower *Plagiobothrys chorisianus var. chorisianus*	Rank 1B.2	Chaparral, coastal prairie, coastal scrub/mesic. Elevation ranges from 50 to 520 feet (15 to 160 meters). Blooms Mar-Jun.	**Unlikely.** The northern coastal scrub habitat in the Study Area is likely too dry to support this species, which prefers mesic conditions. Although this species is somewhat disturbance tolerant and can occur in seasonal wetlands, it typically occurs on acidic to moderately acid substrates derived from sandstone or shale, and the soil in the Study Area has neutral acidity and is derived from quartz diorite parent material (CSRL 2017).	No further actions are recommended for this species.

SPECIES	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE**	RECOMMENDATIONS
Oregon polemonium *Polemonium carneum*	Rank 2B.2	Coastal prairie, coastal scrub, lower montane coniferous forest. Elevation ranges from 0 to 6000 feet (0 to 1830 meters). Blooms Apr-Sep.	**Moderate Potential.** The Study Area contains potentially suitable open areas, particularly in the northern coastal scrub areas.	Seasonally appropriate surveys are recommended for this species.
Hickman's cinquefoil *Potentilla hickmanii*	FE, SE, Rank 1B.1	Coastal bluff scrub, closed-cone coniferous forest, meadows and seeps (vernally mesic), marshes and swamps (freshwater). Elevation ranges from 30 to 490 feet (10 to 149 meters). Blooms Apr-Aug.	**Moderate Potential**. The Study Area contains potentially suitable open areas, particularly in the northern coastal scrub areas.	Seasonally appropriate surveys are recommended for this species.
San Francisco campion *Silene verecunda ssp. verecunda*	Rank 1B.2	Coastal bluff scrub, chaparral, coastal prairie, coastal scrub, valley and foothill grassland/sandy. Elevation ranges from 100 to 2120 feet (30 to 645 meters). Blooms (Feb), Mar-Jun (Aug).	**Unlikely.** The Study Area does not contain mudstone, shale, or highly sandy substrates such as dunes. There is a CNDDB occurrence near the Study Area, but this occurrence is greater than 100 years old and has very vague locality information.	No further actions are recommended for this species.
San Francisco owl's-clover *Triphysaria floribunda*	Rank 1B.2	Coastal prairie, coastal scrub, valley and foothill grassland/usually serpentine. Elevation ranges from 30 to 520 feet (10 to 160 meters). Blooms Apr-Jun.	**Unlikely.** The Study Area does not contain serpentine substrates suitable to support this species.	No further actions are recommended for this species.
coastal triquetrella *Triquetrella californica*	Rank 1B.2	Coastal bluff scrub, coastal scrub/soil. Elevation ranges from 30 to 330 feet (10 to 100 meters).	**Unlikely.** While the Study Area is within 30 meters from the coast, this species grows on gravel or thin soil over outcrops, which is absent in the Study Area.	No further actions are recommended for this species.

SPECIES	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE**	RECOMMENDATIONS
Wildlife				
Mammals				
pallid bat *Antrozous pallidus*	SSC, WBWG	Occupies a variety of habitats at low elevation including grasslands, shrublands, woodlands, and forests. Most common in open, dry habitats with rock crevices, tree hollows, mines, caves, and a variety of man-made structures for roosting.	**Unlikely.** The majority of trees within the Study Area are eucalyptus, and do not support the cavities, exfoliating bark, or leaf structure typically required by this species. No caves, rock outcrops, or abandoned buildings are present to support maternity or day roosting by this species.	No further actions are recommended for this species.
Townsend's big-eared bat *Corynorhinus townsendii*	SC, SSC, WBWG	This species is associated with a wide variety of habitats from deserts to mid-elevation mixed coniferous-deciduous forest. Females form maternity colonies in buildings, caves and mines and males roost singly or in small groups. Foraging occurs in open forest habitats where they glean moths from vegetation.	**Unlikely.** There are no known caves or large rock outcrops within the Study Area to support roosting by this species.	No further actions are recommended for this species.
hoary bat *Lasiurus cinereus*	WBWG	Prefers open habitats or habitat mosaics, with access to trees for cover and open areas or habitat edges for feeding. Roosts in dense foliage of medium to large trees. Feeds primarily on moths. Requires water.	**Unlikely.** The majority of trees within the Study Area are eucalyptus or cypress, and do not support the cavities, exfoliating bark, or dense leaf structure typically required by this species.	No further actions are recommended for this species.
big free-tailed bat *Nyctinomops macrotis*	SSC, WBWG	Occurs rarely in low-lying arid areas. Requires high cliffs or rocky outcrops for roosting sites.	**No Potential.** The Study Area does not contain tall cliffs or large rocky outcrops that support the caves and crevices that are required by this species.	No further actions are recommended for this species.

SPECIES	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE**	RECOMMENDATIONS
fringed myotis *Myotis thysanodes*	WBWG	Associated with a wide variety of habitats including dry woodlands, desert scrub, mesic coniferous forest, grassland, and sage-grass steppes. Buildings, mines and large trees and snags are important day and night roosts.	**Unlikely.** The majority of trees within the Study Area are eucalyptus or cypress, and do not support the cavities, exfoliating bark, or leaf structure typically required by this species. No mesic conifer forest or dry desert scrub habitat is present to support the species.	No further actions are recommended for this species.
southern sea otter *Enhydra lutris nereis*	FT, CFP, MMC	Nearshore marine environments from about Año Nuevo, San Mateo County. To Point Sal, Santa Barbara County. Needs canopies of giant kelp and bull kelp for rafting and feeding. Prefers rocky substrates with abundant invertebrates.	**No Potential.** The Study Area does not contain any marine environments to support the species.	No further actions are recommended for this species.
salt-marsh harvest mouse *Reithrodontomys raviventris*	FE, SE, CFP	Found only in the saline emergent wetlands of San Francisco Bay and its tributaries. Pickleweed is primary habitat. Do not burrow, build loosely organized nests. Require higher areas for flood escape.	**No Potential.** The Study Area does not contain any tidal salt marsh habitat required to support the species.	No further actions are recommended for this species.
American badger *Taxidea taxus*	SSC	Most abundant in drier open stages of most shrub, forest, and herbaceous habitats, with friable soils. Requires friable soils and open, uncultivated ground. Preys on burrowing rodents.	**Unlikely.** The Study Area does not contain suitable grasslands with abundant burrowing mammals to support the species.	No further actions are recommended for this species.

SPECIES	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE**	RECOMMENDATIONS
San Francisco dusky-footed woodrat *Neotoma fuscipes annectens*	SSC	Forest habitats of moderate canopy and moderate to dense understory. Also in chaparral habitats. Constructs nests of shredded grass, leaves, and other material. May be limited by availability of nest-building materials.	**Present.** Nests built by this species were observed during the site assessment.	See Section 5.3.1 for further discussion concerning avoidance measures and recommendations concerning this species.
Birds				
American peregrine falcon *Falco peregrinus anatum*	FD, SD, CFP, BCC	Largely resident. Requires protected cliffs, ledges or tall manmade structures for nesting. Often associated with coasts, bays, marshes and other open expanses of water. Preys primarily upon waterbirds; forages widely.	**Unlikely**. No tall cliffs, or other man-made structures are present to support nesting by the species. Due to the close proximity to the Pacific Ocean, this species may be observed flying overhead while foraging.	No further actions are recommended for this species.
bald eagle *Haliaeetus leucocephalus*	FD, SE, CFP, BCC	Occurs year-round in California, but primarily a winter visitor. Nests in large trees in the vicinity of larger lakes, reservoirs and rivers. Wintering habitat somewhat more variable but usually features large concentrations of waterfowl or fish.	**Unlikely.** This species occasionally nests in the local area but typically only within the undeveloped lands surrounding Crystal Springs Reservoir approximately 5-miles inland.	No further actions are recommended for this species.

SPECIES	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE**	RECOMMENDATIONS
burrowing owl *Athene cunicularia*	SSC, BCC	Largely resident in the region. Found in grasslands and other open habitats with a sparse to absent shrub/tree canopy. Nests and roosts in old mammal burrows, typically those of ground squirrels. Preys upon insects, and also small mammals, reptiles and birds.	**No Potential.** This species requires flat expanses of low grass or bare ground. The scrub and forest which dominates most of the Study Area as well as the surrounding landscape does not provide suitable low vegetation used by this species.	No further actions are recommended for this species.
white-tailed kite *Elanus leucurus*	CFP	Yearlong resident of coastal and valley lowlands. Preys on small diurnal mammals and occasional birds, insects, reptiles, and amphibians.	**Moderate Potential**. This species typically requires grasslands or agricultural fields for foraging, neither of which is present within the Study Area. However, some suitable foraging areas are present along Arroyo De En Medio, and may support foraging as well as nesting by the species. Therefore, while these habitats are not entirely within the Study Area, the species may still occur due to the high numbers of potential nest trees.	See Section 5.3.2 for further discussion concerning avoidance measures and recommendations concerning this species.
California black rail *Laterallus jamaicensis coturniculus*	ST, CFP, BCC	Occurs in tidal salt marsh with dense stands of pickleweed as well as freshwater to brackish marshes.	**No Potential.** The Study Area does not contain any tidal marsh habitat which is required by the species for nesting.	No further actions are recommended for this species.
Ridgeway's (=California) clapper rail *Rallus longirostris obsoletus*	FE, SE, CFP	Associated with tidal salt marsh and brackish marshes supporting emergent vegetation, upland refugia, and incised tidal channels.	**No Potential.** The Study Area does not contain any tidal marsh habitat which is required by the species for nesting.	No further actions are recommended for this species.

SPECIES	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE**	RECOMMENDATIONS
ashy storm-petrel *Oceanodroma homochroa*	SSC, BCC	Marine species; nests in rocky crevices on offshore islands and rocks from southern Mendocino County to northern Baja California. Forages over open ocean for invertebrates and larval fishes.	**No Potential.** The Study Area does not contain rocky offshore islands or other such substrates to support nesting by this species.	No further actions are recommended for this species.
black oystercatcher *Haematopus bachmani*	BCC	Year-round resident of rocky coast habitats along the Pacific coast. Also occurs on coastal and lower estuarine mud-flats. Forages primarily on intertidal invertebrates.	**No Potential.** The Study Area does not contain suitable rocky, estuarine or tidal flats to support nesting or foraging by the species.	No further actions are recommended for this species.
black skimmer *Rynchops niger*	SSC, BCC	Found primarily in southern California; South San Francisco Bay has a small resident population. Nests colonially on gravel bars, low islets, and sandy beaches	**No Potential.** The Study Area does not contain gravel bars, islets or other such substrates to support nesting by this species.	No further actions are recommended for this species.
California brown pelican *Pelecanus occidentalis californicus*	FD, SD, CFP	(Nesting colony) colonial nester on coastal islands just outside the surf line. Nests on coastal islands of small to moderate size which afford immunity from attack by ground-dwelling predators.	**No Potential.** The Study Area does not contain coastal island habitat required to support nesting by the species.	No further actions are recommended for this species.
California least tern *Sterna antillarum browni*	FE, SE, CFP	Nests along the coast from San Francisco bay south to northern Baja California. Colonial breeder on bare or sparsely vegetated, flat substrates: sand beaches, alkali flats, landfills, or paved areas.	**No Potential.** The Study Area does not contain suitable beaches, salt ponds, or alkali flats to support nesting of this species.	No further actions are recommended for this species.

SPECIES	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE**	RECOMMENDATIONS
double-crested cormorant *Phalacrocorax auritus*		(Rookery site) colonial nester on coastal cliffs, offshore islands, and along lake margins in the interior of the state. Nests along coast on sequestered islets, usually on ground with sloping surface, or in tall trees along lake margins.	**No Potential.** The Study Area does not contain offshore island habitat used for nesting by this species. The species may occasionally be seen flying over the Study Area when passing between foraging areas inland and along the coast.	No further actions are recommended for this species.
marbled murrelet *Brachyramphus marmoratus*	FT, SE	(Nesting) Feeds near shore; nests inland along the Pacific coast, from Eureka to Oregon border, and from Half Moon Bay to Santa Cruz. Nests in old-growth redwood-dominated forests, up to six miles inland. Nests often built in Douglas fir or redwood stands containing platform-like branches.	**No Potential.** The Study Area does not contain suitable old growth redwood or fir forest to support nesting by the species. This species may be observed flying over the Study Area while flying inland to more suitable and isolated habitat.	No further actions are recommended for this species.
short-tailed albatross *Phoebastria albatrus*	FE, SSC	Highly pelagic; comes to land only when breeding. Nests on remote Pacific islands. A rare non-breeding visitor to the eastern Pacific.	**No Potential.** The Study Area does not contain island habitat to support nesting by the species.	No further actions are recommended for this species.
western snowy plover *Charadrius alexandrinus nivosus*	FT, SSC, BCC	Federal listing applies only to the Pacific coastal population. Found on sandy beaches, salt pond levees, and shores of large alkali lakes. Requires sandy, gravelly, or friable soils for nesting.	**No Potential.** The Study Area does not contain suitable beaches, salt ponds, or dunes to support nesting of this species.	No further actions are recommended for this species.

SPECIES	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE**	RECOMMENDATIONS
Alameda song sparrow *Melospiza melodia pusillula*	SSC, BCC	Resident of salt marshes bordering south arm of San Francisco Bay. Inhabits Salicornia marshes; nests low in Grindelia bushes (high enough to escape high tides) and in Salicornia.	**Unlikely.** The Study Area does not contain typical salt marsh habitat required by this species.	No further actions are recommended for this species.
Allen's hummingbird Selasphorus sasin	BCC	(Nesting) Inhabits mixed evergreen, riparian woodlands, eucalyptus and cypress groves, oak woodlands, and coastal scrub during breeding season. Nest in shrubs and trees with dense vegetation.	**High Potential.** Xeric coastal scrub habitat is prevalent throughout portions of the Study Area. Water and a habitat mosaic to support foraging are also present. The combination of these habitat components make the area suitable for nesting by the species.	See Section 5.3.2 for further discussion concerning avoidance measures and recommendations concerning this species.
bank swallow *Riparia riparia*	ST	Summer resident in riparian and other lowland habitats near rivers, lakes and the ocean in northern California. Nests colonially in excavated burrows on vertical cliffs and bank cuts (natural and manmade) with fine-textured soils. Currently known to breed in Siskiyou, Shasta, and Lassen Cos., portions of the north coast, and along Sacramento River from Shasta Co. south to Yolo Co.	**No Potential.** The Study Area does not contain suitable cliff habitat to support nesting by the species.	No further actions are recommended for this species.

SPECIES	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE**	RECOMMENDATIONS
Bryant's savannah sparrow *Passerculus sandwichensis alaudinus*	SSC	Associated with the coastal fog belt, primarily between Humboldt and northern Monterey Counties. Occupies low tidally influenced habitats, adjacent to ruderal areas; often found where Pickleweed communities merge into grassland. Infrequently found in drier grasslands. Builds nests in taller grasses and rushes along roads, levees, and water conveyance canals.	**No Potential.** The Study Area does not contain typical tidally influenced habitats required by this species for nesting.	No further actions are recommended for this species.
Costa's hummingbird *Calypte costae*	BCC	Summer resident. Uses xeric habitats, especially California coastal scrub or sage scrub and dry open areas of chaparral in the coast ranges, and is occasionally found in oak savannah. Builds nest in shrub or tree living or dead, on branch, stem, or leaves, usually 1–2 m above ground.	**Unlikely Potential.** The Study Area occurs outside of the known range for this species and therefore there is unlikely potential for it to occur.	No further actions are recommended for this species.
grasshopper sparrow Ammodramus savannarum	SSC	Summer resident. Breeds in annual grasslands in lowlands and foothills, generally with low- to moderate-height grasses and scattered shrubs. Well-hidden nests are placed on the ground.	**Unlikely**. Suitable grasslands to support nesting and foraging by the species are largely absent from the Study Area. Additionally, this species has only rarely been observed in the vicinity of the Study Area (ebird 2017).	No further actions are recommended for this species.

SPECIES	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE**	RECOMMENDATIONS
Lawrence's goldfinch *Spinus (= Carduelis) lawrencei*	BCC	Summer resident, primarily in southern California; generally uncommon and local. Also found in large open areas in Contra Costa and Alameda Counties. Typically found in arid open woodlands, including oak savannah. Breeding distribution is erratic from year to year.	**Unlikely.** This species has been rarely observed on the San Francisco Peninsula, with no sightings recorded in the local area surrounding the Study Area for at least 1.5 years (eBird 2017). Additionally, typical oak savannah habitat used for nesting by this species is not present.	No further actions are recommended for this species.
Nuttall's woodpecker *Picoides nuttallii*	BCC	Year-round resident in lowland woodlands throughout much of California west of the Sierra Nevada. Typical habitat is dominated by oaks; also occurs in riparian woodland. Nests in tree cavities.	**Unlikely.** The majority of the Study Area contains a eucalyptus forest, which does not support the complex cavities required for nesting by this species.	No further actions are recommended for this species.
oak titmouse *Baeolophus inornatus*	BCC	Occurs year-round in woodland and savannah habitats where oaks are present, as well as riparian areas. Nests in tree cavities.	**Unlikely.** The majority of the Study Area contains a eucalyptus forest, which does not support the complex cavities required for nesting by this species.	No further actions are recommended for this species.
olive-sided flycatcher *Contopus cooperi*	SSC, BCC	Summer resident. Typical breeding habitat is montane coniferous forests. At lower elevations, also occurs in wooded canyons and mixed forests and woodlands. Often associated with forest edges. Arboreal nest sites located well off the ground.	**Moderate Potential.** The Study Area contains a variety of edge habitats between eucalyptus forest and shrub. Additionally tall eucalyptus trees provide an abundance of high nesting habitat, preferred by the species.	See Section 5.3.2 for further discussion concerning avoidance measures and recommendations concerning this species.

SPECIES	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE**	RECOMMENDATIONS
saltmarsh common yellowthroat *Geothlypis trichas sinuosa*	SSC, BCC	Resident of San Francisco bay region fresh and salt-water marshes. Requires thick, continuous cover down to water surface for foraging, tall grasses, tule patches, willows for nesting.	**Moderate Potential.** Thick vegetation surrounding various aquatic features within the Study Area may support feeding and nesting by this species.	See Section 5.3.2 for further discussion concerning avoidance measures and recommendations concerning this species.
tricolored blackbird *Agelaius tricolor*	SC, SSC, BCC, RP	Nearly endemic to California, where it is most numerous in the Central Valley and vicinity. Highly colonial, nesting in dense aggregations over or near freshwater in emergent growth or riparian thickets. Also uses flooded agricultural fields. Abundant insect prey near breeding areas essential.	**Unlikely.** The Study Area does not contain extensive marsh or large tule stands which can support nesting or foraging by a colony of this species.	No further actions are recommended for this species.
yellow warbler *Setophaga petechia*	SSC, BCC	Summer resident throughout much of California. Breeds in riparian vegetation close to water, including streams and wet meadows. Microhabitat used for nesting variable, but dense willow growth is typical. Occurs widely on migration.	**Unlikely.** Extremely dense riparian vegetation, preferred by the species is limited within the site. Adjacent streams may support some nesting by the species.	No further actions are recommended for this species.

SPECIES	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE**	RECOMMENDATIONS
Reptiles and Amphibians				
western pond turtle *Actinemys marmorata*	SSC	Occurs in perennial ponds, lakes, rivers and streams with suitable basking habitat (mud banks, mats of floating vegetation, partially submerged logs) and submerged shelter.	**Unlikely.** Ponds within the Study Area may provide suitable deep-water habitat to support the species, however heavy tree canopies prevent most areas from providing suitable basking sites to support the species. Additionally, dry, friable soils are required for nesting and are only present along Arroyo De En Medio where farming operations are likely to destroy any nests, preventing reproduction by the species.	No further actions are recommended for this species.
California giant salamander *Dicamptodon ensatus*	SSC	Occurs in the north-central Coast Ranges. Moist coniferous and mixed forests are typical habitat; also uses woodland and chaparral. Adults are terrestrial and fossorial, breeding in cold, permanent, or semi-permanent streams. Larvae usually remain aquatic for over a year.	**Unlikely.** Cold, deep perennial streams are mostly absent from the Study Area. Arroyo De En Medio and Deer Creek are impounded, and farmed up to the banks along its lower reaches. These practices raise temperatures and create unfavorable water conditions for the species.	No further actions are recommended for this species.
California red-legged frog *Rana aurora draytonii*	FT, SSC	Associated with quiet perennial to intermittent ponds, stream pools, and wetlands. Prefers shorelines with extensive vegetation. Documented to disperse through upland habitats after rains.	**Present.** This species has been observed and documented in most waterways and ponds in close proximity to the Study Area (CDFW 2017). Additionally this species has been observed in ponds along Arroyo De En Medio.	See Section 5.3.3 for further discussion concerning avoidance measures and recommendations concerning this species.

SPECIES	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE**	RECOMMENDATIONS
San Francisco garter snake *Thamnophis sirtalis tetrataenia*	FE, SE, CFP, RP	Vicinity of freshwater marshes, ponds and slow moving streams in San Mateo County and extreme northern Santa Cruz County. Prefers dense cover and water depths of at least one foot. Upland areas near water are also very important.	**Moderate Potential**. Ponds located within the Study Area along Arroyo De En Medio may have sufficient thermal exposure, food resources, and vegetative cover to support the species.	See Section 5.3.3 for further discussion concerning avoidance measures and recommendations concerning this species.
Fish				
green sturgeon *Acipenser medirostris*	FT, SSC, NMFS	Anadromous. Spawns in the Sacramento and Klamath River systems. Lingering transients may be found throughout the San Francisco Bay Estuary, particularly juveniles.	**No Potential.** There are no suitable marine habitats within the Study Area to support this species. The Study Area is outside of the species known spawning habitat.	No further actions are recommended for this species.
Delta smelt *Hypomesus transpacificus*	FT, ST, RP	Endemic to the Sacramento-San Joaquin delta area; found in areas where salt and freshwater systems meet. It occurs seasonally in Suisun Bay, Carquinez Strait and San Pablo Bay.	**No Potential.** The Study Area is outside of the known range for this species.	No further actions are recommended for this species.
longfin smelt *Spirinchus thaleichthys*	ST, RP	Found in open waters of estuaries, mostly in the middle or bottom of the water column. This species prefers salinities of 15 to 30 ppt, but can be found in completely freshwater to almost pure seawater.	**No Potential.** The Study Area is outside of the species known distribution.	No further actions are recommended for this species.

SPECIES	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE**	RECOMMENDATIONS
steelhead - central CA coast DPS *Oncorhynchus mykiss irideus*	FT	Occurs from the Russian River south to Soquel Creek and Pajaro River. Also in San Francisco and San Pablo Bay Basins. Adults migrate upstream to spawn in cool, clear, well-oxygenated streams. Juveniles remain in fresh water for 1 or more years before migrating downstream to the ocean.	**Unlikely**. Arroyo De En Medio and Deer Creek are currently impeded, or are too small to support anadromous fishes (Becker and Reining 2008). Therefore, the species is unlikely to be present.	No further actions are recommended for this species.
Coho salmon - central CA coast ESU *Oncorhynchus kisutch*	FE, SE	Federal listing includes populations between Punta Gorda and San Lorenzo River. State listing includes populations south of San Francisco Bay only. Occurs inland and in coastal marine waters. Requires beds of loose, silt-free, coarse gravel for spawning. Also needs cover, cool water and sufficient dissolved oxygen.	**Unlikely**. Arroyo De En Medio and Deer Creek are currently impeded, or are too small to support anadromous fishes (Becker and Reining 2008). Therefore, the species is unlikely to be present.	No further actions are recommended for this species.
Pacific lamprey *Entosphenus (=Lampetra) tridentatus*	SSC	Spawn between March and July in gravel-bottomed streams in riffle habitat. Larvae drift downstream to areas of low velocity and fine substrates and are relatively immobile in the stream substrates.	**Unlikely**. Arroyo De En Medio and Deer Creek are currently impeded, or are too small to support anadromous fishes (Becker and Reining 2008). Therefore, the species is unlikely to be present.	No further actions are recommended for this species.

SPECIES	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE**	RECOMMENDATIONS
tidewater goby *Eucyclogobius newberryi*	FE, SSC	Brackish water habitats along the California coast from Agua Hedionda Lagoon, San Diego County to the mouth of the Smith River. Found in shallow lagoons and lower stream reaches, they need fairly still but not stagnant water and high oxygen levels.	**No Potential.** There are no suitable lagoon habitats within the Study Area to support this species.	No further actions are recommended for this species.
Invertebrates				
San Bruno elfin butterfly *Incisalia (=Callophrys) mossii bayensis*	FE, RP	Limited to the vicinity of San Bruno Mountain, San Mateo County. Colonies are located on in rocky outcrops and cliffs in coastal scrub habitat on steep, north-facing slopes within the fog belt. Species range is tied to the distribution of the larval host plant, Sedum spathulifolium.	**Unlikely.** The majority of the Study Area is comprised of southern aspect, eucalyptus forest which does not support the species or its host plant.	No further actions are recommended for this species.
mission blue butterfly *Icaricia icarioides missionensis*	FE, RP	Inhabits grasslands of the San Francisco peninsula. Three larval host plants: *Lupinus albifrons, L. variicolor*, and *L. formosus*, of which *L. albifrons* is favored.	**Unlikely.** Distribution of this species is not known to occur near the Study Area. Habitat conditions within the Study Area are generally unfavorable or unsupportive of the habitat features required by this species.	No further actions are recommended for this species.
Bay checkerspot butterfly *Euphydryas editha bayensis*	FT, RP	Restricted to native grasslands on outcrops of serpentine soil in the vicinity of San Francisco Bay. *Plantago erecta* is the primary host plant; *Orthocarpus densiflorus* and *O. purpurscens* are the secondary host plants.	**No Potential.** This species has been extirpated from the San Francisco Peninsula.	No further actions are recommended for this species.

SPECIES	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE**	RECOMMENDATIONS
Myrtle's silverspot butterfly *Speyeria zerene myrtleae*	FE, RP	Restricted to the foggy, coastal dunes/hills of the Point Reyes peninsula; extirpated from coastal San Mateo County. Larval foodplant thought to be Viola adunca.	**No Potential.** This species has been extirpated from San Mateo County (USFWS 2017c).	No further actions are recommended for this species.
monarch butterfly *Danaus plexippus*	SSI	Winter roost sites located in wind-protected tree groves, with nectar and water sources nearby; sites are generally on or close to the coast.	**Moderate Potential.** The majority of the Study Area is comprised of eucalyptus groves, on slopes with a south or western aspect, which are preferred placements and orientation for winter roosting butterflies.	See Section 5.3.4 for further discussion concerning avoidance measures and recommendations concerning this species.
Edgewood blind harvestman *Calicina minor*	SSI	Open grassland in areas of serpentine bedrock. Found on the underside of moist serpentine rocks near permanent springs. Originally collected at Crystal Springs Reservoir in San Mateo County, the species has not been collected there since the construction of Interstate 280. In spite of intensive phalangodid collecting in the Bay Area, the species is currently known only from Edgewood Park. Even where present, populations of this species are quite small.	**No Potential.** The Study Area is not within the limited known range of this species.	No further actions are recommended for this species.
incredible harvestman *Banksula incredula*	SSI	Known only from the north slope of San Bruno Mountain. Habitat is talus slopes with a dense chaparral canopy.	**No Potential.** The Study Area is not within the limited known range of this species.	No further actions are recommended for this species.

SPECIES	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE**	RECOMMENDATIONS
western bumble bee *Bombus occidentalis*	SSI	Formerly common throughout much of western North America; populations from southern British Columbia to central California have nearly disappeared (Xerces 2017). Occurs in a wide variety of habitat types. Nests are constructed annually in pre-existing cavities, usually on the ground (e.g. mammal burrows). Many plant species are visited and pollinated.	**Unlikely**. The Study Area has no grassland to support typical burrowing mammals and the majority of the area is covered by forest, limiting the number of flowering plants and foraging opportunities for the species.	No further actions are recommended for this species.

*** Key to status codes:**

FE	Federal Endangered
FT	Federal Threatened
FD	Federal Delisted
RP	Sensitive species included in a USFWS Recovery Plan or Draft Recovery Plan
SE	State Endangered
ST	State Threatened
SD	State Delisted
NMFS	National Marine Fisheries Service - Species of Concern
SSC	California Department of Fish and Game (CDFG) Species of Special Concern
WBWG	Western Bat Working Group Priority Species
BCC	U.S. Fish & Wildlife Service (USFWS) Birds of Conservation Concern
CFP	CDFW Fully Protected Animal
MMC	Marine Mammal Commission - Species of Special Concern
SSI	CDFW Special Status Invertebrates
Rank 1B.1	California Native Plant Society (CNPS) Rank 1B.1: Plants rare, threatened, or endangered in California and elsewhere (seriously threatened in California)
Rank 1B.2	California Native Plant Society (CNPS) Rank 1B.2: Plants rare, threatened, or endangered in California and elsewhere (moderately threatened in California)
Rank 2B.1	California Native Plant Society (CNPS) Rank 2B.1: Plants rare, threatened, or endangered in California, but more common elsewhere (seriously threatened in California)
Rank 2B.2	California Native Plant Society (CNPS) Rank 2B.2: Plants rare, threatened, or endangered in California, but more common elsewhere (moderately threatened in California)
Rank 3	CRPR Rank 3: Plants about which CNPS needs more information (a review list)

Rank 3.2	CRPR Rank 3.2: Plants about which CNPS needs more information (a review list; moderately threatened in California)
Rank 4.2	California Rare Plant Rank 4.2: Plants of Limited Distribution - A Watch List (moderately threatened in California)
Rank 4.3	California Rare Plant Rank 4.3: Plants of Limited Distribution - A Watch List (not very threatened in California)

****Potential species occurrence definitions:**
Present. Species was observed on the site during site visits or has been recorded (i.e. CNDDB, other reports) on the site recently.

High Potential. All of the habitat components meeting the species requirements are present and/or most of the habitat on or adjacent to the site is highly suitable. The species has a high probability of being found on the site.

Moderate Potential. Some of the habitat components meeting the species requirements are present, and/or only some of the habitat on or adjacent to the site is unsuitable. The species has a moderate probability of being found on the site.

Unlikely. Few of the habitat components meeting the species requirements are present, and/or the majority of habitat on and adjacent to the site is unsuitable or of very poor quality. The species has a low probability of being found on the site.

No Potential. Habitat on and adjacent to the site is clearly unsuitable for the species requirements (foraging, breeding, cover, substrate, elevation, hydrology, plant community, site history, disturbance regime).

APPENDIX C

STUDY AREA PHOTOGRAPHS

Photo 1. Photograph of large pond located within the eastern portion of the blue gum grove.

Photo 2. Photograph of a potential seasonal wetland located within non-native annual grassland at excavated clearing in the blue gum forest.

Photo 3. Photograph of the open non-native annual grassland in the historic quarry pit within the blue gum forest.

Photo 4. Photograph looking southeast towards pond (far background) located in the northeast portion of the Study Area and fed by Arroyo del en Medio. Northern coastal scrub seen in the foreground.

Photo 4. Photo looking northeast towards small pond located under Monterey cypress trees in southern portion of Study Area.

Photo 5. Photo of arroyo willow scrub located on each side of Highway 1.

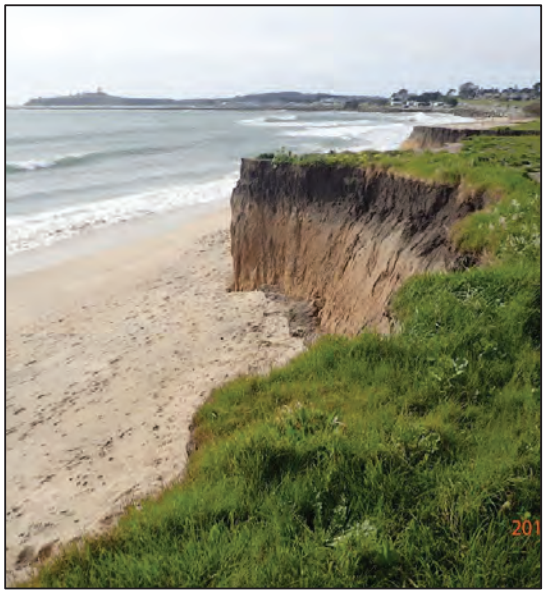

Photo 6. Photo looking northwest where non-native annual grassland transitions via sea cliffs to beaches.

Photo 7. Unidentifiable shrubby lupine species that has potential to be San Mateo tree lupine, observed adjacent to northern coastal scrub habitat.

Photo 7. Photo of a portion of the understory comprised predominately of cape ivy of the blue gum forest.

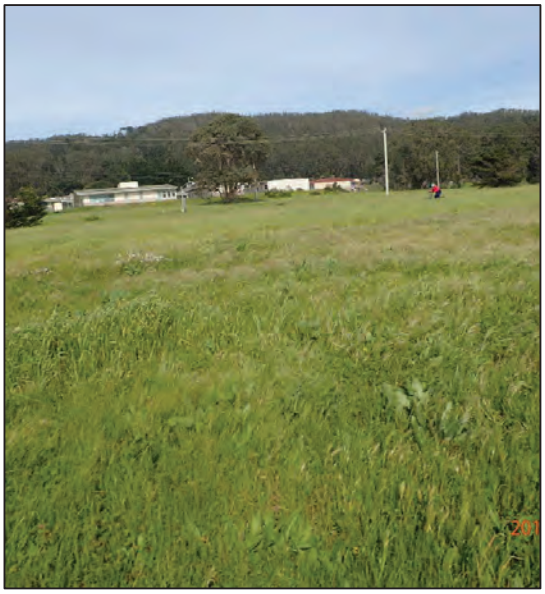

Photo 8. Photo looking north toward non-native annual grassland in southern extent of Study Area.

Photo 9. Photo of ephemeral stream within the blue gum grove.

Photo 10. Photo of woodland strawberry (*Fragaria vesca*) found in the understory of the blue gum groves.

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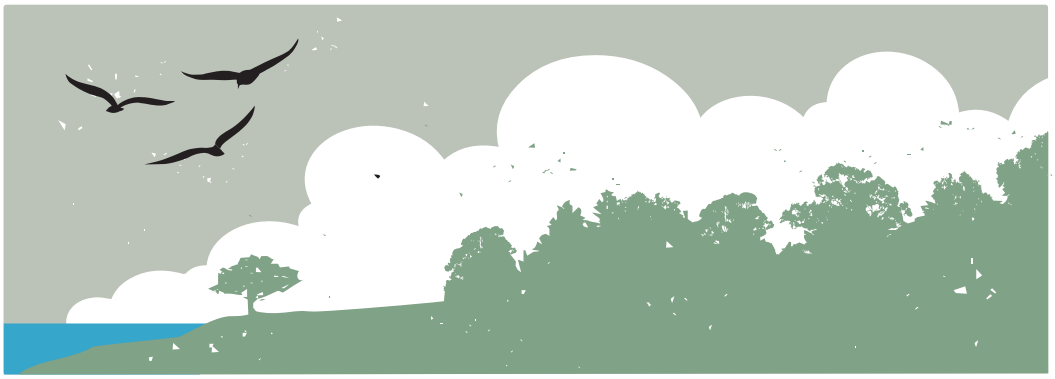
APPENDIX B 1
WATERSHED ASSESSMENT AND EROSION PREVENTION PLAN



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Notes:

1. At the time of report publishing, the park unit was known as Quarry Park.

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Quarry Park Watershed Assessment and Erosion Prevention Planning Project San Mateo County, California

PWA Report No. 181028503
April 2018

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Map 2. Inventoried road and trail related erosion features by problem type and treatment priority; mapped utilities and infrastructure; specific areas of potential concern within Quarry Park Watershed Assessment and Erosion Prevention Planning Project, San Mateo County, California.

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Appendix A. Terminology and techniques used in road and trail related erosion assessments
Appendix B. Field observations and treatment recommendations for road and trail related features
Appendix C. Typical drawings (schematic diagrams) showing construction and installation techniques for recommended erosion control and erosion prevention treatments
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Appendix E. Quarry Park Pond Stability Analysis, PWA Report No. 181028504

COVER PHOTO

View of Quarry Park Property looking west from the top of the quarry.

1. INTRODUCTION

1.1 Background

In 2014, the San Mateo County Parks Department (County Parks) acquired additional land to form the current 567-acre Quarry Park Property (Property). The County's roles and responsibilities as a result of this acquisition include inherited (legacy) existing and/or potential conditions. In 2016, County Parks released a Request for Proposals (RFP) and Gates & Associates (Gates) submitted and was ultimately awarded a contract to develop a Master Plan for the Property. Pacific Watershed Associates (PWA) was part of the winning proposal team and retained by Gates to conduct a Watershed Assessment of the Property and provide an existing conditions report and erosion prevention prioritized plan of action. PWA is providing this summary report of findings resulting from our watershed assessment of the Property. The primary goals of this report are to: (1) provide a preliminary analysis of the existing conditions on the Property; (2) identify, describe and prioritize the most vulnerable areas of the Property; and (3) provide an erosion prevention prioritized plan of action. We understand that this document will be an attachment to the Master Plan which Gates is preparing for the Property.

1.2 Scope of Work

To assist Parks in the process of transforming this Property into a park, PWA's Watershed Assessment includes the following tasks:

- Conduct a comprehensive road and trail erosion assessment of the Property.
- Identify erosional features and categorize them as sediment delivery or non-sediment delivery sites.
- Identify potential areas of concern and potential stream reaches for prioritized rehabilitation.
- Map all observed utilities and infrastructure on the Property.
- Prepare an erosion prevention prioritized plan of action.
- Prepare a report of findings.

1.3 Acknowledgments

PWA staff appreciate the efforts made by many different individuals to make our assessment possible. First and foremost to the Parks staff for their funding in support of this project. And, in particular the following Parks staff that provided continued guidance, onsite field assistance, background literature and data: Sam Herzberg (Senior Planner), Ramona Arechiga (Natural Resource Manager), and Matt DelCarlo and Mark Rodgers (Park Rangers). Thanks to Gates for including us as part of the Master Plan's Project Team.

We would like to thank the original landowners for their initial purchase, their years of land stewardship, and release of land to complete the Quarry Park Property. We appreciate the support of the adjacent private landowners for permitting access to the Property via their properties. Finally, we wish to express our gratitude to a number of professionals whose previous work and detailed reports provided both baseline data and context for this Assessment. Please refer to the References Section for a list of publications and research cited in this report of findings.

2. CERTIFICATION AND LIMITATIONS

This report, entitled *Quarry Park Watershed Assessment and Erosion Prevention Planning Project*, was prepared under the direction of a licensed professional geologist at Pacific Watershed Associates, Inc. (PWA), and all information herein is based on data and information collected by PWA staff. Sediment-source inventory and analysis for the project, as well as erosion control treatment prescriptions, were similarly conducted by or under the responsible charge of a California licensed professional geologist at PWA.

The interpretations and conclusions presented in this report are based on a study of inherently limited scope. Observations are qualitative, or semi-quantitative, and confined to surface expressions of limited extent and artificial exposures of subsurface materials. Interpretations of problematic geologic and geomorphic features (such as unstable hillslopes) and erosion processes are based on the information available at the time of the study and on the nature and distribution of existing features.

The recommendations included in this report are professional opinions derived in accordance with current standards of professional practice, and are valid as of the submittal date. No other warranty, expressed or implied, is made. PWA is not responsible for changes in the conditions of the property with the passage of time, whether due to natural processes or to the works of man, or changing conditions on adjacent areas. Furthermore, to ensure proper applicability to existing conditions, the information and recommendations contained in this report shall be reevaluated after a period of no more than 3 years, and it is the responsibility of the landowner to ensure that no recommendations are inappropriately applied to conditions on the property that have changed since the recommendations were developed.

Finally, PWA is not responsible for changes in applicable or appropriate standards beyond our control, such as those arising from changes in legislation or the broadening of knowledge, which may invalidate any of our findings.

Certified by:

Tara Zuroweste, California Professional Geologist #8418
Pacific Watershed Associates Inc.

3. EXISTING CONDITIONS

3.1 Location and Access Description

Located approximately 25 miles south of San Francisco and adjacent to the city of El Granada, the Quarry Park Property covers 567 acres of coastal foothills and a low-gradient coastal marine terrace that lies completely within San Mateo County (Map 1). Details on 2018 current access and conditions are found below. As of the date of this report, the main points of access for County Park staff include the following locations as depicted on Map 2 and summarized below.

3.1.1 Coastal Foothills Area Access locations

1. Main Parking Lot and Property Entrance: Gated access roads and open pedestrian access (Parking Lot, Map 2). Authorized vehicles and visitors can access the coastal foothill section of the Property at this entrance through three access points. There are two separate locked gates within close proximity to this location, Gate 1 and Gate 2 (Map 2), which provide vehicle access to main arterial roads that traverse the Property. Additionally, the restroom and playground area can be accessed from the southern edge of the parking area through an open pedestrian pathway. Gate 1 provides access to the Property via the Quarry Trail. Vehicle access through Gate 1 is primarily utilized by County Park staff, while the public utilizes the foot path adjacent to Gate 1 to access the Property. Gate 2 provides authorized vehicle and pedestrian access to the Property via the Meadow Trail. From Highway 1, head east on Coronado Street. Take a right on Cabrillo Ave. Travel east for one block and turn left onto Alameda. Take a right on Santa Maria Avenue and travel three blocks to the end of the road at the main parking lot for the Property.

2. Playground Entrance Pedestrian Access: This entrance provides open pedestrian access to the Property (Playground, Map 2). Vehicles cannot access the Property at this location; however there is a small ungated foot path leading from Columbus Street to the playground area. Visitors can access the woodland section of the Property at this entrance as well. From the road intersection of Santa Maria Avenue and Columbus Street travel approximately 300 ft to the south and take a left onto the pedestrian trail.

3. Coronado Street Pedestrian Access: This entrance provides open pedestrian trail access to South Ridge Trail (Map 2). Vehicles cannot access the Property at this location; however, there is trail access for hikers and bicyclists. From Highway 1, travel north east on Medio Avenue. Take the second left onto 5th Street. Travel one block on 5th Street and continue onto The Crossways for one block. Turn right onto Coronado Street and travel to the end of the street. There is no parking at this entrance to the Property.

4. Highway 1 Gate 3 Vehicle Access: This entrance provides gated access to Miranda East Fire Road (Gate 3, Map 2). Authorized vehicles can access the Property at this location with a key. In addition, there is trail access for hikers and bicyclists. This road is primarily accessed by vehicles for property maintenance and fire management purposes. From the intersection of Coronado Street and Highway 1 travel 0.34 miles southward on Highway 1. The gate is located just up the native surfaced road off Highway 1.

5. Dolphine Avenue Vehicle Access: This entrance provides gated access to Dolphine Fire Road and the connected trail system (Gate 4, Map 2). Authorized vehicles can access the Property at this location with a key. In addition, there is trail access for hikers and bicyclists. This road is primarily accessed by vehicles for property maintenance and fire management purposes. From

the intersection of Columbus Street and Santa Maria Avenue, travel north west on Columbus Street and turn right on Isabella Road. Turn right immediately onto El Granada Boulevard. Travel approximately 0.49 miles up El Granada Boulevard to the intersection with Dolphine Road. Take a right at the road intersection and travel down Dolphine Road to Gate 4. There is no parking at this entrance to the Property.

6. Private Drive Vehicle Access: This entrance provides gated access to the paved private drive leading to the private residence at the end of the paved road, and to the top of the South Ridge Trail and connected trail system (Gate 7, Map 2). Authorized vehicles can access the Property at this location with a key. Unauthorized access is not permitted through this gate. This road is primarily accessed by vehicles for property maintenance and fire management purposes. From the intersection of Columbus Street and Santa Maria Avenue, travel north west on Columbus Street and turn right on Isabella Road. Turn right immediately onto El Granada Boulevard. Travel approximately 0.74 miles up El Granada Boulevard to the road intersection at a locked double gate. There is no parking at this entrance to the Property and the public is not permitted to enter the park through this entrance.

3.1.2 Coastal Bluff Trail area Access Locations

1. Magellan Avenue Vehicle Access: This entrance provides open access to the Coastal Bluff Trail (Map 2). Authorized vehicles can access the Property through a locked bollard at this location with a key. In addition, there is trail access for pedestrians and bicyclists around the locked bollard. There is parking space for a small number of vehicles to park and a restroom at this location. From Highway 1, turn west onto Magellan Avenue. Travel approximately 275 feet down Magellan Avenue and turn right into the parking lot.

2. Highway 1 Coastal Bluff Trail Access: This entrance provides open access to the Coastal Bluff Trail (Map 2). Vehicles and pedestrians can access the Coastal Bluff Trail area at this entrance to the Property. A paved road runs through the length of this portion of the Property, and a cross walk allows for pedestrian traffic to cross Highway 1 and enter the Coastal Bluff Trial area. Vehicular access to this point can be gained via the Magellan Avenue locked bollard entrance, or through the Pillar Point Harbor Boulevard entrance approximately 0.61 miles up the paved Coastal Trail.

3.2 Hydrology and Subwatershed Description

Rainfall in the area averages 22” per year as recorded at the Pacifica USCG rain gage, DWR #E70 6586 20[1], falling primarily between November-March. The Property is comprised of several midcoast watersheds that drain to Half Moon Bay along the San Mateo County coastline (Map 1). Ground surface elevations on the Property range from sea level to 935 feet. There are 2 primary subwatersheds within the Property; from north to south they are: an unnamed creek (locally known as Santa Maria Creek) and Arroyo de en Medio. The Property is hydrologically isolated from anadromy; therefore, fish passage is not a concern on the Property. In addition, hydrology at the urban interface along the southern property boundary has significantly altered the unnamed drainage that comprises the majority of the Property.

1 ftp://ftp.water.ca.gov/users/dfmhydro/Rainfall Depth-Duration-Frequency/

Currently, excessive sediment delivery from networks of eroding and/or unmaintained roads/trails on the Property is recognized as a significant, but controllable, threat to water quality. Sediment acts as a pollutant in creeks that support non-anadromous aquatic species. Reduction of sediment inputs from anthropogenic sources and improvements in resource management on the Property will improve water quality and reduce impacts throughout.

3.3 Geology

3.3.1 Structural Geologic Setting

The project area is located in the Coast Range geomorphic province of northern California, characterized by northwest trending mountains and valleys which generally mirror the dominant San Andreas Fault system and smaller, en eschelon fault systems including the nearby San Gregorio fault zone, which includes the Denniston Creek fault and Sea Cove fault (Pampeyan, 1994).

The Alquist-Priolo (AP) zoned San Andreas fault zone lies approximately 4.5 miles east of the Property. The Pilarcitos Fault is located approximately 3 mi to the east and the San Gregorio fault zone is located approximately 1 mi offshore to the west (Jennings, 1994; Brabb, 1998). Pilarcitos fault is Quaternary with an unspecified sense of movement and slip rate where as the San Gregorio fault zone is Holocene active and exhibits dextral strike slip displacement as identified by geomorphic expression and offset of geologic and anthropic deposits (Bryant, 1999).

3.3.2 Surface lithology

The distribution of mapped lithological units within the Property was compiled from GIS provided by the NPS Geologic Resources Inventory Program (NPS, 2009). Over half of the Property is underlain by Quaternary lithologies with colluvial slope and ravine debris (Qsr) being the dominant surficial cover material. Slope and ravine debris of Qsr are primarily found in the steeper, upper half portions of amphitheater shaped sub-basins. The Qsr colluvial deposits are a result of shallow landslides, bioturbation and soil creep geomorphic processes, and are comprised of unconsolidated deposits of weathered rock and soil. Poorly consolidated sands, silts, clays, and gravels comprise the remaining Quaternary age alluvium and terraces (Qalo) as you approach the urban interface. Cretaceous age Granitic rocks of Montara Mountain (Kgr) underlie a small portion of the ridgetops along the outer edges of the Property, consisting of highly fractured, deeply weathered, crystalline granitic rock (quartz diorite and granite). These rocks are foliated and found to primarily dominate the higher elevations. In general, the underlying geologic units develop friable sandy soils, with moderate to high erosion potential, particularly when disturbed by natural episodic events or anthropogenic activities.

3.4 Soils

Soil types and characteristics underlying the Property are greater than 90% Miramar soil units, primarily sandy loams along hillsides with moderate to very steep slope gradients and classified as “eroded” by the USDA Natural Resource Conservation Service (NRCS). The remaining <10% include Denison, Farallone, and Tierra soil types (Figure 1, Table 1).

K factors for the Universal Soil Loss Equation (USLE) determined by the National Cooperative Soil Survey (USDA NRCS, 2013) range from 0.15 for the Miramar complex soils to 0.32 for the Tierra complex soils. The higher K factors indicate more potential for erosion.

Figure 1. Soils within Quarry Park Property according to NRCS Websoil Survey.

Soils underlying the Property can also be categorized by Hydrologic Soil Group (HSG). HSG classification indicates (1) the minimum rate of infiltration controlled by surface conditions and (2) minimum rate of transmission controlled by the soil profile. Group “A” soils have low runoff potential due to high infiltration and transmission rates; “B” soils have moderately low runoff potential due to adequate infiltration rates and unimpeded transmission (USDA NRCS, 2007). Group “C” soils have moderately high runoff potential and group “D” has high runoff potential. Both C and D HSG classified soils have restricted infiltration and transmission of water through surface and subsurface soils.

Table 1. Soils within Quarry Park Property according to NRCS Websoil Survey and SSURGO Database, San Mateo County, California[a].

Map unit[a]	Map unit name	Area (acres)	% within property	HSG	Universal soil loss - K factor[b]				Hazard of road/trail erosion[c]		Suitability[d] for road/trail
					Kw (whole soil)		Kf (rock free)				
					Surface	Subsurface	Surface	Subsurface	off	on	
DcA	Denison clay loam, nearly level	13.6	2.4%	C	0.24	0.24-0.37	0.24	0.24-0.37	Slight	Slight	Moderately suited
DdA	Denison clay loam, nearly level, imperfectly drained	3.3	<1%	C/D	0.24	0.24-0.37	0.24	0.24-0.37	Slight	Slight	Moderately suited
DeA	Denison coarse sandy loam, nearly level	7.7	1.4%	C	0.15	0.24-0.32	0.15	0.24-0.32	Slight	Slight	Well suited
DmA	Denison loam, nearly level	7.8	1.4%	C	0.28	0.24-0.37	0.28	0.24-0.37	Slight	Slight	Moderately suited
DmB	Denison loam, gently sloping	6.7	1.2%	C	0.28	0.24-0.37	0.28	0.24-0.37	Slight	Moderate	Moderately suited
FcB	Farallone coarse sandy loam, gently sloping	0.0	<1%	A	0.15	0.20-0.24	0.15	0.20-0.24	Slight	Slight	Well suited
FcC2	Farallone coarse sandy loam, sloping, eroded	10.0	1.8%	A	0.15	0.20-0.24	0.15	0.20-0.24	Slight	Moderate	Moderately suited
FcD2	Farallone coarse sandy loam, moderately steep, eroded	2.3	<1%	A	0.15	0.20-0.24	0.15	0.20-0.24	Moderate	Moderate	Poorly suited
FyC2	Farallone loamy coarse sand, sloping, eroded	0.4	<1%	A	0.10	0.20-0.24	0.10	0.20-0.24	Slight	Moderate	Moderately suited
Gp	Gravel pits	3.0	<1%	-	0.05	0.05	0.10	0.17	-	-	-
Gu	Gullied land (alluvial soil material)	0.3	<1%	-	-	-	-	-	-	-	-
MmD2	Miramar coarse sandy loam, moderately steep, eroded	14.7	2.6%	B	0.15	0.28	0.15	0.28	Moderate	Severe	Poorly suited

Map unit[a]	Map unit name	Area (acres)	% within property	HSG	Universal soil loss - K factor[b]				Hazard of road/trail erosion[c]		Suitability[d] for road/trail
					Kw (whole soil)		Kf (rock free)				
					Surface	Subsurface	Surface	Subsurface	off	on	
MmE2	Miramar coarse sandy loam, steep, eroded	327.4	57.9%	B	0.15	0.28	0.15	0.28	Moderate	Severe	Poorly suited
MmF2	Miramar coarse sandy loam, very steep, eroded	157.3	27.8%	B	0.15	0.28	0.15	0.28	Very severe	Severe	Poorly suited
TcD2	Tierra clay loam, moderately steep, eroded	1.3	<1%	D	0.32	0.24-0.28	0.32	0.24-0.28	Moderate	Severe	Poorly suited
TeE2	Tierra loam, steep, eroded	4.4	<1%	D	0.32	0.24-0.28	0.32	0.24-0.28	Moderate	Severe	Poorly suited
TeE3	Tierra loam, steep, severely eroded	2.3	<1%	D	0.32	0.24-0.28	0.32	0.24-0.28	Moderate	Severe	Poorly suited
WmB	Watsonville loam, gently sloping	1.7	<1%	D	0.32	0.24-0.28	0.32	0.24-0.28	Slight	Moderate	Moderately suited
N/A	No Data Available	0.7	<1%	-	-	-	-	-	-	-	-
	Total	**564.9**	**100%**	-	-	-	-	-	-	-	-

[a] Shaded cells reflect map units that cover the majority (>85%) of the Property. USDA NRCS Soil Survey Geographic (SSURGO) database for San Mateo Area, California, 2013, http://websoilsurvey.nrcs.usda.gov. Note that acreage is approximate based on the area of interest represented in the table.
[b] The higher K factors indicate more potential for erosion.
[c] Hazard of road trail erosion on/off are based on soil erodibility factor K, slope, and content of rock fragments.
[d] Suitability for road/trail building is based on slope, rock fragments, plasticity index, % sand, USC, depth to water table, ponding, flooding, and the hazard of soil slippage.

Regarding runoff potential, greater than 90% of the soils are classified as HSG "B" (moderately-low runoff potential) or HSG "A" (low runoff potential), indicating a majority of the Property has reasonable infiltration rates. Given that soils have higher surface erosion ratings, increased infiltration rating is a benefit to reduce the likelihood of erosion.

Conventional K factors and USLE analyses tell only the surface erosion potential portion of the erosional story within the Property. The sediment generation during chronic or "normal" weather cycles may come predominantly from roads/trails located within poorly suited soil groups and hillslopes above the channels, and from any hydrologically connected expanses of bare soil areas. However, the risk of sediment production generated during catastrophic episodic events, such as post-wildfire runoff, major floods, large landslides, and seismic events are likely to constitute a significantly larger proportion of long term sediment inputs throughout the Property.

Although the USLE analyses describes the inherent natural erodibility of the landscape, it should be noted that other land management activities can alter sediment production estimates regardless of the underlying geologic and soil characteristics. For example, changes in current land use practices can have significant impact on erosion potential due to an increase/decrease in denuded surfaces, especially where locations in close proximity to watercourses and within the riparian corridor (<50 ft from top of streambank).

3.5 Road/Trail Networks in Quarry Park

PWA inventoried approximately 13.87 mi of native surfaced, rocked and paved roads and trails within Quarry Park. All roads and trails were mapped and identified as to their accessibility either "by foot" or "by truck/quad". A brief description of each category is listed below. Refer to Map 2 for the location and visual representation of all mapped roads and trails.

3.5.1 Roads, accessible via truck/quad

PWA assessed 8.29 miles of truck/quad accessible roads. Roads that are characterized as accessible via truck and or quad are currently open and provide adequate road width and clearance to permit vehicular access as well as pedestrian and cyclist use. These roads generally provide trail access to the public, as well as vehicle access to the property for general maintenance and fuels management. For reference regarding the location and designation of roads identified within the Property, refer to Map 2.

3.5.2 Roads, accessible via foot

PWA assessed 4.49 miles of road accessible by foot within the Property. Roads identified as accessible by foot are all native surfaced legacy road alignments that have adequate geometry and potential to be upgraded in order to reestablish vehicle access if desired. Roads that are characterized as accessible by foot do not permit vehicular access due to overgrown vegetation, cutbank failures, downed trees and/or other physical obstacles. These roads are generally not in use by the public or County Park staff. However, they all have the potential for future development and/or rehabilitation. Many of these roads not currently accessible by vehicles provide unique opportunities to either establish additional access routes to areas of the Property and/or potentially implement road to trail conversions that would minimize anthropogenic impacts on the surface hydrology and promote natural hillslope hydrologic processes. Road to

trail conversion of these overgrown or otherwise unused road lineaments would effectively remediate existing site specific, and chronic road drainage, erosion issues

3.5.3 Trails, accessible via foot

PWA inventoried 1.09 miles of trails accessible by foot within the Property. Trails identified as accessible by foot are generally native surfaced legacy skid trails or small single track foot and bike paths. These trails generally serve as scenic alternatives and connections between the larger arterial roads. Trails range in width from 2 feet to 6 feet and lack adequate geometry to be upgraded to drivable roads without heavy equipment construction.

4. FIELD TECHNIQUES AND DATA COLLECTION

The Quarry Park Assessment consists of two distinct elements: (1) a complete field inventory of all current and potential road/trail related erosion sources along all identified roads and trails (approximately 10 mi); and (2) the development of a prioritized plan of action for cost-effective erosion control and erosion prevention treatments in the project area. All project elements were completed under the direction of a PWA licensed professional geologist.

To facilitate the field inventory, GIS data layers provided by County Parks were combined with NAIP imagery (CaSIL, 2016) and 3 m DEM contour interval layers to produce field maps at a 1:2,400 scale. These maps were used to document the locations of inventoried sites, and to ground truth the location and configuration of mapped road/trail segments in the field. The GIS roads layer was then modified based on ground truthing, and used in the development of the final project maps.

PWA conducted a field inventory of all identified road/trail segments, and assessed all road/trail related erosion sites and determined if they show evidence of past or potential sediment delivery to the stream system. Because the purpose of the inventory was to quantify the potential magnitude of impacts of road/trail related erosion, we included any site or road reach showing evidence for erosion (past, current, or potential) even if it did not also show evidence for current or potential sediment delivery to a stream.

Inventoried sites for this assessment primarily consist of stream crossings, landslides, gullies below ditch relief culverts, road related erosion affecting springs and swales, and various types of drainage discharge for uncontrolled road/trail surface and/or inboard ditch runoff.[2] For each site identified as an erosion feature, PWA staff plotted its location on a GIS-generated map; collected a GPS waypoint using a handheld GPS unit; and recorded a series of field observations including: (1) detailed site description; (2) nature and magnitude of existing and potential erosion problems; (3) likelihood of erosion or slope failure; (4) length of hydrologically connected (or adjacent) road surface associated with the site; and (5) treatments needed for prevention or elimination of future erosion and/or sediment delivery. The data collected for each site also includes an evaluation of *treatment immediacy* based on the potential or likelihood of future erosion, sediment delivery from the site to a stream channel, and the level of urgency for addressing erosion problems at that location.

2 Detailed definitions of sediment delivery sites are provided in Appendix A.

For each existing or possible problem site in the project area, PWA field staff evaluated the potential for erosion and sediment delivery, and collected field measurements (width, depth, and length of the potential erosion area) to derive erosion and sediment delivery volumes (if applicable). For most stream crossings, PWA field crews used tape and clinometer surveys to develop longitudinal profiles and cross sections of the site. These data were used to calculate road fill and potential sediment delivery volumes with the STREAM computer program. This proprietary software, developed by PWA, provides accurate and reproducible estimates of: (1) the potential volume of erosion at a stream crossing, whether over time or during any possible catastrophic, storm-generated washout; (2) excavation volumes associated with culvert installation, culvert replacement, or complete decommissioning of a stream crossing; and (3) backfill volumes associated with culvert installation or replacement. In addition, field crews measured the lengths of hydrologically connected road to derive estimates for chronic sediment delivery. The roadbed, ditch, and cutbank of hydrologically connected road reaches were inspected and each road reach assigned a 1 to 6 rating (High, High-Moderate, Moderate, Moderate-Low, Low, and N/A) of chronic road surface lowering/cutbank retreat rates ranging from 0-0.33. based on the level of road usage, types of surfacing materials, soil competency, vegetative cover, and observed evidence of surface erosion in progress (Weaver, et al, 2006). Chronic sediment production from hydrologically connected road reaches was calculated on a decadal basis, using the following empirical formula: (measured length) x (xft average measured width, including cutbanks and ditches) x (0-0.3 ft average lowering of the road/trail and ditch/cutbank retreat per decade).

Where new or replacement stream crossing culverts are recommended for installation, culverts are sized to convey the 100-year peak storm flow.[4] PWA staff calculated the necessary culvert sizes using either (1) the Rational Method (Dunne and Leopold, 1978), for drainage areas less than 80 acres; or (2) the empirical equations of the USGS Magnitude and Frequency Method (Wannanan and Crippen, 1977) for drainage areas equal to or larger than 80 acres. These culvert sizing calculations were used for stream crossings where the field-estimated bankfull channel dimensions were greater than approximately 3 ft by 1 ft in cross sectional area.[5]

In the final phase of the project, PWA personnel analyzed preliminary inventory results and discussed recommendations with County Park staff to determine realistic needs for future use from the public in order to assign a treatment designation of either “upgrade” or “decommission” for each treatment site.[6] These designations are intended to provide County Parks with prescriptions for storm-proofing treatment sites and hydrologically connected road segments, and are PWA’s best recommendations for the most efficient and cost-effective methods to accomplish this goal. The specific recommendations for upgrading verse decommissioning a

3 Chronic road surface lowering/cutbank retreat rates are as follows: H=0.3, HM=0.25, M=0.2, ML=0.15, L=0.1, and N/A= 0

4 The *100-year peak storm flow* for a location is the discharge that has a 1% probability of occurring at that location during any given year.

5 For stream channels with cross sectional areas of 3 ft^2 or smaller, PWA follows the recommendations outlined in the California Department Fish and Wildlife *Salmonid Stream Habitat Restoration Manual* and defaults to a minimum culvert size of 24”.

6 See Appendix A for additional information on road upgrading and decommissioning.

stream crossing and or particular road reach can be easily changed if the long term planning process so dictates.

5. ASSESSMENT RESULTS

The purpose of the field assessment was to identify and quantify locations of erosional features – those sites that are currently eroding and may have the potential to deliver sediment to streams in the Property, and/or show a potential to do so in the future. We also inventoried on-going or potential erosion sites in the field that did not show evidence for sediment delivery to a stream. These non-delivering sites may impact road or trail maintenance; however, they do not represent as big of a threat to water quality or habitat.

5.1 Erosional Features

PWA inventoried 74 erosional features as part of the existing conditions evaluation. All erosional features were identified as sediment source or non-sediment source sites. Of the 74 erosional features, 52 sites show evidence of past or potential sediment delivery to the stream system and 22 sites do not have the potential to deliver sediment. Table 2 below summarizes the erosional features identified and Map 2 depicts each site spatially.

Table 2. Inventory results for erosional features and adjacent road/trail segments recommended for treatment, *Quarry Park Watershed Assessment and Erosion Prevention Project*, San Mateo County, California.

Site Types	Sediment delivery sites		Non-sediment delivery sites		Total length of roads/trails surveyed for project (mi)
	Sites (#)	Hydrologically connected[a] roads/trails (mi)	Sites (#)	Adjacent[a] roads/trails (mi)	
Stream crossings	32	2.22	-	-	-
Springs	2	0.17	2	0.21	-
Road/trail surface	5	0.45	-	-	-
Landslides	2	0.41	-	-	-
Ditch relief culverts	10	0.99	19	1.00	-
Other	1	0.07	1	-	-
Total	**52**	**4.31**	**22**	**1.21**	**13.87**

[a] *Hydrologically connected* describes sites or road segments from which eroding sediment is delivered to stream channels (Furniss et al., 2000).
[b] *Adjacent* describes road or trail segments from which eroding sediment is connected to non-delivering sites.

5.1.1 Sediment Delivery Features

PWA's field assessment resulted in the identification of 52 sites which show evidence of past or potential sediment delivery to the Property's stream system. Table 3 below summarizes the sources and the estimated future sediment delivery if sites are left untreated.

Table 3. Estimated future sediment delivery for features and hydrologically connected road/trail segments, *Quarry Park Watershed Assessment and Erosion Prevention Project*, San Mateo County, California.

Sources of sediment delivery	Estimated future sediment delivery (yd^3)	Percent of total
1. Episodic sediment delivery from road/trail related erosion sites (indeterminate time period)		
Stream crossings	13,110	91
Springs	220	2
Road/trail surface	415	3
Landslides	40	<1
Ditch relief culverts	520	4
Other	5	<1
Total episodic sediment delivery	**14,310**	**100**
2. Chronic sediment delivery from road/trail surface erosion (estimated for a 10 yr period)[a]		
Total chronic sediment delivery		**3,305**
Total estimated future sediment delivery for the project area		**17,615**

5.1.2 Non Sediment Delivery Features

PWA's field assessment resulted in the identification of 22 sites which show evidence of erosion but do not result in potential sediment delivery to the Property's stream system. Even though these sites were identified as non-delivering sites, the adjacent road reaches contribute to the accelerated erosion at each site if left untreated. This chronic erosion can result in approximately 500 yd^3 of sediment mobilized downroad and/or downslope from the identified site locations.

5.2 Utilities and Infrastructure

During PWA's field investigations, field crews identified and mapped observed utilities and infrastructure within Quarry Park. All mapping was done from existing roads and trails (Map 2). Therefore, there may be other utilities and/or infrastructure within the Property that was not observed by PWA field staff. We recommend that Park staff use this as a baseline and add locations as they are identified.

Notable infrastructure includes: an existing pond and groundwater well with associated subsurface plumbing and surficial infrastructure; parking area, restroom, and playground; a USGS gaging station; an observation deck; several utility boxes and/or markers; and several gates on the Property. Refer to Map 2 for the location of mapped utilities and other infrastructure within the Property.

6. PRIOIRITIZED EROSION PREVENTION AND SEDIMENT CONTROL PLAN

6.1 Identification and Prioritization of Treatment Features

Each of the 74 features recommended for treatment has been prioritized for urgency in implementing the recommended erosion control and erosion prevention measures (Tables 4a and 4b). PWA recommends treatment for all identified sites on inventoried roads and trails within the Property (Map 2; Tables 4a and 4b). In addition, refer to Appendix A for guidance and additional information on terminology and techniques used in road/trail related erosion assessments. Appendix B provides a summary of field observations and treatment recommendations for road related features and Appendix C provides typical construction drawings. Finally, refer to Appendix D for representative site photographs taken during PWA's assessment of the Property.

Table 4a. Evaluation of treatment immediacy for sediment delivery features recommended for treatment in the *Quarry Park Watershed Assessment and Erosion Prevention Project*, San Mateo County, California.

Treatment immediacy	Number of treatment features by type	Road/ trail Length (mi)[a]	Estimated future sediment delivery			
			Site-specific[b]		Chronic[c]	
			(yd^3)	%	(yd^3)	%
High	4 Stream crossings (#4, 8, 19, 39)	0.45	9,735	68	400	12
High-moderate	9 Stream crossings (#1, 7, 9, 13, 32, 35, 36, 41, 43) 2 Road Surface (#34, 71) 1 Landslide (#11) 1 Ditch relief culvert (#40)	0.80	2,445	17	608	18
Subtotal	***18 features***	***1.25***	***12,180***	***85***	***1,008***	***30***
Moderate	12 Stream crossings (#2, 3, 5, 12, 16, 17, 23, 30, 31, 37, 38, 45) 1 Spring (#29) 1 Road Surface (#10) 3 Ditch relief culverts (#25, 28, 55) 1 Other (#14)	1.37	1,540	11	1,178	36
Moderate-low	3 Stream crossings (#20, 26, 44) 1 Spring (#21) 1 Landslide (#74) 1 Ditch relief culvert (#27)	0.73	465	3	509	15
Subtotal	***24 features***	***2.10***	***2,005***	***14***	***1,687***	***51***
Low	4 Stream crossings (#22, 24, 33, 42) 1 Road surface (#15) 5 Ditch relief culverts (#61, 62, 64, 65, 66)	0.95	130	1	610	19
Subtotal	***10 features***	***0.95***	***130***	***1***	***610***	***19***
Total	**52 features**	**4.30**	**14,315**	**100**	**3,305**	**100**

[a]*Road/trail length* refers to hydrologically connected road/trail reaches adjacent to recommended treatment features.

[b]Episodic sediment delivery for road/trail related features (indeterminate time period).

[c]Chronic sediment delivery from adjacent hydrologically connected road/trails and cutbanks (estimated for a 10 yr period).

Table 4b. Evaluation of treatment immediacy for non-sediment delivery features recommended for treatment in the *Quarry Park Watershed Assessment and Erosion Prevention Project*, San Mateo County, California.

Treatment immediacy	Number of treatment features by type	Road/trail Length (ft)[a]
High	1 Other (#73)	-
Subtotal	***1 feature***	**-**
Moderate	1 Spring (#18) 2 Ditch relief culverts (#56, 69)	0.26
Moderate-low	1 Spring (#72)	-
Subtotal	***4 features***	***0.26***
Low	17 Ditch relief culverts (#46-54, 57-60, 63, 67, 68, 70)	0.95
Subtotal	***17 features***	***0.95***
Total	**22 features**	**1.21**

6.2 Recommended Treatments

6.2.1 Sediment delivery site treatments

Sediment delivery site-specific treatments are primarily implemented to reduce the risk of catastrophic failure and sediment delivery resulting from road fill erosion, stream crossing failure or stream diversion along forest roads/trails. Recommended treatments for stream crossings include: (1) replacing undersized, damaged, or poorly installed stream crossing culverts with new properly sized culverts installed at channel grade; (2) installing single trash racks above culverted inlets to reduce plugging potential; (3) oversizing culverts to establish adequate excess capacity to pass anticipated debris and sediment (4) constructing critical dips to prevent diversions at streams with diversion potential; (5) installing new adequately sized culverts at currently unculverted fill crossings; (6) constructing armored fill crossings; (7) decommissioning stream crossings on abandoned roads by excavating and removing all the crossing fill and restoring the historic channel alignment, width, and sideslope configuration; (8) excavating and permanently removing extraneous fill material, primarily at stream crossings and unstable fillslopes for both upgrade and decommission sites; (9) installing rock armor to stabilize stream crossing with steep fillslopes, erodible ditches, and active headcuts; (10) conducting routine maintenance such as clearing out culvert debris; and (11) implementing miscellaneous site-specific treatments (Table 5a).

Table 5a. Recommended erosion control and erosion prevention treatments for sediment delivery sites, *Quarry Park Watershed Assessment and Erosion Prevention Project*, San Mateo County, California.

Treatment type			Total number of locations	Comments
Site specific treatments	Stream crossing treatments	Culvert (replace)	9	Replace an undersized, poorly installed, or worn out culvert (Site #2, 8, 9, 12, 13, 23, 32, 36, and 39)
		Culvert (install)	7	Install new culvert at unculverted fill crossing (Site #3, 4, 20, 21, 29, 31, and 35)
		Culvert (clean/clear)	6	Remove sediment or debris from the culvert (routine maintenance)
		Trash rack	11	Install at culvert inlets to help prevent plugging
		Critical dip	14	Install to prevent stream diversions
		Armored fill or rocked ford (wet) crossing	11	Install rocked armored fill crossing using 262 yd^3 of 0.5-2.0' mixed diameter rock armor (Site #5, 7, 14, 16, 17, 22, 24, 30, 33, 37, and 38)
		Decommission crossing	10	Remove all fill from the stream crossings (or relic ponds) and restore the natural channel dimensions and alignment (Site #1, 3, 19, 26, 37, and 41-45)
	Other	Rock (armor)	21	At 21 sites, add a total of 537 of 0.5-3.0' mixed diameter rock armor on inboard and outboard stream crossing fillslopes, ditches, culvert outlets, and/or headcuts
		Soil excavation	10	At 10 sites, excavate and remove a total of 2,377 yd^3 of sediment, primarily at fillslopes and stream crossings
		Miscellaneous treatments	7	Miscellaneous treatments at 7 site-specific locations
Road/trail surface treatments	Road/trail drainage structures	Ditch relief culvert (install or replace)	6	Install or replace ditch relief culverts to improve road/trail surface drainage
		Rolling dip	103	Install to improve road/trail drainage.
		Cross road drain	28	At 6 locations, install cross road drain to improve road/trail surface drainage on proposed decommission road/trail segment.
	Road/trail shaping treatments	Outslope road/trail and remove ditch	32	At 32 locations, outslope road/trail and remove ditch for a total of 15,380 ft of road/trail to improve road/trail surface drainage
		Outslope road/trail and retain ditch	1	At 1 location, outslope road/trail and retain ditch for a total of 230 ft of road/trail to improve road/trail surface drainage
		Inslope road/trail	3	At 3 locations, inslope road/trail for a total of 290 ft of road/trail to improve road/trail surface drainage
		IPOS road/trail	7	At 7 locations, in-place outslope (IPOS) road/trail for a total of 2,561 ft of road to improve road/trail surface drainage along proposed decommission road/trail segment.
	Other	Remove berm	2	At 2 locations, remove the berm for a total of 290 ft
		Road rock (for road/trail surfaces)	9	At 9 locations, use a total of 170 yd^3 of road rock to rock the road/trail surface at wet, rutted and/or muddy segments.

6.2.2 Non-Sediment delivery site treatments

Recommendations prescribed at non-sediment delivery sites are primarily implemented to reduce the risk of continued erosion and risk of prohibiting access resulting from road/trail surface and/or road fill erosion. Recommended treatments for non-delivering sites include: (1) routine maintenance by removing sediment or debris from the culvert; (2) installing road surface drainage treatments; and (3) relocating the existing observation deck (Table 5b).

Table 5b. Recommended erosion control and erosion prevention treatments for non-sediment delivery sites, *Quarry Park Watershed Assessment and Erosion Prevention Project*, San Mateo County, California.

Treatment type	Total number of locations	Comments
Culvert (clean/clear)	18	Remove sediment or debris from the culvert (routine maintenance)
Install/replace ditch relief culvert	4	Install or replace 4 ditch relief culverts (18" diameter, 120 linear ft) to improve road/trail surface drainage
Rock armor	3	Install rock armor at 3 culvert outlet locations using 20 yd^3 of 0.5-1.5' mixed diameter rock armor
Armored fill or rocked ford (wet) crossing	1	Install rocked armored fill crossing using 15 yd^3 of 0.5-1.0' mixed diameter rock armor
Relocate Observation Deck	1	Relocate existing observation deck and maintain a minimum 35 ft setback from existing slope
Rolling dip	24	Install to improve road/trail drainage.
Outslope road/trail and remove ditch	15	At 15 locations, outslope road/trail and remove ditch for a total of 4,920 ft of road/trail to improve road/trail surface drainage
Outslope road/trail and retain ditch	14	At 14 locations, outslope road/trail and retain ditch for a total of 140 ft of road/trail to improve road/trail surface drainage

6.2.3 Road treatments

Road/trail surface treatments are designed to control road/trail drainage by reshaping the road/trail bed, dispersing road/trail surface runoff onto stable slopes and preventing delivery of concentrated runoff. Upgrading treatments to redirect flow include outsloping and insloping road/trail segments; installing rolling dips and ditch relief culverts; cleaning and/or cutting ditches; and removing berms. Road surface erosion is mitigated by reducing hydrologically connected road lengths as feasible to minimize the volume of water that is conveyed via the road surface, subsequently lessening the erosive forces of the overland flow. Road surface erosion if further curtailed by installing road rock, which fortifies the surface and reduces production of fine sediment. Treatments for road/trail decommissioning include installation of frequent cross-road drains and in-place outsloping (IPOS) intended to rapidly disperse and direct water off road and trail surfaces (Tables 5a and 5b).

Complete treatment prescriptions for each erosional feature recommended for treatment are included in the database and in Appendix B. Appendix C includes schematic diagrams of construction and installation techniques to be implemented at most typical features.

6.3 Heavy Equipment Requirements and Estimated Construction Costs

Equipment needs and estimated construction costs for recommended erosion control treatments are not detailed in this report; however, PWA can provide summaries as needed based on feedback from County Parks' on their needs and available staff, equipment, and budget.

Most treatments require the use of heavy equipment, e.g., hydraulic excavator, bulldozer, and water truck. Some smaller trail equipment and/or hand labor will be required to treat trail sites and/or at features needing new culverts or culvert repairs, or for applying erosion control, such as seed and mulch, to ground disturbed during construction. Equipment needs can be estimated using in-house staff and/or subcontracted construction crew(s).

Most of the treatments listed in this plan are not complex or difficult for equipment operators with experience in road upgrading and decommissioning operations on steep forestlands. All work is assumed reasonable if it is performed by experienced operators using modern heavy equipment. The use of inexperienced operators, improper or old equipment, or the wrong combination of heavy equipment would require additional technical oversight and supervision in the field, as well as an escalation of the costs to implement the work.

Estimated costs are dependent on: (1) final treatment package(s); (2) qualifications of construction crew(s); (3) charge out rates of equipment and labor; (4) current material and delivery costs; and (5) permitting, contract management, oversight, conducting effectiveness monitoring, and post-project analysis and reporting. To help insure success of the project, it is imperative that only the most experienced and reliable heavy equipment operators be employed, and that the project coordinator is on-site full time at the beginning of the project and at a minimum intermittently after equipment operations have begun.

6.4 Environmental Compliance and Permitting

Many of the recommended treatments will require natural resource investigations prior to construction in order to comply with California Environmental Quality Act (CEQA) and National Environmental Policy Act (NEPA). In addition, permitting and agency agreements must be obtained before construction work on any stream crossings is undertaken. These may include, but not be limited to: California Department of Fish and Wildlife (CDFW) Lake and Streambed Alteration Agreement (LSAA) 1602, State Water Resources Control Board (SWRCB) 401 Certification, and Army Corps of Engineers (ACOE) 404 Permit. County permitting may also be required for grading and/or work within streams.

7. SPECIFIC AREAS OF POTENTIAL CONCERN

The following section discusses specific areas on the property where PWA identified locations of episodic active and/or potential future erosion. We've included a brief description of the identified issues. Refer to the Map 2 for locations of each *Area of Concern.* In addition, representative photos are included in Appendix D. Areas of Concern (AOC) are not listed in terms of priority. Each AOC has different issues that may affect priority and can be affected by what management tasks are being addressed.

7.1 Area of Concern 1

The area of concern consisting of coastal bluff retreat and gully erosion has compromised portions of the unpaved coastal trail (AOC 1, Map 2). The bluffs are composed of weakly lithified sandstone; active erosion is a result from groundwater seepage leading to a reduction of tensile strength and subsequent fracture; overland flow or sheetwash eroding the surface of the bluffs forming gullies along flow paths; poor drainage practices along the trail/road and general erosion due to oversteepening and direct erosion from wave action (Photos 30-32 Appendix D). The instability of the bluffs and active erosion along the coastal trail will continue to be a maintenance issue as well as a potential safety concern for visitors as sea level continues to rise.

7.2 Area of Concern 2

There are two locations along the south western boundary of the Property (excluding Mirada Surf) where well defined streams discharge runoff directly to the paved residential surface streets of the city of El Granada (AOC 2 and AOC 3, Map 2). Of the two locations where streams exit the Property and flow into the downstream residential area, AOC 2 has a larger drainage area and poses an increased potential for contributing to damages to downstream residential and city properties. However, both locations convey varying amounts of stream flow and associated suspended and bedload sediments to paved surface streets.

Area of Concern 2 is located at the intersection of Santa Maria Ave. and Columbus St. (Photo 35, Appendix D). This location receives a 0.43 mi^2 drainage area consisting of the entire Santa Maria drainage along with the majority of the Property's watershed. There is no obvious effort to manage this runoff in any form of designed drainage structure ever. During field investigations, stream flow was observed traveling across and down the paved road, choosing its' own flowpath. Anecdotal accounts from residents report flow exiting the Property has resulted in flooding a large portion of the neighborhood during peak storm events. It should be noted that addressing the problem in this AOC would require collaboration with other entities, which may include City, County, and/or private landowner(s) since area is located outside Park's property boundaries.

7.3 Area of Concern 3

The second location along the south western boundary of the Property where flow is conveyed to paved surface streets Area of Concern 3 (AOC 3, Map 2) is located on Moro Ave., midway between the road intersections of Santiago Ave. and Salvador St. Flow and sediment from this Class II stream discharges to an uncontrolled street location approximately 640 ft downstream of Site #39. Stream flow is diverted down the left inboard ditch along Moro Ave. toward the intersection with Santiago Ave., at which point flow disperses and infiltrates into the wooded alluvial area to the south (Photo 36-37, Appendix D). At the time of field investigations, bedload was visible in the ditch along Moro Ave., indicative of sediment transport during winter.

Area of Concern 4Based on aerial imagery analysis, the identified failures are likely new hillslope failures or have at least experienced recent episodic activity, occurring during the 2016-2017 wet weather season. Additionally, the residence located at 540 El Granada Boulevard was constructed in 2006-2007. Initial evidence of disturbance to the hillslope immediately upslope of

the existing slide feature below this residence was observed on aerial imagery from 2006 and 2007. Uninvestigated drainage outfalls are visible beneath the residence and are conveying flow to the unstable area.

A washed out fill crossing (Site #41) located on a steep Class III stream has eroded through the road as a result of a debris torrent originating in the upslope headwaters region of this stream (AOC 4, Map 2). The debris torrent passed through this stream crossing delivering sediment and debris to a Class II stream approximately 45' downstream of Site #41, and then continued farther downstream beyond the confluence of the two channels. The recent active erosion in the headwaters of this channel has resulted in a severely scoured channel both upstream and downstream of the crossing at Site #41. The stream banks through the failed stream crossing are oversteepened and unstable. The remaining perched road fills on both banks of the stream crossing are very susceptible to future failure. However, the bottom of the stream channel has incised down to a more competent resistive bedrock material, and appears to have reached a stable gradient through the crossing.

7.4 Area of Concern 5

A combination of Class III stream flow, upslope residential drainage and emergent cutbank spring flow are actively saturating and eroding the fill at this crossing (Site #19). The road associated with this crossing has been constructed through the steep headwall area of this Class III stream channel (AOC 5, Map 2). There is no formal drainage structure at the crossing; therefore, the combined flows are actively eroding the road fill though the crossing. There are several active cutbank slides on the right road approach and a large section of the road fill has failed on the right hingeline of the stream crossing fillslope (Photos 11 and 12, Appendix D). The remaining outboard fillslope is long and oversteepened. Additionally, there are large, arcuate scarps upslope of the crossing that are indicative of a potential future hillslope failure with debris torrent potential if the entire headwall swale area were to fail. In the event of a catastrophic hillslope debris slide failure, the sediment and vegetal materials being transported downstream would likely result in the complete failure of both Site #19, as well as the downslope stream crossing at Site #7.

There is a private residence upslope of the headwater area that is actively conveying surface drainage and runoff from the graded area surrounding the home toward the unstable hillslope. There is a section of exposed 24" diameter plastic culvert on the hillslope above Site #19 that is likely a drainage outfall from the upslope private property. Site #19 appears to be very near, if not directly on, the Property boundary. Due to the stream crossings proximity to the property boundary, and the unspecified volume and source of increased concentrated runoff being directed to the site, further investigation of the upslope drainage area will be required in order to develop a comprehensive treatment design. The upslope drainage area investigation should be implemented in cooperation with the neighboring property, as it will require access, to determine the exact nature of the influence on the natural drainage. Additionally, treatment development may require property boundary delineation through this area to determine potential responsibility.

7.5 Area of Concern 6

Approximately 685 ft of inboard ditch and springy cutbank adjacent to the paved private road near the top of the Property drains to a 24" diameter ditch relief culvert (Site #40) located in the headwaters of the Santa Maria drainage (AOC 6, Map 2). The ditch relief culvert (DRC) is set shallow in the fillslope, and the inlet area is hardened with concrete. During field inspections, flow was infiltrating into the ground approximately 45 ft up the inboard ditch from the culvert inlet, and was emerges at the base of the actively migrating headcut at the disconnected outlet to the DRC. A large active gully (on average 10 ft deep x 16 ft wide x 175 ft long) has eroded the steep colluvial hollow as a result of the DRC downspout separating and filing in the 2016-2017 winter (Photos 16-18, Appendix D). The disconnected ditch relief culvert downspout was previously ~120 ft longer and conveyed the road and spring runoff to the base of the very erodible colluvial hollow (i.e. protect the hillslope from the observed serious erosion), and deliver the flow to the head of a downslope Class III stream

The lack of slope inspection and maintenance of the drainage structure is a factor in the observed erosion and sediment delivery. In addition, the flow is likely piping through pores and/or infiltrating through the sandy decomposed granitic soils and emerge due to an underlying contact with a less permeable material. The remaining segments of culvert and the underlying hillslope will likely fail as the active headcut continues to enlarge and migrate upslope toward the road. Flow and eroded sediment from Site #40 is routed to an unculverted fill crossing at Site #16, approximately 390 ft downstream.

7.6 Area of Concern 7

An instream pond on a Class II watercourse being retained by an earthen dam associated with stream crossing Site #4 (Map 2). Preliminary evaluations revealed that the majority of the fill face of the dam appears stable, other than the uncontrolled spillway at the right hingeline of reservoir/stream crossing (AOC 7, Map 2). The dam's overflow does not have any formal drainage structure, and therefore is at a high risk of catastrophic failure. The pond outlets at the southwest corner of the dam where pond outflow is bifurcated by a temporary dysfunctional sandbag check dam. The temporary dam sandbag structure is actively diverting approximately 50% of the flow across the road forming an active gully near the right hingeline of the dam face, while the rest of the flow is diverted 90 ft down road causing a relatively new road failure resulting in a completely washed out road prism.

Additionally, there are 4 past diversion gullies further down the western road approach that were likely caused by past uncontrolled pond outflow. Eroded sediment from these two active outflow locations is currently being deposited in broad alluvial meadow area downslope from the dam. The outflow across the meadow flows through small diffuse channels for ~275 ft, at which point flow enters a Class II stream channel. Some seepage is also occurring through a valve at the base of the dam. The active gullying and headcutting at the earthen dam pose a flooding and erosion threat to the downstream watershed areas associated with catastrophic failure potential. Refer to photos 4-8 in Appendix D.

PWA conducted a follow up evaluation of the pond and earthen dam. Our evaluation consisted of the following tasks: (1) conducting a field assessment, total station survey, and subsurface soil investigations to evaluate the structural integrity and seismic susceptibility of the existing dam

and identify deficiencies; (2) analyzing the data and develop a treatment plan (short and long term) to improve the structural integrity to keep the existing feature and/or a plan to decommission the pond and restore the stream channel; and (3) preparing a post-project memo report of findings. Please refer to the supplemental memo report of findings in Appendix E for: (a) summary of scope of work; (b) description of existing site conditions and a summary of observations; (c) results of field and/or laboratory surveys, testing, and analysis; (d) site map depicting locations of any testing and/or surveys; and (e) general recommendations for treatment.

7.7 Area of Concern 8

A flashy Class III stream is conveyed via 2 plugged undersized culverts, one 24" diameter and one 12" diameter (Site #39). The culverts are installed high in the fill and both culvert inlets are completely plugged with aggraded sediment. Oversaturated fills and a steep outboard fillslope have resulted in a failure of the outboard fillslope exposing the two culverts in the outboard fillslope (AOC 8, Map 2). The fillslope failure has resulted in an oversteepened outboard fillslope, and the remaining perched fill is now prone to future failure. Additionally, combined concentrated road runoff and diverted stream flow from Site #39 have resulted in a second outboard edge of road fill failure approximately 125 ft down the left road approach to the crossing. This second fill failure delivers sediment directly to the Class III stream at the base of slope and will likely continue to deliver sediment if left uncorrected (Photos 13-15, Appendix D).

7.8 Area of Concern 9

The “observation deck” at the top of the quarry (Site #73) is experiencing erosion beneath one of the footings (AOC 9, Map 2). The active slope failure beneath the footing is undermining the deck and causing instability. (Photos 33 and 34, Appendix D). The active erosion and subsequent destabilization of the deck is a potential safety hazard for visitors. County Parks has closed the site due to potential hazard until it can be relocated. PWA recommends that the infrastructure be relocated a minimum of 35 feet back from the edge of the existing unstable slope.

8. POTENTIAL REACHES FOR PRIORITIZED HABITAT REHABILITATION

There are three distinct reaches which PWA staff has identified as potential locations for prioritized habitat rehabilitation (Map 2). These reaches have been significantly altered due to anthropogenic land use practices resulting in: (1) sediment delivery from episodic failure of road/trail fill; (2) changes in channel morphology from aggradation and/or incision; (3) degradation of native riparian vegetation; (4) reduced hydrologic function; and/or (5) negative effects to suitable habitat. Temporary impacts and disturbance from heavy equipment construction activities would be temporally limited in scope. However, the long term effects of rehabilitation would prevail and promote native riparian revegetation, restore hydrologic function, and improve available habitat.

8.1 Riparian Reach #1

This alluvial stream reach is heavily impacted by the highly erodible nature of the local geology and historic anthropogenic impacts on the landscape. The stream reach (Reach #1, Map 2) has sediment aggradation upstream of stream crossing Site #2 with deeply incised, near vertical

banks downstream. The area appears to have been intentionally ponded in the past by the construction of two berms/levees. The ponds have since become inundated with aggraded sediment. Stream flow is currently conveyed through the area via subsurface percolation and a series of two undersized 15" diameter culverts. One culvert is oriented upstream of the Meadow Trail alignment, and the second culvert is approximately 50 ft downstream of the trail. The hydrologic impact of the undersized culverts and subsequent backwatering of the Class II stream has caused aggradation within the two small reservoirs.

Stream flow is actively eroding through the aggraded sediment downstream of Site #2. The flow that is percolating underneath the aggraded material and levee fill emerges downstream of the lower levee at the base of a 6 ft tall headcut. The headcut is actively migrating upstream and the potential for an episodic crossing failure is relatively high. In the event of an episodic failure induced by the headward migration of the headcut, the increased sediment delivery to the downstream channel reach would likely result in uncontrolled riparian bank erosion within the stored alluvial sediments downstream, loss of riparian vegetation, and would likely negatively impact downstream crossing infrastructure.

8.2 Riparian Reach #2

This alluvial stream reach is also heavily inundated with aggraded sediment due to the highly erodible nature of the local geology and historic anthropogenic impacts on the landscape (Reach #2, Map 2). This restorable stream reach extends from stream crossing Site #17 downstream through Site #26 all the way to stream crossing Site #23 at the initiation the Meadow Trail. The upstream reach from Site #26 to Site #17 is incised with near vertical banks for approximately 500 ft. There is a historic levee or small dam that extends across the width of the alluvial valley at Site #26 that is impeding the natural watercourse. The channel downstream of Site #26 is minimally defined and heavily vegetated with invasive species.

8.3 Riparian Reach #3

This restorable stream reach is located within the main historic quarry area at a small failed pond shown as Site #37 (Reach #3, Map 2). The pond likely served as a water storage and or washing facility from industrial quarry activities. Several emergent springs actively deliver sediment to the headwall swale above the pond. Flows have resulted in a gully through the levee fill on the downstream edge of the pond feature and deliver to Site #37 downstream. The pond is not functioning as it retains approximately 25% of its original impoundment capacity.

9. OPPORTUNITIES AND CONSTRAINTS

PWA previously provided County Parks with an *Opportunities and Constraints Analysis* to translate technical information gathered during field investigations. This document and corresponding maps describe; existing and potential future risks to property resources to begin the process of developing conceptual alternatives for controlling accelerated erosion, and altered hydrology, and options to restore and protect natural processes and natural resources. This section summarizes PWA's memo dated May 2017, which provided conceptual findings and recommendations, reliant on input from County Parks, the consultant team, the public, and other stakeholders.

9.1 Opportunities

The recent acquisition of additional land has provided the County with a great opportunity to protect, stabilize, enhance, and restore the existing natural features and processes, infrastructure, access, recreation, and safety for staff and visitors. While PWA considers there is also an opportunity for expansion of the trail networks and/or infrastructure within the Park in the future; based on our site investigations and analysis, we suggest that initial remedial actions and primary focus be placed on the former rather than the latter opportunities with respect to the property.

Final opportunities leading to the development of a final *Master Plan* for the Park should consider the following bulleted outline based on PWA's initial work to date:

(1) Initiate, develop, and foster communications, collaboration, and partnership with neighboring landowners and other stakeholders;

(2) Develop and implement prioritized, cost effective projects to improve, stabilize, restore natural processes or habitats, whereas one project can meet multiple objectives for the Property including, but not limited to:

  (a) Existing and proposed road/trail network

  (b) Park access

  (c) Park infrastructure

  (d) Natural features, resources, and processes

  (e) Water – quality, availability, diversion(s), impoundment(s), and/or storage

  (f) Public safety within the Park

  (g) Recreational uses and overall experience for visitors

(3) Develop and implement Park protocols and methodology (maintenance, monitoring, etc.)

9.2 Constraints

The County's roles and responsibilities as a result of this acquisition include inherited (legacy) existing and/or potential conditions. These include a number of land use activities and land management activities being conducted by upslope adjacent landowners that are have significant impacts on Park resources, as well as a number of deferred maintenance and poorly designed roads, ponds and infrastructure features that pose a risk of significant downstream impacts to both Park resources and/or downslope adjacent land and property owners. Many of these may require careful discussions and negotiations with adjacent landowners and regulatory agencies. Others may require more detailed studies and analysis to evaluate long-term risk to natural resources and Park infrastructure, determine and permit appropriate solutions and evaluate public access and safety constraints.

Identifying opportunities to prepare and execute a final *Master Plan* (goals, objectives, prioritized planning efforts, timeline, etc.) is one step. The other step is identifying the constraints that can play an equal role (if not greater) in actualizing execution of such a Plan. Based on PWA's preliminary work to date, we have included a similar outline of constraints that may restrict, delay, and/or prevent realization of opportunities to include, but not limited to the following:

(1) Prioritizing actions - identifying immediate needs vs. goals (short and long-term),

(2) Overall cost – availability and timing of appropriate funds

(3) Coordinating, collaborating, and securing final approval from the community (visitors), adjacent landowners, stakeholders, and the County

(4) Identifying, addressing, and clarifying roles and responsibilities related to legal responsibilities, permitting, and regulatory compliance

(5) Timeline (planning, approval, funding, implementation, etc.)

10. CONCLUSIONS

This assessment is a comprehensive inventory of ongoing and future road and trail related erosion and sediment delivery to streams along a total of 13.87 mi of road and trail within Quarry Park, San Mateo County, California. It provides field data to identify and quantify currently observable and possible future sources of erosion and sediment delivery originating from roads and trails on the Property owned and managed by San Mateo County Parks Department.

A fundamental result of this erosion assessment is a prioritized plan of action for erosion and sediment control and erosion prevention for identified erosional features within the Property. When implemented and employed in combination with protective land use practices, the treatment prescriptions outlined in this report may be expected to significantly contribute to the long-term protection and improvement of water quality and habitat in the Property.

We understand that treatments are likely to be implemented. However, we also understand that a variety of factors, such as available funds, public input, and results of the Master Plan may dictate the number and order of implemented treatments. Therefore, PWA offers our assistance to County Parks with developing specific treatment packages based on a variety of factors upon request.

11. REFERENCES

Brabb, E.E., Graymer, R.W., and Jones, D.L., 1998, Geology of the onshore part of San Mateo County, California: A digital database: U.S. Geological Survey Open-File Report OF 98-137, scale 1:62,500.

Brabb, E.E., Graymer, R.W., and Jones, D.L., 1998, Geology of the Palo Alto 30 x 60 minute quadrangle, San Mateo County, California: A digital database: U.S. Geological Survey Miscellaneous Field Studies Map MF 2332, scale 1:100,000.

Bryant, W.A., and Cluett, S.E., compilers, 1999, Fault number 60a, San Gregorio fault zone, San Gregorio section, in Quaternary fault and fold database of the United States: U.S. Geological Survey website, http://earthquakes.usgs.gov/hazards/qfaults, accessed 04/04/2016 12:22 PM.

California Geological Survey (CGS), 2008. Earthquake Shaking Potential for California. Map Sheet 48.

Davis, James, State Geologist, 1982, Alquist-Priolo Revised Official Map, Montara Mountain 7.5' Quadrangle, San Mateo County, California: Sacramento, CA, California Department of Conservation, Division of Mines and Geology Special Studies Zones, scale 1:24,000.

Dunne, T. and L.B. Leopold. 1978. Water in Environmental Planning. W.H. Freeman and Company, New York.

Flosi, G., Downie, S., Hopelain, J., Bird, M., Coey, R., and Collins, B., eds., 1998, California salmonid stream habitat restoration manual, 3d. ed.: Sacramento, CA, California Department of Fish and Game, 497 p. Available from: http://www.dfg.ca.gov/fish/Resources/HabitatManual.asp

Flosi, G., Downie, S., Hopelain, J., Bird, M., Coey, R., and Collins, B., eds., 2010, California salmonid stream habitat restoration manual, 4th. ed.: Sacramento, CA, California Department of Fish and Game, 497 p. Available from: http://www.dfg.ca.gov/nafwb/pubs/1998/manuals.pdf

GGNRA, 2015 PowerPoint presentation (rcdt_progress_2011_09_14)

Google Earth, May 12, 1995, September 6, 1998, June 6, 2002, October 1, 2002, July 30, 2003, July 30, 2004, December 30, 2005, June 19, 2007, August 14, 2008, June 5, 2009, July 13, 2010, December 2, 2011, May 5, 2012, and October 2017. Accessed between December 2016 and February 2018.

Higgins, P.T., Dobush, S., and Fuller, D, 1992, Factors in Northern California threatening stocks with extinction: Arcata, CA, American Fisheries Society, Humboldt Chapter, 25 pp. http://conserveonline.org/workspaces/Sustainable_Forestry/Management_Plans/garcia_mana manage_plans/view.html

Jennings, C.W., 1994, Fault activity map of California and adjacent areas, with locations of recent volcanic eruptions: California Division of Mines and Geology Geologic Data Map 6, 92 p., 2 pls., scale 1:750,000.

Google Earth, May 12, 1995, September 6, 1998, June 6, 2002, October 1, 2002, July 30, 2003, July 30, 2004, December 30, 2005, June 19, 2007, August 14, 2008, June 5, 2009, July 13, 2010, December 2, 2011, and May 5, 2012. Accessed between December 2015 and Aril 2016.

National Park Service (NPS), 2009. *Geologic Resources Inventory Map Document for Golden Gate National Recreation Area*, Geologic Resources Incentive Program.

NPS GRI Program, 2009, Digital Geologic Map of the Golden Gate Recreation Area and Vicinity, California [digital layer], National Park Service Geologic Resources Inventory Program.

Pampeyan, E.H., 1994, Geologic Map of the Montara Mountain and San Mateo 7.5' Quadrangles, San Mateo County, California, .U.S. Geological Survey, Miscellaneous Investigations Series Map I-2390, 1:24,000 scale (GRI Source Map ID 4100).

Taylor, R.N. and Love, M., 2004, Part IX, Fish Passage Evaluation at Stream Crossings, in Flosi, G., Downie, S., et al., eds., California salmonid stream habitat restoration manual, 3d. ed.: Sacramento, CA, California Department of Fish and Game, 177 p. Available from: https://nrmsecure.dfg.ca.gov/FileHandler.ashx?DocumentID=3597

USGS, 2012, Montara Mountain California [map]: Washington, D.C., U.S. Geological Survey, 7.5 Minute Map 37122e4, scale 1:24,000.

United States Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS). National Forestry Handbook, title 190, February 2004. (http://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=37005.wba).

URS, 2010. GGNRA reference from 2015 PowerPoint presentation (rcdt_progress_2011_09_14)

USDA, NRCS. National Engineering Handbook (NEH) Part 630, May 2007 (http://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=17757.wba)

USDA National Agriculture Imagery Program (NAIP), 2010, 2012, 2014, and 2016 Digital orthoimagery of San Mateo County, California: ortho_1-1_1n_s_ca053_2010_1, USDA-FSA Aerial Photography Field Office, Salt Lake City, Utah (downloaded from http://datagateway.nrcs.usda.gov/)

USDA, NRCS, 2013. *Soil Survey Geographic (SSURGO) database for San Mateo Area, California. Available at:* http://websoilsurvey.nrcs.usda.gov

USDA NRCS Websoil Survey online server, 2016. Accessed October 2017 to list soils and soil properties of areas within San Mateo County. Website: http://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm

United States Department of Agriculture, Natural Resources Conservation Service. National

Wannanen, A.O., and Crippen, J.R., 1977, Magnitude and frequency of floods in California: U.S. Geological Survey Water-Resources Investigations 77-21, 96 p.

Weaver, W.E., Hagans, D.K., and Weppner, E.M., 2015, Handbook for forest, ranch and rural roads: a guide for planning, designing, constructing, reconstructing, upgrading, maintaining and closing wildland roads: Ukiah, CA, Mendocino County Resource Conservation District, 406 p. Available from: http://www.mcrcd.org/publications/

Weaver, W.E., Hagans, D.K., and Weppner, E., 2006, Part X: Upslope erosion inventory and sediment control guidance, *in* Flosi, G., Downie, S., et al., eds., California salmonid stream habitat restoration manual, 3d. ed.: Sacramento, CA, California Department of Fish and Game, 207 p. Available from: http://www.dfg.ca.gov/nafwb/pubs/2006/manual_partX.pdf

Appendix A

Terminology and techniques used in road related erosion assessments

Quarry Park Watershed Assessment and Erosion Prevention Planning Project San Mateo County, California

1 TERMINOLOGY AND TECHNIQUES USED IN ROAD RELATED EROSION ASSESSMENTS

1.1 Sources of Road Related Erosion

Sources for erosion and sediment delivery in the assessment area are divided into two categories: (1) sediment from specific treatment features, and (2) sediment from the surfaces of road segments of varying lengths—and their associated cutbanks and inboard ditches—that are hydrologically connected1 to streams.

Feature-specific erosion is termed *episodic*, as it is projected to occur over an indeterminate time frame, usually from months to decades as typically triggered by some event (usually intense or significant rainfall or peak flows in a stream). Some features may show evidence for imminent failure, erosion, and sediment delivery, such as unstable road cuts or fills on steep hillslopes. Other features may show the potential for erosion and sediment delivery, but will not activate until a threshold is reached based on a combination of factors at the feature (for example, type of geologic substrate, type and density of vegetative cover; size of channel, steepness of terrain, intensity and duration of rainfall, peak flows, etc.).

In contrast to feature-specific episodic erosion, erosion from road surfaces is termed *chronic* because it occurs on an on-going basis, every time there is surface runoff, and is primarily dependent on the level of road usage, the erodibility of the ditch or road surface, and the steepness of the road. PWA estimates chronic erosion for a 10-year period, based on empirical calculations for fine sediment generation from hydrologically connected road surfaces and associated cutbanks and ditches. The amount of fine sediment delivered to stream channels from eroding road surfaces can be substantial when evaluated on timescales similar to those applied to episodic erosion features (mulit-decades), and in some watersheds may represent the greater detriment to water quality and fish habitat.

1.1.1 Feature-specific erosion sources

Stream crossings

A *stream crossing* is a ford or drainage structure on a road (such as a culvert or bridge) installed across a stream or watercourse (USDA Forest Service, 2000). When they erode, sediment delivery from stream crossings is always assumed to be 100%, because any sediment eroded is delivered directly to the stream. Once eroded sediment is delivered to a stream, the grain size of the sediment and the size of the stream affects the rate of sediment movement down the channel. Regardless, any eroded sediment delivered to small ephemeral streams in upland areas will eventually be transported to downstream larger fish-bearing stream channels.

Common features of stream crossings that lead to erosion problems include (1) fill crossings without culverts, (2) crossings with undersized culverts, (3) crossings with culverts susceptible to being plugged, (4) crossings with logs or debris buried in the fill intended to convey streamflow

1 *Hydrologically connected* describes sites or road segments from which eroding sediment is delivered to stream channels (Furniss et al., 2000).

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(i.e., *Humboldt log crossings*), (5) crossings with a potential for stream diversion, and (6) crossings that have currently diverted streams.

An unculverted *fill crossing* is a stream crossing without a culvert to carry the flow through the road prism. At such features, stream flow either crosses the road surface and flows over and back down the outside fillslope, or is diverted down the road via the road surface or inboard ditch. Most fill crossings are located at small Class II or III streams that only have flow during larger runoff events. *Armored fill crossings* and *ford crossings* are similarly designed to be functional, unculverted stream crossings. A properly constructed armored fill crossing contains fill in the stream crossing that is protected from erosion by the use of rock armor. It is based on a feature-specific design, using a mix of riprap-sized rock to minimize or prevent erosion during flood events while allowing the stream to flow across the surface of the road prism (Weaver et al., 2015). A ford crossing may use rock armor to stabilize the roadway where it crosses the stream, but the road is built essentially on the naturally armored stream bed, and fill is not used.

Humboldt log crossings were typically constructed during historic logging activities from logs or woody debris, usually dumped into or laid parallel to flow, which are then covered with fill. Humboldt crossings are susceptible to plugging, collapse, gullying, and washout when the woody debris rots or peak flows erode the poorly built crossing during storm events (Weaver et al., 2006). Older Humboldt log crossing structures beneath more recently installed culverts are often found in rural northern California road networks. Their existence often shows up only when sink holes develop in the road surface.

Significant erosion may occur at stream crossings when culverts are too small for the peak flow and storm flows exceed culvert capacity, or when culverts become plugged by sediment and debris. In these instances, flood runoff will pond behind the road prism and eventually spill across the roadbed causing erosion of the stream crossing fill and development of a partial or complete *washout crossing*. The larger the stream crossing fill, and the larger the stream discharge, the greater the volume of erosion and sediment delivery that will occur when flood flows overtop the crossing. Washout crossings will remain highly problematic as the stream erodes down through the erodible road fill and the banks of the developing gully continue to erode back to a natural grade.

Even more significant erosion can occur at a stream crossing that exhibits a *diversion potential*, which means that flow is diverted down the road, either on the roadbed or in the ditch, instead of spilling over the fill and back into the same stream channel. In this case, the adjacent roadbed, hillslope, and/or stream channel that receives the diverted stream flow may become deeply gullied or destabilized. As road and hillslope gullies enlarge over time, they will deliver increasingly greater quantities of sediment to downslope stream channels (Hagans et al., 1986), and streamflow diverted onto steep, unstable hillslopes may trigger large landslides or debris flows.

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To be considered adequately sized, culverts at stream crossings must have the capacity to convey a 100-year peak storm flow,[2] including sediment and organic debris in transport (Weaver et al., 2006). In areas where large, floating debris may also be a problem, trash racks and trash barriers should be installed slightly upstream from culvert inlets to screen out the larger woody debris as an additional precaution against plugging. Substandard stream crossing culverts include those that are not large enough to convey a 100-year flow, or are installed at too low of a gradient through the stream crossing fill to prevent plugging. Improper, low-gradient culvert installations were once common because they required shorter lengths of pipe to convey flow through the road, and were therefore used to minimize construction costs. However, in the long run these cost-cutting measures often prove detrimental to erosion control and road maintenance costs because the low gradient culvert is more likely to plug with sediment and debris, and at its outlet it discharges stream flow onto steep, unconsolidated road fill rather than into the pre-existing stream channel below the road fill, resulting in pronounced erosion of the outboard, downstream fill face.

Ditch relief culverts

A *ditch relief culvert* (DRC) is a plastic, metal, or concrete pipe installed beneath the road surface to convey flow from an inside road ditch to an area beyond the outer edge of the road fill. When properly spaced, DRCs collect road and cutbank runoff and disperse it to the downslope hillside at frequent intervals along the road. They limit the quantity of water available in the ditch so that it cannot cause erosion in the ditch or at the outlet of the culvert. It is sometimes necessary to install downspouts or rock armor at DRC outlets to further disperse energy and prevent erosion.

Landslides

Unstable road cutbanks and fillslopes with the potential to fail during periods of high and prolonged rainfall events are identified in the field by tension cracks, scarps showing vertical displacement, corrective regrowth on trees (i.e., pistol butt trees) and perched, hummocky fill indicating surface instability. As a standard practice, PWA maps all active and potential road-related landslides observed in the field, but only inventories those that exhibit a potential to fail and deliver sediment to a watercourse. Types of landslides in a road-related erosion assessment typically include (1) road fill failures, (2) landing fill failures, (3) cutslope debris slides, (4) hillslope debris slides, and (5) deep-seated, slow landslides. The majority of treatable landslides in an assessment area are often the result of failure of unstable fill and sidecast material from earlier road construction on steep hillslopes. Typically, the most cost-effective preventive treatment for unstable or potentially unstable fillslopes is the excavation and removal of unstable fill material and redepositing it in a stable, designated spoil disposal site (preferably nearby) where it cannot fail or erode and enter a watercourse. Conversely, large, deep-seated landslides are often technically infeasible or not cost-effective to treat.

2 The *100-year peak storm flow* for a location is the discharge that has a 1% probability of occurring at that location during any given year.

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Additional feature-specific sediment sources

Other, less frequent sources of sediment delivery include: (1) discharge points for road surface, cutbank, and ditch erosion (e.g., the outlets of rolling dips, waterbars or lead-out ditches); (2) point source springs or multiple, closely spaced springs feeding a ditch; (3) features of bank erosion at or near a stream crossing or where the road has been built within or immediately next to a small watercourse; (4) active or beheaded headwall swales; (5) channel scour at or near stream crossings; and (6) non-road related upslope gullying caused by past logging, including eroding skid trail stream crossings, skid trail stream diversions or concentrated surface runoff from skid trail systems.

Unpaved road surfaces, and their associated cutbanks and inboard ditches, are often major sources for erosion and delivery of fine sediment to stream channels. Road surface, cutbank, and ditch erosion is termed “chronic” because it occurs throughout the year, any time there is significant surface runoff, and may include one or more of the following processes: (1) mechanical pulverizing and wearing down of road surfaces by vehicular traffic, and the use of unpaved roads during wet weather and wet soil conditions; (2) erosion of unpaved road surfaces by rainsplash and runoff during periods of wet weather; (3) erosion of poorly drained road surfaces characterized by steep grades, deep vehicle treads, outside berms or throughcut road sections that prevent surface drainage; (4) erosion of inboard ditches by road surface and cutbank runoff and emergent spring flow during wet weather periods; (5) active erosion within recently graded or maintained (bare) ditches, and (6) erosion of cutbanks by dry ravel, rainfall, slope failures, and brushing/grading practices.

Discharge points for road surface, cutbank, and ditch erosion are locations where sediment-laden flow from poorly drained road/cutbank/ditch segments exits the roadway to be delivered into the stream system. The most common discharge points include: (1) stream crossings, where road surfaces and ditch runoff exits the road alignment and directly enters the stream; (2) ditch relief culverts where runoff leaves the road close enough to a stream to allow storm flow to enter the watercourse or where the culvert discharges runoff into a gully that connects to a downslope stream channel; (3) road surface drainage structures, including rolling dips, waterbars, berm breaks, lead-out ditches and natural low spots in the road alignment that drain runoff and eroded sediment from the road surface, down the fillslope and into a nearby watercourse.

Point source springs refer to features where spring flow is entering the roadbed and causing erosion. Flow from multiple springs may become concentrated along a road or ditch with inadequate drainage structures, creating roadside gullies or fillslope failures. *Swales* are channel-like depressions that only carry minor flow during periods of extreme rainfall. *Bank erosion* features refer to locations of streambank erosion caused or exacerbated by emplacement of a nearby road or stream crossing. *Non-road related upslope gullies* form upslope of the road (often on logged areas) and discharge runoff and eroded sediment onto the road during storm events.

1.1.2 Evaluation of hydrologically connected road segments

During our road erosion assessments, PWA measures the lengths of hydrologically connected road segments adjacent to sediment delivery features, such as on one or both approaches to

stream crossings, ditch relief culverts, or other discharge points, to derive an estimate for total potential sediment delivery from all connected road surfaces and ditches in the project area. In addition, because the adjacent hydrologically connected road segments contribute to the overall erosion and sediment delivery problem at a feature, PWA considers the treatment feature and adjacent road segments as a unit when estimating future sediment delivery and developing treatment prescriptions for that location. Thus, for example, prescriptions for a culverted stream crossing would include the necessary treatments to upgrade the culvert for the 100-year peak flow, as well as those drainage treatments on one or both road approaches that are needed to reduce and minimize road surface and ditch runoff that drains to the watercourse.

1.2 Overview of Storm-proofing Roads (Road Upgrading and Decommissioning)

Forest and rural roads may be storm-proofed by one of two methods: upgrading or decommissioning (Pacific Watershed Associates, 1994; Weaver and Hagans, 1999; Weaver et al., 2006). Upgraded roads are kept open, and are inspected and maintained. Their drainage facilities and fills are designed or treated to accommodate the 100-year peak storm flow[3]. Conversely, properly decommissioned roads are closed and no longer require maintenance. Whether through upgrading or decommissioning, the goal of storm-proofing is to make the road as "hydrologically invisible" as possible; that is, to reduce or prevent future sediment delivery to the local stream system. A well-designed storm-proofed road includes specific characteristics (see table, next page), all proven to contribute to long-term improvement and preservation of watershed hydrology and aquatic habitat.

1.2.1 Road upgrading

Road upgrading involves a variety of treatments used to make a road more resilient to large storms and flood flows. The most important of these include upgrading stream crossings (especially culvert upsizing to accommodate the 100-year peak storm flow and debris in transport, and correct or prevent stream diversion); removing unstable sidecast and fill materials from steep slopes; and applying road drainage techniques (e.g., installing ditch relief culverts, removing berms, constructing rolling dips, insloping or outsloping the road) to improve dispersion of surface runoff. Road upgrading may also include adding road rock or riprap as needed to fortify roads and stream crossings.

<u>Installing rolling dips</u>

Rolling dips are installed on low- to moderate-gradient hydrologically connected[4] road segments to disperse surface runoff and discharge it onto the native hillslope below the road. Rolling dips extend from the inboard edge to the outboard edge of a road, and are constructed at intervals as needed to disperse surface runoff and control erosion (typically 100, 150, or 200 ft). They are effective in reducing year-round ("chronic") erosion and sediment delivery from road surfaces, and are designed to be easily drivable and not impede vehicular traffic.

3 The *100-year peak storm flow* for a location is the discharge that has a 1% probability of occurring at that location during any given year.
4 *Hydrologically connected* describes sites or road segments from which eroding sediment is delivered to stream channels (Furniss et al., 2000).

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Characteristics of storm-proofed roads (Weaver et al., 2006).

Storm-proofed stream crossings

- All stream crossings have a drainage structure designed for the 100-year peak storm flow (with sediment and debris in transport).
- Stream crossings have no diversion potential (functional critical dips are in place).
- Stream crossing inlets have low plug potential (trash barriers installed).
- Stream crossing outlets are protected from erosion (extended beyond the base of fill; dissipated with rock armor).
- Culvert inlet, outlet, and bottom are open and in sound condition.
- Undersized culverts in deep fills (greater than backhoe reach) have emergency overflow culvert.
- Bridges have stable, non-eroding abutments and do not significantly restrict 100-year flood flow.
- Fills are stable (unstable fills are removed or stabilized).
- Road surfaces and ditches are "hydrologically disconnected" from streams and stream crossing culverts.
- Class I stream crossings meet CDFG and NMFS fish passage criteria (Taylor and Love, 2003).

Storm-proofed fills

- Unstable and potentially unstable road and landing fills are excavated or structurally stabilized.
- Excavated spoil is placed in locations where it will not enter a stream.
- Excavated spoil is placed where it will not cause a slope failure or landslide.

Road surface drainage

- Road surfaces and ditches are "hydrologically disconnected" from streams and stream crossing culverts.
- Ditches are drained frequently by functional rolling dips or ditch relief culverts.
- Outflow from ditch relief culverts does not discharge to streams.
- Gullies (including those below ditch relief culverts) are dewatered to the extent possible.
- Ditches do not discharge (through culverts or rolling dips) onto active or potential landslides.
- Decommissioned roads have permanent drainage and do not rely on ditches.
- Fine sediment contributions from roads, cutbanks, and ditches are minimized by utilizing seasonal closures and implementing a variety of surface drainage techniques including berm removal, road surface shaping (outsloping, insloping, or crowning), road surface decompaction, and installing rolling dips, ditch relief culverts, waterbars, and/or cross-road drains to disperse road surface runoff and reduce or eliminate sediment delivery to the stream.

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Road shaping

Road shaping changes the existing geometry or orientation of the road surface, and is accomplished through insloping (sloping the road toward the cutbank), outsloping (sloping the road toward the outside road edge), or crowning (creating a high point somewhere near the center axis of the road so that it slopes equally inward and outward). Like rolling dips, road shaping is used to quickly drain surface runoff off the road surface and direct it to the inside ditch or to the outside road shoulder. Road shaping keep water from standing on, or flowing down, the road bed, thereby reducing roadbed saturation, surface deterioration and surface erosion.

Installing ditch relief culverts

A ditch relief culvert is a drainage structure (usually an 18 inch diameter pipe) installed across a road prism to move water and sediment from the inboard ditch to the base of the outside road fill so that it can be dispersed on the native hillslope beneath the road. Ditch relief culverts are used to drain ditch flow on roads that are insloped or crowned, that have springs and seeps draining to the ditch, or that are too steep for rolling dips or outsloping.

Excavating unstable fills and fillslopes

The fillslope, the sloping part of the road fill located between the outboard edge of the road prism and the natural hillslope below, may fail or show signs of instability and potential failure. As a preventative measure, before failure occurs, fillslope materials that shows signs of instability (cracks, scarps, or hummocky topography) or that are perched on steep slopes above a stream can be excavated and hauled or pushed to a stable spoil deposal site where they no longer threaten water quality. This is often the most cost-effective treatment for unstable road fills on forest roads.

Upgrading stream crossings

Techniques used to prevent or remediate road related erosion at a stream crossing are dependent on the size of the stream channel, and specific physical characteristics at the crossing feature. Crossings of Class I and large Class II watercourses may require a bridge, or, if their banks are small or low gradient, a ford crossing may be suitable if seasonal use is anticipated. A common approach to upgrading moderate sized crossings of Class II and III watercourses is to construct a culverted fill crossing capable of withstanding the 100-year flood flow.

Techniques for upgrading small stream crossings include:

- *Installing or replacing culverts.* A culvert capable of passing the 100-year storm flow, including expected sediment and debris in transport, is installed or replaced in the fill crossing. Culverts on non fish-bearing streams are placed at the base of fill, in line and on grade with the natural stream channel upstream and downstream of the crossing feature. Backfill material, free of woody debris, is compacted in 0.5-1.0 ft thick lifts until at least 1/3 of the diameter of the culvert has been covered, and then backfilled over the top of the pipe to the final road tread elevation. At features where fillslopes are steeper than 2:1, or where eddying currents might erode fill on either side of the inlet, rock armor is applied to the fillslope as needed.

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- *Installing an armored fill.* Armored fills are installed on smaller stream crossings with relatively small fill volume, but where debris torrents are common, channel gradients are steep, or inspection and maintenance of a culverted crossing is not feasible. The roadbed is heavily rocked, and a keyway in the outboard fillslope is excavated and backfilled with interlocking rock armor of sufficient size to resist transport by stream flow (Weaver at al., 2015). Armored fill crossings are constructed with a dip in the axis of the crossing to prevent diversion of the stream flow during the design flood event, and focus the flow over the axial part of the fill that is most densely armored.
- *Installing secondary drainage structures.* A variety of secondary structures may be used to increase the function of small stream crossings by preventing culvert plugging, decreasing backwater flooding, and controlling erosion. Where a culvert has been improperly installed too high in the fill, a *downspout* may be added to its outlet to carry stream flow to the base of the fill and into the natural stream channel, rather than letting it cascade from the height of the culvert. *Rock armor* may be used to buttress steep fillslopes, as well as to prevent erosion of inboard or outboard fillslopes by eddying currents. A *trash rack* placed in the channel slightly upstream of the culvert inlet will trap large debris and reduce the potential for culvert plugging. To prevent stream diversion should the culvert become plugged or its capacity exceeded, a *critical dip* (essentially a rolling dip constructed in line with the stream channel) may be installed to ensure that stream flow will be directed across the road and back into the natural channel rather than diverted down the road or ditch. Finally, an *overflow culvert* may be a necessary addition higher in the fill at a culverted crossing where, because of site conditions, plugging or capacity exceedence of the primary culvert is anticipated.

1.2.2 Road decommissioning

In essence, decommissioning is “reverse road construction,” although complete topographic obliteration of the roadbed is not usually required to achieve cost-effective erosion prevention. In most cases, serious erosion problems are confined to a few, isolated locations along a road (perhaps 10% to 20% of the full road network to be decommissioned) where stream crossings need to be excavated, unstable sidecast on the downslope side of a road or landing needs to be removed before it fails, or the road crosses unstable terrain and the entire road prism must be removed. But typically, most of the road to be decommissioned (outside of stream crossings and unstable road fills) usually requires simpler, permanent improvements to surface drainage, such as surface decompaction (road ripping), additional road drains, and/or partial outsloping. As with road upgrading, the heavy equipment techniques used in road decommissioning have been extensively field tested, and are widely accepted (Weaver and Sonnevil, 1984; Weaver and others, 1987, 2006; Harr and Nichols, 1993; Weaver et al., 2015).

Road ripping or decompaction

Road ripping is a technique in which the surface of a road or landing is disaggregated or "decompacted" to a depth of at least 18 in. using mechanical rippers. This action reduces or eliminates surface runoff and enhances revegetation of formerly compacted roadbeds.

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Installing cross-road drain

Cross-road drains (also called “deep waterbars”) are large ditches or trenches excavated across a road or landing surface to provide drainage and prevent runoff from traveling along, or pooling on, the former road bed. They are typically installed at 50, 75, 100 or 200 ft intervals, or as necessary at springs and seeps. In some locations (e.g., streamside zones), partial outsloping may be used instead of cross-road drain construction to accomplish the same objectives.

In-place stream crossing excavation (IPRX)

IPRX is a decommissioning treatment used for roads or landings that are built across stream channels. The fill (including the culvert or Humboldt log crossing) is completely excavated and the original streambed and side slopes are exhumed. Excavated spoil is stored at nearby, stable locations where it will not erode and enter the stream. In some cases, this may necessarily be as far as several hundred feet from the crossing. An IPRX typically involves more than simply removing a culvert, as the underlying and adjacent fill material must also be removed and stabilized. As a final measure, the sides of the channel may be excavated back to slopes a typically stable 2:1 slope gradient, and mulched and seeded for erosion control.

Exported stream crossing excavation (ERX)

ERX is a decommissioning treatment in which stream crossing fill material is excavated and the spoil is hauled off-site for storage (the act of moving spoil material off-site is called “endhauling”). This procedure is necessary when large, stable storage areas are not available at or near the excavation site. It is most efficient to use dump trucks to endhaul the spoil material.

In-place outsloping (IPOS)

IPOS (also called "pulling the sidecast") calls for excavation of unstable or potentially unstable sidecast material along the outside edge of a road prism or landing, and placement of the spoil on the roadbed and/or against the corresponding, adjacent cutbank within several hundred feet of the site. As a further decommissioning measure, the spoil material placed against the cutbank helps block unwanted access to the decommissioned road.

Export outsloping (EOS)

EOS is a technique comparable to IPOS, except that spoil material is moved off-site to a permanent, stable storage location. EOS is required when it is not possible to place spoil material against the adjacent cutbank (e.g., where the road prism is narrow or where there are springs along the cutbank). EOS usually requires dump trucks to endhaul the spoil material. This technique is used for both decommissioning and upgrading roads, but as the roadbed is partially or completely removed, EOS is more commonly used for decommissioning.

1.3 Determining Treatment Immediacy and Cost-Effectiveness

Identifying *treatment immediacy* is an integral part of an assessment used to prioritize features prior to implementation. Treatment immediacy is a professional evaluation of how important it is to quickly perform erosion control or erosion prevention work. It is defined as “high,”

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"moderate," or "low," and represents the urgency of treating the feature before it erodes or fails. An evaluation of treatment immediacy is based on the following criteria: (1) *erosion potential*, or whether there is a low, moderate, or high likelihood for future erosion at a feature; (2) *sediment delivery*, which is an estimate of the sediment volume projected to be eroded from a feature and delivered to a nearby stream; and (3) the value or sensitivity of downstream resources being protected. Generally, features that are likely to erode or fail in a normal winter, and are expected to deliver significant quantities of sediment to a stream channel, are rated as having high treatment immediacy.

The *erosion potential* of a feature is a professional evaluation of the likelihood that erosion will occur during a future storm, based on local site conditions and field observations. It is a subjective probability estimate, expressed as "low," "moderate," or "high," and not an estimate of how much erosion is likely to occur. The volume of sediment projected to erode and reach stream channels is described by *sediment delivery*, which plays a significant role in determining the treatment immediacy for a feature. The larger the volume of potential future sediment delivery to a stream, the more important it becomes to closely evaluate the need for treatment.

From this assessment, treatment immediacy and *cost-effectiveness* may be analyzed, along with the client's transportation needs, to prioritize treatment features or locations for implementation. *Cost-effectiveness* is not only a necessary consideration for environmental protection and restoration projects for which funding may be limited, but is also an accepted and well-documented tool for prioritizing potential treatment features in an area (Weaver and Sonnevil, 1984; Weaver and Hagans, 1999; Weaver et al., 2006). A quantitative estimate for cost-effectiveness is determined by dividing the cost of accessing and treating a feature by the volume of sediment prevented from being delivered to local stream channels. The resulting value, or *sediment savings*, provides a comparison of cost-effectiveness among features, and an average for the entire project area. For example, if the cost to develop access and treat an eroding stream crossing is projected to be $5000, and the treatment will potentially prevent 500 yd^3 of sediment from reaching the stream channel, the predicted cost-effectiveness for that feature would be $\$5000/500yd^3$, or $\$10/yd^3$.

PWA further evaluates cost-effectiveness for an entire assessment area by organizing features into logistical groups based on similar requirements for heavy equipment and materials, and addressing these as a unit to minimize expenses. Furthermore, although features and road segments with the lowest immediacy ratings are placed last on the list for treatment, it is sometimes possible to treat these features once the project is underway, as opportunities to cost-effectively treat low-immediacy features often arise when heavy equipment is already located nearby to perform maintenance or restoration at higher-immediacy features.

1.4 Appendix A references

Furniss, M., Flanagan, S., and McFadin, B., 2000, Hydrologically-connected roads: An indicator of the influence of roads on chronic sedimentation, surface water hydrology and exposure to toxic chemicals: Fort Collins, CO, USDA Forest Service, Rocky Mountain Research Station, Stream Systems Technology Center, Stream Notes, July, 2000, p. 5-7

Hagans, D.K., Weaver, W.E., and Madej, M.A., 1986, Long-term on-site and off-site effects of logging and erosion in the Redwood Creek Basin, Northern California, *in* Papers presented at the American Geophysical Union meeting on cumulative effects (December 1985): New York, NY, National Council for Air and Stream Improvement Technical Bulletin, no. 490, p. 38-66. Available from: http://www.krisweb.com/biblio/gen_ncasi_hagans_etal_1986_roadsed.pdf

Harr, R.D., and Nichols, R.A. 1993, Stabilizing forest roads to help restore fish habitats: A northwest Washington example: Fisheries, v. 18, no. 4, p. 18-22.

USDA Forest Service, 2000, Water/road interaction field guide: San Dimas, CA, San Dimas Technology and Development Center, 68 p. Available from: http://www.fs.fed.us/eng/pubs/pdf/00771803.pdf

USGS, 1979, Igo, California [map]: Washington, D.C., U.S. Geological Survey, 7.5 Minute Map 40122E5, scale 1:24,000.

Weaver, W.E., and Hagans, D.K., 1994, Handbook for forest and ranch roads: a guide for planning, designing, constructing, reconstructing, maintaining and closing wildland roads: Ukiah, CA, Mendocino County Resource Conservation District, 198 p. Available from: http://www.mcrcd.org/publications/

Weaver, W.E, and Hagans, D.K., 1999, Storm-proofing forest roads, *in* Sessions, J., and Chung, W., eds., Proceedings of the International Mountain Logging and 10th Pacific Northwest Skyline Symposium, Corvallis, Oregon, April 1999: Oregon State University, Forest Engineering Department, p 230-245. Available from: http://www.iufro.org/science/divisions/division-3/30000/30600/publications/

Weaver, W.E., and Sonnevil, R.A., 1984, Relative cost-effectiveness of erosion control for forest land rehabilitation, Redwood National Park, *in* Conference on Erosion Control, Man and Nature, XV, Denver, CO., February 23-24, 1984, Proceedings: Denver, CO, International Erosion Control Association, p. 83-115.

Weaver, W.E., Hagans, D.K., and Madej, M.A., 1987, Managing forest roads to control cumulative erosion and sedimentation effects, *in* Callaham, R.Z., and DeVries, J.J., eds., California Watershed Management Conference, November 18-20, 1986, Proceedings: Berkeley, CA, University of California, Wildland Resources Center, Report 11, p. 119-124. Available from: http://danr.ucop.edu/wrc/pubs.html

Weaver, W.E., Hagans, D.K., Weppner, E., 2006, Part X: Upslope erosion inventory and sediment control guidance, *in* Flosi, G., Downie, S., et al., eds., California salmonid stream habitat restoration manual, 3d. ed.: Sacramento, CA, California Department of Fish and Game, 207 p. Available from: https://nrmsecure.dfg.ca.gov/FileHandler.ashx?DocumentID=3596

W.E., Weppner, E.M. and Hagans, D.K., 2015, Handbook for Forest, Ranch and Rural Roads: A Guide for Planning, Designing, Constructing, Reconstructing, Upgrading, Maintaining and Closing Wildland Roads (Rev. 1st ed.), Mendocino County Resource Conservation District, Ukiah, California. Available from: http://www.pacificwatershed.com/sites/default/files/RoadsEnglishBOOKapril2015b.pdf

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Appendix B

Field observations and treatment recommendations for road related features

Quarry Park Watershed Assessment And Erosion Prevention Planning Project San Mateo County, California

Table B1. Field observations and treatment recommendations for road/trail related sediment source sites. Quarry Park Watershed Assessment and Erosion Prevention Planning Project, San Mateo County, California.

Site #	Road/trail Name	TI	Future sediment delivered (yds^3)	Hydrologically connected road/trail length (ft)		Comment on Problem	Comment on treatment
				Left	Right		
Abbreviations and Acronyms: BOT = Bottom of excavation; TOP = Top of excavation; IPOS = In-place outslope; CMP = Corrugated metal pipe; OBF = Outboard edge of fill; IBF = Inboard edge of fill; TI = treatment immediacy; and yd^3 = cubic yards; DRC = Ditch relief culvert; IBD = Inboard ditch. Left and Right directions are referenced as looking downstream or downslope.							
1	Meadow Trail Spur 3	HM	116	0	0	A Class II stream crossing at a terminal landing. Stream flow is actively eroding a large gully. There is a network of legacy skids in the immediate area. The road surface leading to the site is densely vegetated. There is a bedrock cascade at the TOP. Future erosion has been calculated with gully dimension enlargement.	1) Decommission crossing, excavate TOP to BOT, establish a 5' wide channel bottom with 2:1 side slopes. 2) Store spoils locally, utilize materials for local IPOS on right road approach.
2	Meadow Trail	M	601	75	687	A large Class II stream appears to have been ponded in the past by the construction of two berms/levees. The ponds have since been filled with aggraded sediments, the upstream channel has been heavily tractored. Stream flow is conveyed through two 15" undersized culverts, one is upstream and the other downstream of the active trail. The culverts have been installed at a shallow grade and high in the fill. A 6' headcut has formed downstream of the lower culvert outlet. The existing trail traverses along the inboard edge of the lower past pond feature.	1) Excavate TOP to BOT, remove both culverts. Define new 8' wide channel bottom with 2:1 slopes from TOP to the new culvert inlet, and define an 8' wide channel bottom from the culvert outlet to the BOT. 2) Install a new 48"x 70' corrugated metal pipe at base of fill. 3) Define an 8' wide channel with 2:1 slopes below new corrugated metal pipe outlet for 200'. 4) Store spoils locally for IPOS on Quarry Park trail 9B, use remaining soils to raise and shape the left road to parking lot. 5) Install $5yds^3$ of 0.5' to 1.5' diameter armored rock at outlet to act as an energy dissipater. 6) Install a galvanized trash rack. 7) Install 3 rolling dips on right road approach. 8) Outslope and fill ditch for 687' of right road approach.

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Site #	Road/trail Name	TI	Future sediment delivered (yds^3)	Hydrologically connected road/trail length (ft)		Comment on Problem	Comment on treatment
				Left	Right		
Abbreviations and Acronyms: BOT = Bottom of excavation; TOP = Top of excavation; IPOS = In-place outslope; CMP = Corrugated metal pipe; OBF = Outboard edge of fill; IBF = Inboard edge of fill; TI = treatment immediacy; and yd^3 = cubic yards; DRC = Ditch relief culvert; IBD = Inboard ditch. Left and Right directions are referenced as looking downstream or downslope.							
3	Pond Trail	M	97	0	165	A near origin Class III stream crossing with no formal drainage structure. The stream is forming from an extensive network of skid road drainages and is conveyed down a through cut skid. The upstream channel is tractored to headwaters. The stream drains to a pond downstream. There is active headcutting through a lower skid prism.	1) Excavate from TOP to BOT and Install a 24"x50' long culvert. 2) Upon fill rebuild establish a 30-degree angle and armor lower 1/4 OBF with 7 yd^3 of 1-2.5' diameter riprap 3) Install 3 yd^3 of 0.5-1.5' diameter rip rap at CMP outfall for energy dissipation. 4) Install a critical dip along the left hingeline. 5) Decommission stream crossing through the lower road crossing from TOP#2 at the outlet of the new culvert to BOT#2 at the base of the headcut. Establish a 4' wide channel bottom with 2:1 sideslopes throughout the excavation. 6) Spoil locally for and utilize the spoil materials to decommission the lower road alignment via IPOS road decommissioning treatment. 7) Install 5 cross road drains up road on right bank of upstream channel reach. 8) Rock road through crossing with 10 yd^3 road rock.

Table B1. Field observations and treatment recommendations for road/trail related sediment source sites. Quarry Park Watershed Assessment and Erosion Prevention Planning Project, San Mateo County, California.

Site #	Road/trail Name	TI	Future sediment delivered (yds^3)	Hydrologically connected road/trail length (ft)		Comment on Problem	Comment on treatment
				Left	Right		
Abbreviations and Acronyms: BOT = Bottom of excavation; TOP = Top of excavation; IPOS = In-place outslope; CMP = Corrugated metal pipe; OBF = Outboard edge of fill; IBF = Inboard edge of fill; TI = treatment immediacy; and yd^3 = cubic yards; DRC = Ditch relief culvert; IBD = Inboard ditch. Left and Right directions are referenced as looking downstream or downslope.							
4	Meadow Trail	H	9259	25	0	Overflow of an instream pond on a Class II system which has no formal drainage structure. Fill face of dam appears stable other than the uncontrolled spillway at right hinge of stream crossing. Overflow is bifurcated 45' down road by a dysfunctional sandbag check dam, which is shunting some of the flow across the road and forming a gully near the dam face, the rest of the flow is diverted 90' down road where is has caused a failure and washed out most of the road. Sediment is being deposited in broad meadow beneath dam through diffuse channels. Some seepage is occurring through a valve at the base of the dam. Active headcuts pose a threat to the pond with catastrophic potential. A formal drainage structure should be installed at spillway to prevent failure. In depth evaluation of pond is needed for sediment delivery potential and stability analysis.	**Upgrade option** ***(upon request, an engineered design package will provide complete treatment details based on County Parks short/long term preference)*** 1) Install a 48"x30' culvert in the axis of the spillway to convey flows through the levee. 2) Attach a 10-degree 48" diameter elbow to the culvert outlet to convey flow into the downspout. 3) Install a 48"x70' downspout culvert to covey the flow to the base of the fill. 4) Define a rocked outboard fillslope to act as an emergency spillway in the event of culvert plugging. Define a keyway 75' long x 25' wide at the top x 20' wide at the base x 3' deep on average. Rock armor the spillway with 190yd^3 of 0.5'-2.5' rock armor. 5) The CMP should be installed with 6 culvert stakes driven into the slope no more than 40 feet apart in accordance with the manufacturer's recommendations. A 3/8 galvanized wire rope should extend from the top set of culvert stakes to the bottom set and bonded to the CMP at every joint to distribute the load. 6) Install a culvert 48" diameter "T" at the outlet of the culvert to dissipate outflow energy onto rock armor.

Table B1. Field observations and treatment recommendations for road/trail related sediment source sites. Quarry Park Watershed Assessment and Erosion Prevention Planning Project, San Mateo County, California.

Site #	Road/trail Name	TI	Future sediment delivered (yds^3)	Hydrologically connected road/trail length (ft)		Comment on Problem	Comment on treatment
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Abbreviations and Acronyms: BOT = Bottom of excavation; TOP = Top of excavation; IPOS = In-place outslope; CMP = Corrugated metal pipe; OBF = Outboard edge of fill; IBF = Inboard edge of fill; TI = treatment immediacy; and yd^3 = cubic yards; DRC = Ditch relief culvert; IBD = Inboard ditch. Left and Right directions are referenced as looking downstream or downslope.							
5	Meadow Trail Spur 2	M	2	0	85	A low volume Class II stream crossing on a small mountain bike trail in an alluvial setting. Downstream of crossing the majority of stream flow is diverting to Meadow Trail access road. Efforts have been made to mitigate this diversion. A ditch has been recently constructed 130' downstream to divert the flow back to its original orientation but has failed. The flow has traveled down the park road forming multiple large gullies in road surface. The majority of the diverted stream flow travels to Site #6 and has formed a large sediment fan.	1) Install an armored fill stream crossing, lower road by at least 1' in axis of dip, construct broad dip such that it disconnects road approaches. Excavate a keyway 18' wide at the top x 12' wide at the base x 10' long x 2' deep, armor the keyway with $12yd^3$ of 0.5-2' diameter rock armor. 2) Rock road through stream crossing with 5yds of road rock. 3) Define channel from base of keyway to BOT#2 downstream from the crossing, establish an 8' wide x 150' long x 1.5' deep channel with 2:1 sideslopes to convey flow back to natural channel and prevent future diversions.. 4) Outslope and remove ditch for 85' on right road approach. 5) Store the spoil materials locally on the trail approaches and utilize the material for trail shaping.
6	Meadow Trail	HM	177	0	904	Concentrated road runoff and diverted stream flow has eroded multiple gullies down the road. Gullies have been intersected via several recently installed non-functioning crossroad drains. The majority of the sediment has laid out in the alluvial meadow up road from the parking lot near cement pad. The fans will continue to build and may gully through and deliver to the Class II stream. Stream channel definition prescribed at Site #5 should abate active diversion.	1) Install 6 rolling dips up the right road approach. 2) Rock road at each rolling dip, install $10yd^3$ of coarse road rock at through the trough of each dip feature, $60yd^3$ total road rock. 3) Install sediment basin at edge of meadow 20' wide x30' long by 3' deep with 3:1 sideslopes.

Table B1. Field observations and treatment recommendations for road/trail related sediment source sites. Quarry Park Watershed Assessment and Erosion Prevention Planning Project, San Mateo County, California.

Site #	Road/trail Name	TI	Future sediment delivered (yds^3)	Hydrologically connected road/trail length (ft)		Comment on Problem	Comment on treatment
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7	Dolphine Fire Road	HM	62	156	278	A fill crossing on a Class III stream. There is a small springy swale to the left which should be conveyed into crossing. There is aggraded sediment at the inboard edge of fill which has developed a fan. The crossing is dipped adequately, flow is actively gullying the outboard edge of fill.	1) Install an armored fill, clear the fan at the inboard edge of the road, establish a broad dip that conveys stream flow though the crossing and lower the road by 1' through the axis of the dip, excavate a keyway 21' wide at the top x 8' wide at the base x 21' long x 2' deep, armor the keyway with $25yd^3$ of 0.5'-2' diameter rock armor. 2) Rock road with through the crossing with $15yd^3$ of road rock. 3) Outslope and fill ditch for 278' of right road. 4) Install 1 rolling dip on the right road approach.
8	Dolphine Fire Road	H	210	92	417	Class III stream flow is conveyed through this crossing via an undersized 15" diameter corrugated metal pipe that is installed high and short in the fill. The inlet of the culvert is 50% plugged. A section of the outboard fill has failed, exposing the bent culvert in the outboard fill vacancy. There is a stump on the edge of the outboard fill exhibiting basal flair. The upstream channel reach has been heavily tractored.	1) Excavate TOP to BOT, replace corrugated metal pipe with new 30"x60' culvert at the base of fill. 2) Excavate 35' upstream and define a 4' wide channel bottom with 2:1 sideslopes. 3) Install critical dip on left hinge of the stream crossing. 4) Place $5yd^3$ of 0.5'-2' diameter rock armor as energy dissipater. 5) Upon fill rebuild armor lower 1/4 of outboard fill with $10yd^3$ of 2-3' diameter rock armor to buttress the steep fillslope. 6) Spoil locally on road to left and right, utilize spoil material for outslope road fill ditch road upgrade treatment. 7) Install a single post trash rack.

Table B1. Field observations and treatment recommendations for road/trail related sediment source sites. Quarry Park Watershed Assessment and Erosion Prevention Planning Project, San Mateo County, California.

Site #	Road/trail Name	TI	Future sediment delivered (yds^3)	Hydrologically connected road/trail length (ft)		Comment on Problem	Comment on treatment
				Left	Right		
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9	Dolphine Fire Road	HM	92	0	110	A flashy Class III stream is conveyed through this crossing via an undersized 15" diameter corrugated metal pipe. The culvert is installed high and short in the fill. The outboard edge of fill has failed, resulting in a shotgunned outlet with an 11' plunge. Upstream channel has been heavily tractored. This crossing is actively failing. The outlet of the culvert is crushed.	1) Excavate TOP to BOT, replace existing culvert with a new 30"x 50' corrugated metal pipe at the base of fill. 2) Install a single post trash rack. 3) Install rock armor to the lower 3/4 of the outboard edge of fill with $21yd^3$ of 1'-3' diameter rock. 4) Place $4yd^3$ of 0.5'-1.5' diameter rock armor at outlet as an energy dissipater. 5) Enhance the critical dip on left hinge of stream crossing. 6) Outslope road and fill ditch for 110' on right road approach. 7) Store spoil materials locally on road to left and right.
10	Dolphine Fire Road	H	6	120	120	Concentrated road runoff from the hydrologically connected road is evacuating the road at this location. The uncontrolled flow has eroded a gully down the outboard fillslope which has laterally destabilized the slope and caused a failure in the outboard fill. Flow is being directed to the failure along a 60' long berm on the right road approach. The berm was likely created by storing material from a failed cutbank on the outside edge of fill.	1) Excavate perched material on either side of failure from left to right 20' wide x 15' long x 1' deep, spoil locally and use material for rolling dip and outsloping. 2) Install armored fill at existing drainage outflow location, establish a broad dip that conveys flow into the axis of the keyway, excavate a keyway 15' wide at the top x 7' wide at the base x 15' long x 2' deep, armor the keyway with $12yd^3$ of 0.5'-1.5' diameter rock armor. 3) Install 1 rolling dip on left road approach and outslope the left road for 120'. 4) Inslope right road approach for 160' through site #11, and retain a berm to avoid outletting flow onto the unstable slopes below the road.

Table B1. Field observations and treatment recommendations for road/trail related sediment source sites. Quarry Park Watershed Assessment and Erosion Prevention Planning Project, San Mateo County, California.

Site #	Road/trail Name	TI	Future sediment delivered (yds^3)	Hydrologically connected road/trail length (ft)		Comment on Problem	Comment on treatment
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11	Dolphine Fire Road	HM	38	0	163	A section of perched outboard edge of fill has failed with delivery to a Class II stream downslope. There are cracks in remaining material along the outboard edge of fill. The right road is connected for 163'. The decomposed granite cutbanks are raveling.	1) Excavate the perched outboard fill material from left to right, 60' wide x 15' long x 1.5' deep. 2) Install 1 rolling dip up right road approach at swale, and outslope right road approach for 163'. 3) Spoil locally to left and right. 4) Install a $5yd^3$ keyway at the outboard edge of fill break in slope at the outlet of the rolling dip.
12	Dolphine Fire Road	M	119	15	90	Class III stream flow is conveyed through this crossing via an undersized 15" diameter culvert. The channel upstream of the culvert is a box channel with a bedrock nick point upstream. The culvert has been installed short and high in the fil and is undersized. There is aggraded sediment aggraded at the inlet of the culvert. The channel has incised through the old tractored fill upstream of the crossing. Shallow bedrock may inhibit excavation. Cutbanks are composed of decomposed granite. There is a 2' diameter tree under the existing culvert in the outboard edge of fill, and a large tree is laying in the channel downstream of crossing.	1) Excavate TOP to BOT, remove the existing culvert and install a new 36"x 50' culvert at the base of fill. 2) Upon rebuild of the outboard fillslope armor the lower 3/4 of slope with $27yd^3$ of 2'-3' diameter armored rock to buttress the steep fillslope. 3) Install an energy dissipater at culvert outfall with $3yd^3$ of 0.5-1.5 diameter rock. 4) Install a critical dip at left hinge of crossing. 5) Define a 4' wide channel bottom with 2:1 sideslopes from the TOP to the culvert inlet for 60' 6) Outslope and remove berm on right road approach for 90' 7) Establish 15' wide road through the crossing upon fill rebuild. 8) Install a single post trash rack at the inlet of the culvert.

Table B1. Field observations and treatment recommendations for road/trail related sediment source sites. Quarry Park Watershed Assessment and Erosion Prevention Planning Project, San Mateo County, California.

Site #	Road/trail Name	TI	Future sediment delivered (yds^3)	Hydrologically connected road/trail length (ft)		Comment on Problem	Comment on treatment
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13	Dolphine Fire Road	HM	112	0	85	Class III stream flow is conveyed through this crossing via an undersized 15" culvert which is set high and short in the fill. A large part of the outboard edge of fill has failed due to being oversteep and likely saturated by road runoff from the right approach. Logs have been placed on the right outboard edge of fill. Remaining outboard edge of fill is near vertical and prone to future failure.	1) Excavate TOP to BOT, replace existing culvert with a new 36"x 50' corrugated metal pipe at the base of fill, clear debris and define channel below BOT for 15' 2) Lay back streamside banks upstream of TOP for 35' to the bedrock headcut. 3) Install a single post trash rack at the culvert inlet. 4) Outslope road and remove ditch on right road for 85'. 5) install 1 rolling dip 6) Install energy dissipater at culvert outlet with $5yd^3$ of 1'-2.5' diameter rock armor. 7) Install a critical dip on the left hinge of the crossing. 8) Armor the lower 3/4 of the outboard edge of fill slope with 8' wide at the top x 20' wide at the base x 12' long x 3' deep with $20yd^3$ of 1'-3' diameter armored rock.
14	Dolphine Fire Road	M	6	0	375	Headwall swale flow and combined concentrated road runoff are directed off the road via a crossroad drain up the right road from Site #13. An armored fill crossing should be installed to disconnect diverted flow. There is active rilling and gullying development occurring which is ultimately delivering to the Class II stream downstream of crossing Site #13.	1) Construct an armored fill crossing; establish a broad dip that conveys flow, excavate a keyway 20' wide at the top x 8' wide at the base x 18' long x 3' deep, armor the keyway with $30yd^3$ of 0.5-1.5' diameter rock armor. 2) Outslope road and remove ditch on right road approach for 350' 3) Install 1 type 1 rolling dip up right road.

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15	Dolphine Fire Road	M	56	30	156	Combined diverted stream flow from Site #16 and concentrated road runoff have formed two active gullies in middle of the road. The gullies exit the road surface and are actively eroding down the outboard fillslope and delivering to a Class III stream downslope from the road. Treatment of Site #16 should abate the majority of the flow from the right road approach.	1) Treat Site #16 to mitigate the stream crossing diversion. 2) Install 2 rolling dips up the right road approach. 3) Outslope road and fill ditch for 160' of right road approach. 4) Outslope road and fill ditch for 30' of left road approach.
16	Dolphine Fire Road	M	8	0	130	A Class III stream is actively diverting down the left road to the road surface discharge Site #15. The right road is connected for 130'. The stream crossing is on the edge of the forest, flow emerges from underneath thick brush and duff. There is an active spring to the left which should be incorporated into the new crossing. The crossing is at the head waters of the Denniston Creek drainage and drains into a large pond downstream. There is a large volume of sediment suspended upstream of this crossing due to past debris torrent at Site #40. This site should be maintained as sediment pulses through the system to prevent failure.	1) Construct an armored fill crossing; establish a broad dip that conveys stream flow though the crossing, excavate a keyway 18' wide at the top x 8' wide at the base x 15' long x 2.5' deep, armor the keyway with $20yd^3$ of 0.5-1.5' diameter rock armor. 2) Outslope and remove ditch for 130' on the right road approach. 3) Install 1 rolling dip on the right road approach. 4) Rock the road through the crossing with $20yd^3$ of road rock.

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17	Quarry Trail	M	32	27	564	A low volume fill crossing on a Class III stream. There are 2 connected roads on the right and a short portion on the left. The long right approach coming down from Site #35 is actively rilling and delivering to the crossing. The treatment immediacy at this site will increase as will active erosion as upstream diversions are corrected.	1) Construct an armored fill crossing; establish a broad dip that conveys stream flow though the crossing, excavate a keyway 18’ wide at the top x 8’ wide at the base x 14’ long x 2’ deep, armor the keyway with 15yd^3 of 0.5-1.5’ diameter rock armor. 2) Install a sediment basin downstream and to the right of the crossing, 6' wide x 10' Long with 3:1 sideslopes. 3) Outslope road and fill ditch on the longer right road approach that comes down from Site #35 for 371'. 4) Install 2 rolling dips on the right road approach. 5) Outslope road for 27' on left road approach. 6) Define a 5' channel bottom with 2:1 sideslopes upstream of crossing for 150'. 7) Spoil locally.

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19	Middle Ridge Trail Legacy road	H	186	165	20	Class III stream flow and emergent cutbank spring flow are actively saturating and eroding the fill at this crossing. There is no formal drainage structure, and the road fill is actively failing. The outboard fillslope is long and oversteep. The road has been installed through the headwall area of this Class III stream. There are numerous active cutbank slides on the right road approach, and a large section of the road fill has failed on the right hinge of the crossing. There is a residence atop the slope that is actively conveying drainage to this swale from the graded flat. There is a section of exposed culvert on the hillslope above the crossing. There is a large tree in the axis of the channel that is undercut by recent failures and prone to failure. This site appears to be on the property boundary. Additionally, there are large scarps upslope of the crossing that are indicative of a potential torrent activity if the entire swale were to fail. This large-scale failure would likely blow out stream crossing site #7 downstream. Treatment at this site may be contentious due to the fact that one of the factors of instability may be the excessive drainage being conveyed to the crossing from the property at the top of the hill. The Client should be advised of the potential property boundary issue.	1) Decommission the stream crossing, excavate from TOP to Bot and establish a 4' wide channel bottom with 2:1 slopes. 2) Construct a rock grade control structure (GCS) at the TOP of the excavation. Excavate a 20' wide x 10 ' long x 3' deep keyway at the top of the excavation and armor the keyway with $25yd^3$ of 0.5-2.5' diameter armor to stabilize any potential headcutting. 3) Construct a rock GCS at the BOT of the excavation. Excavate a 20' wide x 10 ' long x 3' deep keyway at the top of the excavation and armor the keyway with $25yd^3$ of 0.5-3' diameter armor to stabilize any potential headcutting. 4) Store spoil materials locally on the road to the left and utilize spoil materials for local IPOS. NOTE: Due to the driving factor of instability potentially being the excessive drainage being conveyed to the crossing from the property at the top of the hill, treatment design will require investigation of the neighboring drainage infrastructure to determine impact to the site.

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20	Pond Trail	ML	154	0	332	A crossing on a small near origin Class III stream with no formal drainage structure. The channel upstream of the crossing is heavily tractored. The stream morphology is diffuse due to the dense debris layer. The right road approach is heavily vegetated. This site drains to the pond associated with Site #4. There is a second road prism downslope of this crossing that should be decommissioned in concert with this crossing. The site is not actively disaggregating, but if the road were re-opened the site would be an erosion issue.	1) The crossing through the main road alignment will be upgraded and the lower crossing will be decommissioned. Excavate from TOP#1 to BOT#1 and install a 24"x60' CMP at the base of fill. 2) Install a critical dip on the left hinge of the crossing. 3) Rebuild the road 12' wide through the axis of the crossing, establish a 45 degree inboard fillslope rebuild and rock the entire inboard fillslope with $5yd^3$ of 0.5'-2' diameter rock armor to buttress the steep fill and prevent scour. 4) Rebuild the outboard fillslope at 42 degrees and armor the lower 3/4 of the fillslope with $40yd^3$ 1'-3' rock armor to buttress the steep fillslope. 5) Install $3yd^3$ of 0.5'-2' diameter rock armor at the culvert outfall to serve as energy dissipation. 6) Install 3 rolling dips up the right road approach. 7) Outslope and fill ditch for 332' up the right road approach. 8) Decommission the lower stream crossing, excavate from TOP to BOT and establish a 4' wide channel bottom with 2:1 slopes. 9) Store spoil materials locally on the left road and utilize spoil materials for local IPOS.

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21	Pond Trail	ML	105	0	421	A headwall swale with emergent spring flow. The spring flow delivers to a Class III stream downslope. The road bench and the cutbank are very springy and vegetated with hydrophilic vegetation. The road is effectively dipped through the crossing to prevent diversion. Class II Denniston Creek is at the base of the stream valley downslope of the crossing.	1) Excavate from TOP to BOT and install a new 24"x60' CMP at the base of fill. 2) Upon fill rebuild establish a 12' wide road through the axis of the crossing and an outboard fill rebuild angle of 40 degrees. Armor the lower 3/4 of the outboard fillslope with 50yd^3 of 1'-3' diameter rock armor to buttress the steep fillslope. 3) Install 3yd^3 of 0.5-2' diameter rock armor the outlet of the newly installed culvert to serve as energy dissipation. 4) Install 2 rolling dips on the right road approach. 5) Outslope and fill ditch for 427' of right road.
22	Meadow Trail	L	14	502	0	A near origin low power Class III stream crosses the road with no formal drainage structure. Sediment is actively being deposited on the right road for ~200'. The left road is contributing flow for 502'. Active erosion at the site is minimal, and flow is actively diverting down the right road. There is a swale 220' up the left road approach that should be drained across the road.	1) Construct an armored fill crossing; establish a broad dip that conveys stream flow though the crossing, excavate a keyway 18’ wide at the top x 8’ wide at the base x 15’ long x 2’ deep, armor the keyway with 15yd^3 of 0.5'-1.5’ diameter rock armor. 2) Outslope road and fill ditch on left approach for 502'.

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23	Meadow Trail	M	22	1089	0	A Class II stream crossing at the intersection of Quarry Trail and Meadow Trail. Flow is conveyed through this crossing via an 18" diameter cement culvert. The crossing receives diverted stream flow from Meadow trail and stream flow from stream crossing Site #26. The stream flow appears to overtop the crossing at high flows and is actively eroding he ditch 35' upstream and 185' downstream of the crossing. The stream evacuates the park and flows onto the Columbus Ave. The channel should be defined to prevent erosion and contain the seasonal high flow volumes. Flow is also contributed to the crossing from a marshy alluvial area to the right of the culvert inlet.	1) Excavate from TOP to BOT removing the existing undersized CMP and install a new $13ft^2$ cement box culvert installed at the base of fill. (4' wide x 3.25' tall x 15' long) 2) Define the channel upstream of the crossing for 250', establishing a 5' wide channel bottom with 2:1 banks. 3) Install 3 rolling dips up the left road approach on Meadow Trail. 4) Install 3 rolling dips up the left road approach on Quarry Trail. 5) Define the ditch downstream of the crossing 5' wide with 2:1 banks to Columbus Ave. 6) Drain 70% of the new surface of the parking lot to the south toward the playground into the grassy alluvial setting. 7) Remove and replace the fencing as necessary.
24	Meadow Trail Spur 1	L	33	20	200	A small makeshift bridge crosses a Class II stream on a small single-track trail Meadow Trail Spur 1. The channel upstream and downstream of the crossing avulses during high flow events. The stream banks are near vertical. The bridge is not a permanent crossing but appears to be moderately stable.	1) Upgrade the existing crossing by installing a rocked ford crossing, remove the bridge and define a 6' wide channel bottom and lay the road approaches back to 3:1. Install $5yd^3$ of 0.5-2' diameter rock armor through the channel 10' wide x 6' long x 2' deep 2) Define a 5'-6' wide channel bottom with 2:1 banks upstream and downstream of the crossing for 100' in total length. 3) Rock the road approaches with $5yd^3$ of road rock per approach, for $10yd^3$ total. 4) Install 2 rolling dips on the right road approach.

Table B1. Field observations and treatment recommendations for road/trail related sediment source sites. Quarry Park Watershed Assessment and Erosion Prevention Planning Project, San Mateo County, California.

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25	Quarry Trail	M	25	657	0	A confined section of road and springy ditch has a 12" diameter DRC that conveys flow to stream crossing site #26. The swale upslope does not display any channel morphology. There is significant portion of right IBD that flows to this site as well.	1) Install 1 rolling dip on the left hinge of the crossing to function as a critical dip. 2) Install 4 rolling dips on the right road approach. 3) Outslope road and fill ditch for 650' of right road approach. 4) Replace the existing 12" DRC and install an 18"x40' DRC at the base of fill.
26	Quarry Trail Spur 1	ML	97	0	0	A Class II stream in an alluvial setting is conveyed through this site via a 15" diameter culvert with a dropped inlet. The stream valley has been dammed via a levee that conveys all stream flow in the valley to this pond. The ponded area also receives flow from Site #25. The area should be decommissioned, and the stream valley should be redefined up and downstream of the crossing. The channel could be defined from Site #17 to Site #23 which would include the removal of many large diameter trees.	1) Decommission the stream crossing, excavate from TOP to BOT and establish a 6' wide channel bottom with 2:1 sideslopes. 2) Remove the levee and pond area and convey the DRC outflow from Site #25 to this crossing. 3) Revegetate the disturbed riparian area with willows. 4) Define the channel upstream of the crossing for 200', establish a 6' wide channel bottom with 2:1 banks. 5) Define the downstream channel 6' wide with 2:1 banks to the TOP of Site #23.
27	Miranda East Fire Road	ML		633	165	A DRC in a headwall swale setting. There is a 24" diameter DRC that with a T-outlet that delivers IBD flow from and upslope road prism to this site. The crossing is effectively dipped, but the left road approach is long and insloped. Combined DRC and road run off deliver to the downstream swale with no active erosion.	1) Clean the outlet area and install $3yd^3$ of 0.5-1.5' diameter rock armor to serve as energy dissipation. 2) Inslope the road through the slide up the left road approach for 80'. 3) Install 4 rolling dips on the left road approach. 4) Outslope and fill ditch for 700' of left road approach, do not outslope the road through the slide feature. 5) Maintain the DRC up the left road approach, open outlet and clean IBD.

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28	Vista Point Trail	M	27	235	0	A 24" diameter DRC with active IBD flow. The inlet is 50% plugged. There is a 3' drop at the outlet of the DRC with a gully working headward into the OBF slope. The DRC is currently conveying a long section of IBD and spring flow from Site #29. There is also a 75% plugged DRC up the left road approach.	1) Outslope the left road approach for 235'. Retain the active IBD approach to the DRC up the left road and clean the inlet. 2) Armor the DRC outfall to prevent splash zone erosion, install $3yd^3$ of 0.5-1' diameter rock armor and define spillway.
29	Vista Point Trail	M	115	463	0	A headwall setting with emergent spring flow. Spring flow along with inboard ditch flow from the left approach deliver to Site #28 down the right road. The springy headwall swale should be delivering flow to the downslope swale across the road, but the majority of flow is currently gullying down the right road approach. The inboard fill area is very wet and there is a large downed tree.	1) Install a 30"x50' CMP at the base of fill on the right hinge of the turn. 2) Clean and define the upslope area to convey spring flow into the culvert inlet. 3) Install a critical dip on the right hinge of the crossing. 4) Outslope and fill ditch for 463' of left road approach. 5) Install 3 rolling dips on the left road approach, connected to cutbank. 6) Rebuild the inboard fillslope at 40 degrees and install 5yd of 1'-2' diameter rock armor on the inboard fillslope to buttress the steep fill. 7) Armor the lower half of the outboard fillslope with $10yd^3$ of 1'-2' diameter rock armor. 8) Install a single post trash rack. 9) Install $2yd^3$ of 1' diameter rock at the culvert outfall to serve as energy dissipation.

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30	Vista Point Trail	M	116	579	0	An at origin Class III stream crossing in a headwall swale. Road diverts stream flow to right. Combined road runoff and stream flow have diverted over the outboard edge of fill 50' to the right, resulting in a laterally destabilized outboard fillslope. 90% of the outboard fill at this location has failed. There is a cutbank failure above the washed out outboard fillslope where spoils have been stored/unintentionally perched. Road surface drainage should not be discharged at this location.	1) Install an armored fill crossing, establish a broad dip that conveys stream flow across the road, excavate a keyway 25' wide x 10' wide x 25' long x 2.5' deep, and armor the keyway with $40yd^3$ of 0.5-2.0' diameter rock armor. 2) Outslope road and fill ditch for 579' of left road. 3) Install 3 rolling dips up the left road approach. 4) Pull the outboard berm at the OBF failure to the right and inslope the road through the feature (~50'), direct drainage to the next rolling dip outlet.

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31	Vista Point Trail	M	124	265	0	A stream crossing on a near origin Class III stream with emergent springs in a headwall setting with no formal drainage structure. Diverted stream flow from Site #30 up the left road approach and Class III stream flow have saturated the fill and induced a failure on the outboard edge of the fill prism. Sediment from the fill failure has delivered to a Class II stream approximately 125' below the road. Remaining perched outboard fill will likely continue to fail and deliver sediment. Additionally, the stream flow is also partially diverted down the right road.	1) Excavate remaining perched fill on the outboard edge of the road to the left and right of the crossing for 50'. 2) Excavate TOP to BOT and Install a new 24"x60' culvert at the base of fill. 3) Upon fill rebuild rock the lower 3/4th of the outboard fillslope with $30yd^3$ of 1'-3' diameter rock armor to buttress the steep fill face. 4) Construct an rock apron at the culvert outfall with $2yd^3$ of 0.5'-1' diameter rock armor to serve as energy dissipation. 5) Install critical dip on the right hinge of the crossing 6) Outslope road and fill ditch on left road approach for 120'. 7) Install 1 rolling dip up the left road approach. 6) Install single post trash rack at the inlet of the culvert. 7) Install $3yd^3$ of 0.5'-1' diameter rock armor on the lower half of the inboard fillslope.

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32	Vista Point Trail	HM	242	324	0	An intermittent Class II stream is conveyed through crossing via a 12" diameter corrugated metal pipe with a vented drop inlet. Sediment has aggraded above crossing to the TOP. This site has a high diversion potential. The left inboard ditch is actively conveying springy flow into the crossing. The road surface is actively rilling/gullying. Another road runs above the right bank of the crossing.	1) Replace existing CMP, excavate TOP to BOT and install new 36"x60' CMP at base of fill. 2) Bowl out the immediate upstream channel reach to convey active ditch flow into new culvert inlet. Convey 65' of left inboard ditch into the new CMP inlet. 3) Install 3 rolling dips up the left road approach. 4) Construct critical dip at right hinge of crossing. 5) Install $3yd^3$ of 0.5'-2.0' diameter rock armor at new culvert outlet to act as energy dissipater. 6) Store spoil materials locally, and utilize spoils to outslope road to the left and right. 7) Outslope left road approach and fill ditch for 325' 8) Install a single post trash rack.

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33	Dolphine Fire Road	L	15	564	1277	A near origin Class III stream is actively diverting down right road. This site has no formal drainage structure at the crossing. A skid road running along the right hillslope above crossing also intersects at this point and shows evidence of conveying flow.	1) Construct an armored fill crossing; establish a broad dip that conveys stream flow though the crossing, excavate a keyway 18’ wide at the top x 8’ wide at the base x 15’ long x 2’ deep, armor the keyway with 15yd^3 of 0.5'-1.5’ diameter rock armor. 2) Outslope road and fill ditch on right approach for 827'. 3) Outslope road and fill ditch on left approach for 564'. 4) Install 4 broad Type I rolling dips connected to the cutbank on the left road approach. 5) Install 6 broad Type I rolling dips connected to the cutbank on the right road approach. 6) Install 6 cross road drains on hiking trail above right bank.
34	Vista Point Trail	HM	178	811	0	Convergent concentrated road runoff has combined with spring flow to cause a 30' wide failure to form in the outboard fill. A cross road drain 20' down from the fork of Vista Point Trail and a spur off Dolphine Fire Road is actively diverting flow to the outboard edge of fill. Active 2' wide by 1' deep gullies are incising the road. Sediment from the gullies and outboard fill are being delivered to a Class II stream below.	1) Outslope road and remove ditch for both right road approaches on Dolphine Fire Road and South Ridge Road Spur. 2) Install 1 rolling dip where the roads converge. 3) Install 1 rolling dip on the right road approach for Dolphine Fire Road. 4) Install 4 rolling dips on the right road approach for South Ridge Road Spur. 5) Excavate perched outboard fill 50' wide x 10' Long x 1' Deep, maintain drivable road width.

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35	Vista Point Trail	HM	611	742	0	A marshy intermittent Class II stream is actively diverting down right ditch and delivering flow to fill crossing at road intersection where Site #17 is located. The stream channel has been heavily tractored. The upper stream channel reach has split flow for 175', the channels combine at the aggraded sediments upstream of road and divert right. The left ditch is actively conveying sediment from the inboard ditch and insloped road surface to this crossing. Channel should be decommissioned upstream of crossing for 200'; however, a steel culvert may be installed without optional upstream decommission if aggraded sediment is excavated.	1) Excavate TOP to BOT, install a new 36"x 60' corrugated metal pipe at base of fill. 2) Bowl out inlet area to convey spring flow into inlet and clear aggraded sediment. 3) Construct a critical dip on right hinge of crossing. 4) Decommission upstream bifurcated channel for 250' up to TOP #1, define a 5' wide channel bottom with 2:1 banks. 5) Install 4 type 1 rolling dips connected to cutbank up left road. 6) Install a single post trash rack 7) Spoil on road Quarry Park trail 9 to raise road and establish an outsloped road surface. 8) Establish 20' wide road at stream crossing. 9) Outslope and fill ditch for 742' of left road approach.

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36	Quarry Trail	HM	54	0	360	Flow from a Class II stream along with concentrated road run off is conveyed through an undersized 12" corrugated metal pipe. A 2' headcut has formed in the stream 3' in front of the culvert inlet in what appears to be an old pond levee. The outlet delivers to an alluvial watercourse downstream of road. Gullies are forming on the right road approach.	1) Excavate TOP to BOT and replace existing culvert with a 24"x 50' corrugated metal pipe at the base of fill. 2) Install critical dip at left hinge of crossing. 3) Outslope right road for approach for 360'. 4) Install a type 2 rolling dip on right road approach at edge of landing and 1 rolling dip midway up right road approach. 5) Install a single post trash rack. 6) Armor lower 1/4 of outboard fill slope with 8 yd^3 of 1'-2' diameter rock armor. 7) Armor lower 1/2 of inboard fill slope with 2 yd^3 of 1'-2' diameter rock armor. 8) Remove berm along right road for 200'.

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37	Quarry Floor Trail	M	149	0	0	A pond in a large landing within a large quarried area. Several springs are contributing flow to the pond. The pond fill face has a gully through the right hinge that appears to be occupied during high flow events and will continue to enlarge over time until the pond is undercut. Considerable seepage from the pond is saturating through the base of the small levee that is forming a marshy ponded area situated upstream from site #36. This site can be decommissioned, and the trail retained. Additionally, the inboard landing ditch conveys flow to the head of the pond. If levee were to episodically fail site #36 would likely be deleteriously impacted.	1) Decommission pond, drain pond and excavate from TOP to BOT, to the TOP of Site #36. Define a 4' channel bottom with 2:1 sideslopes. 2) Spoil locally and use spoil material to construct dips on trail. 3) Define 2 broad dips at the two flagged springy locations and install 2 armor fills, establish a broad dip that conveys spring flow though the crossing, excavate a keyway 20' wide at the top x 10' wide at the base x 15' long x 2.5' deep, armor the keyway with 20yd^3 of 0.5-2' diameter rock armor. (Or install 2 24"x 20' long corrugated metal pipes with energy dissipaters.) 4) Bowl out and define left springy area to convey flow into the corresponding armored fill, convey inboard landing ditch into the right armored fill. 5) Rock road/trail with 20yd^3 for 10' wide x180' long x 0.3 deep. 6) Install rolling dip on right road approach.

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38	South Ridge Vista Trail	M	25	0	600	An at origin Class III stream with emergent spring flow. A hiking trail traverses the axis of the swale. The concentrated road runoff, spring flow and swale sheet flow is diverting down the left road. Flow had previously been delivered to the Class III stream valley just downslope from the road. Social trail should be rocked and shaped to convey flow into the axis of the swale, alternatively the trail could be removed or relocated.	1) Construct an armored fill crossing; establish a broad dip that conveys stream flow though the crossing, excavate a keyway 25' wide at the top x 10' wide at the base x 25' long x 2.5' deep, armor the keyway with 40yd^3 of 0.5-2' diameter rock armor. 2) Decommission/ discontinue the use of the small trail running down the swale upslope from this crossing and install 6 cross road drains. 3) Define a 4' wide channel for 60' upstream of the inboard edge of the road. 4) Rock road through dip with 20yd^3 of rip rap. 5) Outslope road and fill ditch for 320' on right road approach, (Quarry Park trail 8). 6) Define a 4' wide channel with 2:1 sideslopes from BOT to base of keyway.

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39	Miranda East Fire Road	H	770	0	742	A flashy Class III stream is conveyed through this crossing via 2 plugged culverts, 24" and 12". The inlet is completely filled with aggraded sediment. The outboard edge of fill has failed exposing the two culverts. The outboard fill slope is prone to future failure. There is also another failure in the outboard edge of fill at a low in the road 125' to the left of the crossing, this failure delivers directly to the Class III stream at the base of slope and will likely deliver sediment due to future erosion.	1) Excavate TOP to BOT and replace old culverts with a new 54"x 80' corrugated metal pipe at base of fill. Upon Fill rebuild establish a 20' wide road through the axis of the crossing and lower the road surface by 2'. 2) Install a critical dip at the left hinge of crossing. 3) Install 5yd^3 of 0.5-2' diameter rock armor at the outfall. 4) Outslope road and fill ditch for 742' on right road approach. 5) Construct 4 rolling dips on right road. 6) Outslope road and fill ditch for 250' on left road approach. 7) Excavate remaining perched fill at failure on the outboard edge of fill for 120' 8) Rebuild inboard fill at 40 degrees and rock the lower 3/4 of slope 22’ wide at the top x 10’ wide at the base x 6’ long x 2’ deep with 10 yd^3 of 0.5-2' diameter rock armor. 9) Install a galvanized single post trash rack. 10) Rock the road through the crossing with 20yd^3 of road rock.

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40	Private Paved Road	HM	468	687	0	A long section of the inboard ditch off the private paved road delivers to the inlet of this ditch relief culvert. The ditch relief culvert is set shallow in the hillslope, and the inlet area is hardened with concrete. Flow from this site delivers to site #16 approximately 450' downstream. The ditch relief culvert has separated below road and has subsequently eroded a very long 10' deep and 16' wide gully, the gully develops into a juvenile Class III stream channel downslope of the site. The active flow in the inboard ditch infiltrates into the ground upstream of the inlet of the ditch relief culvert and emerges at the base of the headcut at the top of the gully. The main issues associated with this large failure are likely due to an excessive length of springy inboard ditch that delivers to this site, and the shallow depth at which the culvert is installed.	1) Install 2, 18"x60' ditch relief culverts up left road approach. 2) Layback oversteepened banks for 250' define 4' channel bottom with 2:1 slopes. 3) Decommission ditch relief culvert, excavate TOP to BOT at base of existing headcut.
41	Upper Pond legacy road	HM	274	83	2	A Class III stream at a washed out fill crossing. The channel has washed out and left steep tall perched walls on either side of the channel that will likely fail. The bottom of the channel has incised down to component bedrock and will likely not cut down any further. A debris torrent appears to have flowed down the channel in the past, large logs are laying in and across the channel. Several houses are perched directly above the channel at the top of the swale and are in imminent danger of failing.	1) Decommission crossing, install temporary crossing and lay back left and right bank side slopes 2:1 or to stable slopes where applicable. Remove temporary crossing to finish decommissioning site. 2) store spoils locally and use for IPOS on left and right road approaches.

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42	Dolphine Mt Bike Trail	L	66	0	0	A Class III stream at a washed out crossing downstream of Site #14. The channel has eroded down to stable bedrock throughout the channel. Future erosion is minimal and will likely result from small oversteep banks failing along length of channel through road. There is shallow bedrock throughout area. There is a high flow diversion on the left edge of crossing. Shallow bedrock may inhibit excavation.	1) Define channel through remainder of crossing. 2) Spoil on right edge of crossing, reshape banks to keep flow in channel to left. 3) IPOS for 309' on right road approach.
43	Ridge Top Vista Trail Spur 3	HM	22	86	100	A fill crossing on a Class III stream, the stream Is actively eroding the road with an active head cut in the outboard fill. A secondary road prism exists downstream. A springy swale to the right of the crossing should be conveyed through the crossing.	1) Decommission crossing, Excavate TOP to BOT, create a 3' channel bottom with 2:1 streamside banks. 2) Spoil locally. 3) IPOS Left and right road for 186'
44	Ridge Top Vista Trail Spur 5	ML	108	0	324	A Class III stream has washed out a fill crossing. Most of the fill has washed away, creating a large gully and leaving oversteepened gully walls and material perched over the channel. The left bank has cut back to nearly the edge of the valley. The oversteepened right bank will continue to fail and deliver sediment to the downstream watercourse. This large failed fill crossing has likely destabilized the upstream stream reach. There are several undercut residential properties.	1) Decommission crossing, install temporary crossing and remove perched material on left bank, remove material on right bank to a 2:1 slope and remove temporary crossing. 2) Store spoils locally and use for road shaping. 3) Outslope and fill ditch for 324' of the right road. 4) Install 3 rolling dips on the right road approach.

Table B1. Field observations and treatment recommendations for road/trail related sediment source sites. Quarry Park Watershed Assessment and Erosion Prevention Planning Project, San Mateo County, California.

Site #	Road/trail Name	TI	Future sediment delivered (yds^3)	Hydrologically connected road/trail length (ft)		Comment on Problem	Comment on treatment
				Left	Right		
Abbreviations and Acronyms: BOT = Bottom of excavation; TOP = Top of excavation; IPOS = In-place outslope; CMP = Corrugated metal pipe; OBF = Outboard edge of fill; IBF = Inboard edge of fill; TI = treatment immediacy; and yd^3 = cubic yards; DRC = Ditch relief culvert; IBD = Inboard ditch. Left and Right directions are referenced as looking downstream or downslope.							
45	Ridge Top Vista Trail Spur 5	M	15	0	332	A washed out fill crossing on a Class III stream. The majority of fill has eroded with a small block of fill remaining on the inboard half of road. The channel upstream and downstream have eroded down to the granite Bedrock. The right road approach is intact while the left has failed 50%.	1) Decommission crossing. Establish 4' wide channel with 2:1 side slope banks. 2) Spoil locally on road to left and right, utilize materials for IPOS. 3) IPOS right road approach for 332'. 4) Establish broad cross road drains at springy areas.
55	Vista Point Trail	M		0	557	A 24" partially crushed and plugged corrugated metal pipe that conveys road and ditch runoff to Site #27. The hydrologically connected road length can be disconnected via outsloping and rolling dip installation. There is a through cut up right road approach that will likely be retained in perpetuity due to the depth of the cut.	1) Regular maintenance, clean out ditch and culvert. 2) Install 2 rolling dips up right road, one on either side of through cut. 3) Install type 1 rolling dip at the ditch relief culvert and drain to ditch relief culvert. 4) Rock outlet of ditch relief culvert on downstream side of through cut with $5yd^3$ of 0.5-1.5' diameter rock armor at outboard fill transition. 5) Outslope 200' of right road approach on either side of through cut.
61	Private Paved Road	L		650	0	A 15" corrugated metal pipe with a drop inlet box and an elbow. Flow delivers to headwaters of Class III downstream. The ditch relief culvert is located on a long relatively flat paved section of road high on the watershed.	1) Regular maintenance, clean out ditch and culvert. 2) Install two 18"x40' ditch relief culverts on right road approach, Install $5yd^3$ of 0.5' - 1.5' diameter rock armor at each outlet as an energy dissipater.
62	Private Paved Road	L		621	0	A 15" ditch relief culvert that conveys the springy inboard ditch through a dirt driveway. There is some active erosion occurring in the inboard ditch approach.	1) Regular maintenance, clean out ditch and culvert.

Table B1. Field observations and treatment recommendations for road/trail related sediment source sites. Quarry Park Watershed Assessment and Erosion Prevention Planning Project, San Mateo County, California.

Site #	Road/trail Name	TI	Future sediment delivered (yds^3)	Hydrologically connected road/trail length (ft)		Comment on Problem	Comment on treatment
				Left	Right		
Abbreviations and Acronyms: BOT = Bottom of excavation; TOP = Top of excavation; IPOS = In-place outslope; CMP = Corrugated metal pipe; OBF = Outboard edge of fill; IBF = Inboard edge of fill; TI = treatment immediacy; and yd^3 = cubic yards; DRC = Ditch relief culvert; IBD = Inboard ditch. Left and Right directions are referenced as looking downstream or downslope.							
64	Private Paved Road	L		502	182	A springy inboard ditch and cutbank are drained by this drop inlet ditch relief culvert. The outboard edge of fill is buttressed by a retaining wall and appears stable.	1) Regular maintenance, clean out ditch and culvert. 2) Install one 18" x 40' ditch relief culvert on left road approach, Install $5yd^3$ of 0.5'-1.5' diameter rock armor at outlet as an energy dissipater.
65	Private Paved Road	L		270	0	A 15" ditch relief culvert that conveys paved inboard ditch flow through intersection with dirt road leading up to the USGS station. The inboard ditch has some active erosion.	1) Regular maintenance, clean out ditch and culvert.
66	Private Paved Road	L		54	0	A 12" ditch relief culvert that conveys paved inboard ditch flow through second intersection with dirt road leading up to the USGS station.	1) Regular maintenance, clean out ditch and culvert.
71	Dolphine Fire Road	L		246	0	Outboard edge of fill erosion at a rolling dip outlet with delivery to a springy swale.	1) Increase road drainage, outslope left road for 246'. 2) Maintain and enhance the existing rolling dip feature. 3) Install armored fill 17' wide x 6' wide x 16' long x 2' deep, 15 yd^3 of 0.5-1' diameter rock armor. 4) Apply $10yd^3$ of rock to road surface through the dip.
74	Quarry Trail	ML		2000	0	A landslide 210' long and 45' wide slide deposit has covered the road. A cross road drain above the slide on Middle Ridge Trail is actively diverting flow to above slide and likely induced the failure, but the uncontrolled road drainage exacerbated the existing hillslope instability.	1) Clear slide debris and redefine the road through the slide. 2) Install 11 rolling dips on the Middle Ridge Trail upslope from the slide feature to minimize the hydrologically connected road drainage. 3) Outslope and fill ditch for 2,000' of left road approach. Extend the road shaping up Middle Ridge Trail.

Table B2. Field observations and treatment recommendations for road/trail related non-sediment source sites. Quarry Park Watershed Assessment and Erosion Prevention Planning Project, San Mateo County, California.

Site #	Road/trail Name	TI	Adjacent road/trail length (ft)		Comment on Problem	Comment on treatment
			Left	Right		
Abbreviations and Acronyms: BOT = Bottom of excavation; TOP = Top of excavation; IPOS = In-place outslope; CMP = Corrugated metal pipe; OBF = Outboard edge of fill; IBF = Inboard edge of fill; TI = treatment immediacy; and yd^3 = cubic yards.						
18	Middle Ridge Trail	M	108	1000	Spring flow emerges out of the cutbank at the base of small swale. Spring flow is actively diverting down the right road. Spring flow combines with concentrated road runoff to form several severe gullies. There is a recently installed breach in the berm that is capturing a portion of the concentrated road runoff. There are also numerous emergent cutbank springs on the left road approach. Flow should be conveyed directly across the road and directed in to the natural swale downslope. There is no direct sediment delivery at this site.	1) Construct an armored fill crossing; establish a broad dip that conveys stream flow though the crossing, excavate a keyway 15’ wide at the top x 6’ wide at the base x 17’ long x 2’ deep, armor the keyway with 15yd3 of 0.5'-1.5’ diameter rock armor. 2) Outslope road and fill ditch for 108' of left road approach 3) Outslope road and fill ditch for 1000' of the right road approach. 3) Install 1 rolling dip up the left road approach. 4) Install 5 rolling dips up the right road approach.
46	South Ridge Trail	L	200	0	An 18" ditch relief culvert with a wooden box drop inlet. No Delivery.	1) Regular maintenance, clean out ditch and culvert. 2) Outslope road on left approach, maintain inboard ditch at inlet of culvert for 10'. 3) Install 1 rolling dip on left approach.
47	South Ridge Trail	L	162	0	An 18", 50% plugged ditch relief culvert with a T outlet in poor condition that has no delivery.	1) Regular maintenance, clean out ditch and culvert. 2) Outslope road on left approach, maintain inboard ditch at inlet of culvert for 10'.
48	South Ridge Trail	L	240	0	An 18" ditch relief culvert which has a T outlet and has no delivery.	1) Regular maintenance, clean out ditch and culvert. 2) Outslope road on left road approach, maintain inboard ditch at inlet of culvert for 10'. 3) Install rolling dip on left approach.
49	South Ridge Trail	L	186	0	An 18" partially plugged ditch relief culvert which has a T outlet and has no direct sediment delivery.	1) Regular maintenance, clean out ditch and culvert. 2) Outslope road on left approach, maintain inboard ditch at inlet of culvert for 10'. 3) Install rolling dip on left approach.

Table B2. Field observations and treatment recommendations for road/trail related non-sediment source sites. Quarry Park Watershed Assessment and Erosion Prevention Planning Project, San Mateo County, California.

Site #	Road/trail Name	TI	Adjacent road/trail length (ft)		Comment on Problem	Comment on treatment
			Left	Right		
Abbreviations and Acronyms: BOT = Bottom of excavation; TOP = Top of excavation; IPOS = In-place outslope; CMP = Corrugated metal pipe; OBF = Outboard edge of fill; IBF = Inboard edge of fill; TI = treatment immediacy; and yd^3 = cubic yards.						
50	South Ridge Trail	L	494	0	An 18" partially plugged ditch relief culvert which has a T outlet and has no delivery.	1) Regular maintenance, clean out ditch and culvert. 2) Outslope road on left approach, maintain inboard ditch at inlet of culvert for 10'. 3) Install 2 rolling dips on left approach.
51	South Ridge Trail	L	0	216	An 18" partially plugged ditch relief culvert which has a T outlet and has no direct sediment delivery.	1) Regular maintenance, clean out ditch and culvert. 2) Outslope road on right approach, maintain inboard ditch at inlet of culvert for 10'. 3) Install 1 rolling dip on right approach.
52	South Ridge Trail	L	0	239	An 18" partially plugged ditch relief culvert which has a T outlet and has no delivery.	1) Regular maintenance, clean out ditch and culvert. 2) Outslope road on right approach, maintain inboard ditch at inlet of culvert for 10'. 3) Install 1 rolling dip on right approach.
53	South Ridge Trail	L	0	208	An 18” 50% plugged ditch relief culvert which has a T outlet and has no delivery.	1) Regular maintenance, clean out ditch and culvert. 2) Outslope road on right approach, maintain inboard ditch at inlet of culvert for 10'. 3) Install 1 rolling dip on right approach.
54	South Ridge Vista Trail	L	247	0	An 18” 90% plugged ditch relief culvert which has a T outlet and has no delivery.	1) Regular maintenance, clean out ditch and culvert. 2) Outslope road on left approach, maintain inboard ditch at inlet of culvert for 10'. 3) Install 1 rolling dip on left approach.
56	Vista Point Trail	M	216	0	A 24” 60% plugged ditch relief culvert which has a T outlet and has no delivery. No active erosion at outlet ditch is vegetated and stable.	1) Regular maintenance, clean out ditch and culvert. 2) Outslope road on left approach, maintain inboard ditch at inlet of culvert for 10'. 3) Install 1 rolling dip at ditch relief culvert and one up left road approach.
57	South Ridge Vista Trail	L	146	0	An 18” partially plugged ditch relief culvert which has a T outlet and has no delivery.	1) Regular maintenance, clean out ditch and culvert. 2) Outslope road on left approach, maintain inboard ditch at inlet of culvert for 10'.

Table B2. Field observations and treatment recommendations for road/trail related non-sediment source sites. Quarry Park Watershed Assessment and Erosion Prevention Planning Project, San Mateo County, California.

Site #	Road/trail Name	TI	Adjacent road/trail length (ft)		Comment on Problem	Comment on treatment
			Left	Right		
Abbreviations and Acronyms: BOT = Bottom of excavation; TOP = Top of excavation; IPOS = In-place outslope; CMP = Corrugated metal pipe; OBF = Outboard edge of fill; IBF = Inboard edge of fill; TI = treatment immediacy; and yd^3 = cubic yards.						
58	South Ridge Vista Trail	L	255	0	An 18" partially plugged ditch relief culvert which has a T outlet and has no delivery.	1) Regular maintenance, clean out ditch and culvert. 2) Outslope road on left approach for 245', maintain inboard ditch at inlet of culvert for 10'. 3) Install 1 rolling dip on left road approach.
59	Miranda East Fire Road	L	0	409	An 18" partially plugged ditch relief culvert which has a T outlet and has no delivery.	1) Regular maintenance, clean out ditch and culvert. 2) Outslope road on right approach for 399', maintain inboard ditch at inlet of culvert for 10'. 3) Install 2 rolling dips on right approach.
60	Miranda East Fire Road	L	0	734	An 18" partially plugged ditch relief culvert which has no delivery. The culvert is located at the bottom of the park in a semi wet land environment, puddling is occurring in front of the inlet.	1) Regular maintenance, clean out ditch and culvert. 2) Outslope road on right approach for 724', maintain inboard ditch at inlet of culvert for 10'. 3) Install 3 rolling dips on right approach.
63	Private Paved Road	L	216	332	A ditch relief culvert with a drop box inlet and a T outlet. The inlet is located at a low, there is minimal active erosion at the outlet but no sediment delivery.	1) Regular maintenance, clean out ditch and culvert. 2) Install one 18" x 40' ditch relief culvert on right road approach, Install 5 yd3 of 0.5 to 1.5 diameter rock armor at outlet as an energy dissipater.
67	Deer Creek Trail	L	0	224	A 12" ditch relief culvert that conveys flow from the inboard ditch on the lower paved road that does not have delivery. Inlet and outlet are entirely clogged.	1) Regular maintenance, clean out ditch and culvert.
68	Deer Creek Trail	L	0	487	A 15" ditch relief culvert that is 50% plugged. Flow is conveyed in the inboard ditch along the lower paved road for 487'; however, there is no sediment delivery.	1) Regular maintenance, clean out ditch and culvert. 2) Install 1 18" x 40' ditch relief culverts on right road approach, Install 5 yd3 of 0.5'-1.5' diameter rock armor at each outlet as an energy dissipater.
69	Deer Creek Trail	M	0	40	A 15" ditch relief culvert that is 50% plugged and partially crushed. A gully is occurring at the outlet along the steep outboard edge of fill; however, there is no sediment delivery.	1) Regular maintenance, clean out ditch and culvert. 2) Replace culvert with 18"x40' culvert, install 5yd3 of 0.5-'1.5' diameter rock armor at outlet to act as an energy dissipater.
70	Deer Creek Trail	L	0	30	A ditch relief culvert with a drop inlet located in the middle of the paved road at a low point near front of gate with no delivery.	1) Regular maintenance, clean out ditch and culvert.

Table B2. Field observations and treatment recommendations for road/trail related non-sediment source sites. Quarry Park Watershed Assessment and Erosion Prevention Planning Project, San Mateo County, California.

Site #	Road/trail Name	TI	Adjacent road/trail length (ft)		Comment on Problem	Comment on treatment
			Left	Right		
Abbreviations and Acronyms: BOT = Bottom of excavation; TOP = Top of excavation; IPOS = In-place outslope; CMP = Corrugated metal pipe; OBF = Outboard edge of fill; IBF = Inboard edge of fill; TI = treatment immediacy; and yd^3 = cubic yards.						
72	Middle Ridge Trail	ML	0	0	Spring flow emerges from the base of the cutbank. The majority of the spring flow diverts down right road. There is no direct sediment delivery.	1) Install 1 rolling dip at spring.
73	Vista Point Trail	H	0	0	The lookout deck at the top of the quarry is experiencing erosion beneath one of the footings. The active debris slide slope failure beneath the footing is undermining the deck and causing instability. The active erosion and subsequent destabilization of the deck is a potential safety hazard for visitors. There is no direct sediment delivery from this site.	1) Relocate the observation deck away from the failing slope. Maintain a 35' set back has been established to prevent future destabilization.

Appendix C

Typical drawings (schematic diagrams) showing construction and installation techniques for recommended erosion control and erosion prevention treatments.

Quarry Park Watershed Assessment And Erosion Prevention Planning Project San Mateo County, California

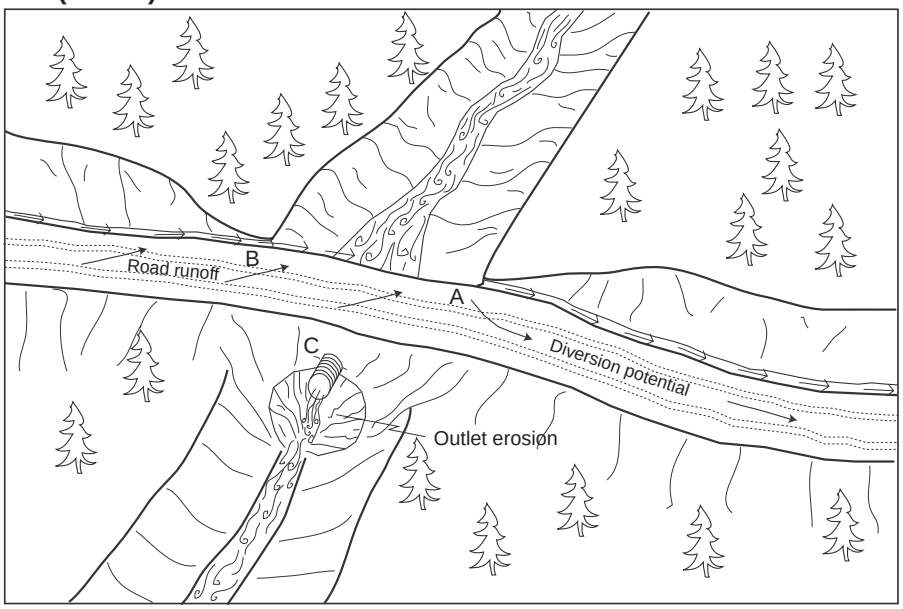
Typical Problems and Applied Treatments for a Non-fish Bearing Upgraded Stream Crossing

Problem condition (before)

A - Diversion potential

B - Road surface and ditch drain to stream

C - Undersized culvert high in fill with outlet erosion

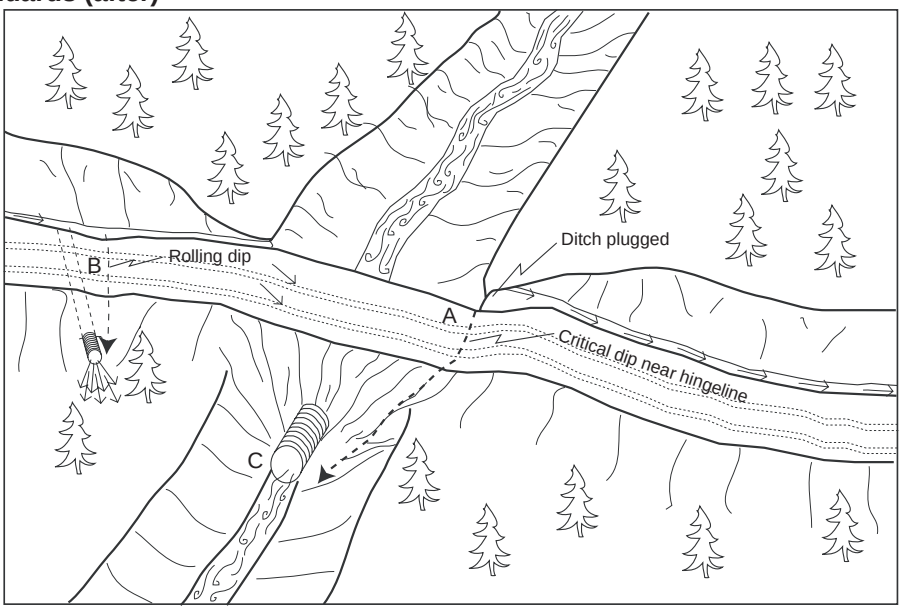


Treatment standards (after)

A - No diversion potential with critical dip installed near hingeline

B - Road surface and ditch disconnected from stream by rolling dip and ditch relief culvert

C - 100-year culvert set at base of fill



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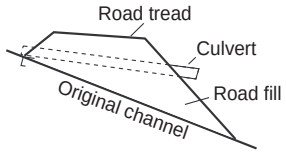
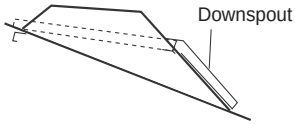
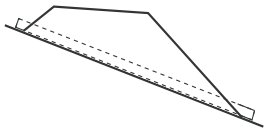
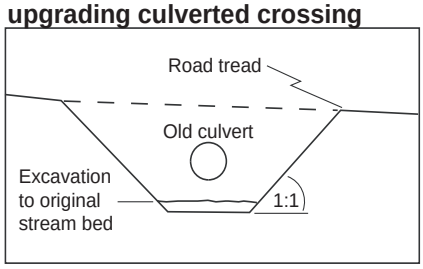
Typical Drawing #1

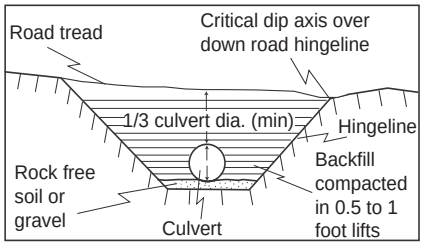
Typical Design of a Non-fish Bearing Culverted Stream Crossing

Existing	Upgraded	Upgraded (preferred)
		
1. Culvert not placed at channel grade. 2. culvert does not extend past base of fill.	1. Culvert not placed at channel grade. 2. Downspout added to extend outlet past road fill.	1. Culvert placed at channel grade. 2. Culvert inlet and outlet rest on, or partially in, the originial streambed.

Excavation in preparation for upgrading culverted crossing



Upgraded stream crossing culvert installation



Note:
Road upgrading tasks typically include upgrading stream crossings by installing larger culverts and inlet protection (trash barriers) to prevent plugging. Culvert sizing for the 100-year peak storm flow should be determined by both field observation and calulations using a procedure such as the Rational Formula.

Stream crossing culvert Installation

1. Culverts shall be aligned with natural stream channels to ensure proper function, and prevent bank erosion and plugging by debris.
2. Culverts shall be placed at the base of the fill and the grade of the original streambed, or downspouted past the base of the fill.
3. Culverts shall be set slightly below the original stream grade so that the water drops several inches as it enters the pipe.
5. To allow for sagging after burial, a camber shall be between 1.5 to 3 incher per 10 feet culvert pipe length.
6. Backfill material shall be free of rocks, limbs or other debris that could dent or puncture the pipe or allow water to seep around pipe.
7. First one end then the other end of the culvert shall be covered and secured.;The center is covered last.
8. Backfill material shall be tamped and compacted throughout the entire process:
   - Base and side wall material will be compacted before the pipe is placed in its bed.
   - Backfill compacting will be done in 0.5 - 1 foot lifts until 1/3 of the diameter of the culvert has been covered. A gas powered tamper can be used for this work.
9. Inlets and outlets shall be armored with rock or mulched and seeded with grass as needed.
10. Trash protectors shall be installed just upstream from the culvert where there is a hazard of floating debris plugging the culvert.
11. Layers of fill will be pushed over the crossing until the final designed road grade is achieved, at a minimum of 1/3 to 1/2 the culvert diameter.

Erosion control measures for culvert replacement

Both mechanical and vegetative measures will be employed to minimize accelerated erosion from stream crossing and ditch relief culvert upgrading. Erosion control measures implemented will be evaluated on a site by site basis. Erosion control measures include but are not limited to:

1. Minimizing soil exposure by limiting excavation areas and heavy equipment distrubance.
2. Installing filter windrows of slash at the base of the road fill to minimize the movement of eroded soil to downslope areas and stream channels.
3. Retaining rooted trees and shrubs at the base of the fill as “anchor” for the fill and filter windrows.
4. Bare slopes created by construction operations will be protected until vegetation can stabilize the surface. Surface erosion on exposed cuts and fills will be minimized by mulching, seeding, planting, compacting, armoring, and/or benching prior to the first rains.
5. Excess or unusable soil will be stored in long term spoil disposal locations that are not limited by factors such as excessive moisture, steep slopes greater than 10%, archeology potential, or proximity to a watercourse.
6. On running streams, water will be pumped or diverted past the crossing and into the downstream channel during the construction process.
7. Straw bales and/or silt fencing will be employed where necessary to control runoff within the construction zone.

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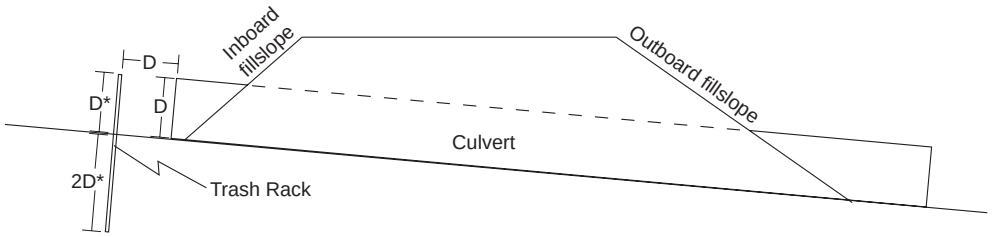
Typical Drawing #2

Typical Design of a Single-post Culvert Inlet Trash Rack

Cross section view



D - Culvert diameter

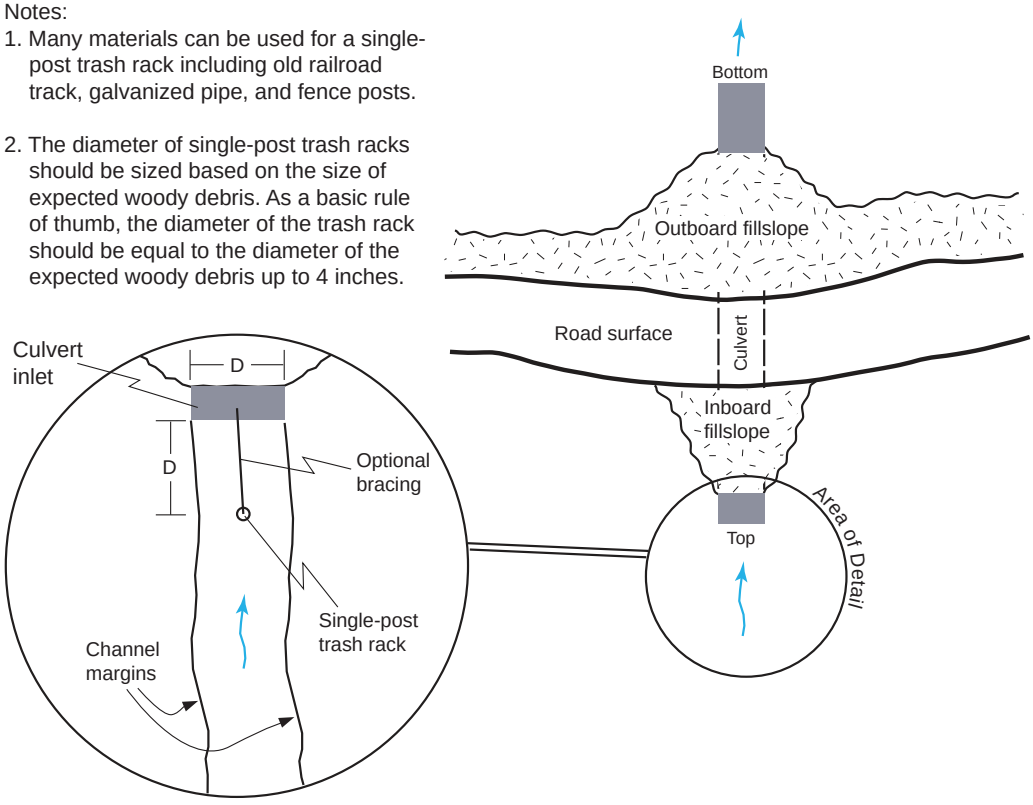
D* - If the culvert is designed for the 100-year peak storm flow, the trash rack height above the streambed should equal D.
If the culvert is undersized, then the trash rack needs to be extended vertically above the streambed to match or exceed the expected headwall height.

Plan view

Notes:

1. Many materials can be used for a single-post trash rack including old railroad track, galvanized pipe, and fence posts.

2. The diameter of single-post trash racks should be sized based on the size of expected woody debris. As a basic rule of thumb, the diameter of the trash rack should be equal to the diameter of the expected woody debris up to 4 inches.



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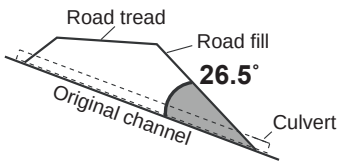
Typical Drawing #3

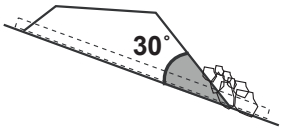
Typical Design of Stream Crossing Fill Armor

Fill angles ≤26.5˚ (2:1)



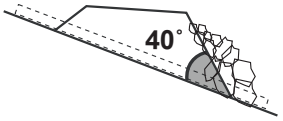
No rock armor needed

Fill angles 26.5˚ - 35˚ (1.5:1)



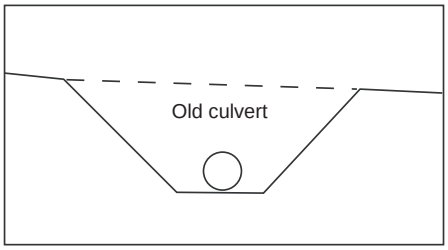
Armor 1/4 up fill face

Fill angles 35˚ - 45˚ (1:1)

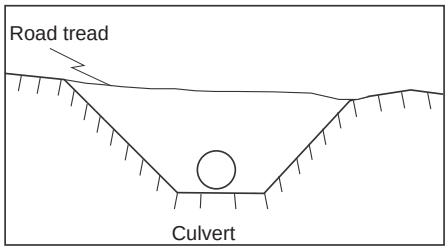


Armor 3/4 way up fill face

Fill angles 26.5˚ - 35˚ (1.5:1)



Fill angles 35˚ - 45˚ (1:1)



Note:
Road upgrading tasks typically include upgrading stream crossings by installing larger culverts and inlet protection (trash barriers) to prevent plugging. Culvert sizing for the 100-year peak storm flow should be determined by both field observation and calculations using a procedure such as the Rational Formula.

Stream crossing culvert Installation

1. Culverts shall be aligned with natural stream channels to ensure proper function, and prevent bank erosion and plugging by debris.
2. Culverts shall be placed at the base of the fill and the grade of the original streambed or downspouted past the base of the fill.
3. Culverts shall be set slightly below the original stream grade so that the water drops several inches as it enters the pipe.
5. To allow for sagging after burial, a camber shall be between 1.5 to 3 incher per 10 feet culvert pipe length.
6. Backfill material shall be free of rocks, limbs or other debris that could dent or puncture the pipe or allow water to seep around pipe.
7. First one end and then the other end of the culvert shall be covered and secured. The center is covered last.
8. Backfill material shall be tamped and compacted throughout the entire process:
   - Base and side wall material will be compacted before the pipe is placed in its bed.
   - Backfill compacting will be done in 0.5 - 1 foot lifts until 1/3 of the diameter of the culvert has been covered. A gas powered tamper can be used for this work.
9. Inlets and outlets shall be armored with rock or mulched and seeded with grass as needed.
10. Trash protectors shall be installed just upstream from the culvert where there is a hazard of floating debris plugging the culvert.
11. Layers of fill will be pushed over the crossing until the final designed road grade is achieved, at a minimum of 1/3 to 1/2 the culvert diameter.

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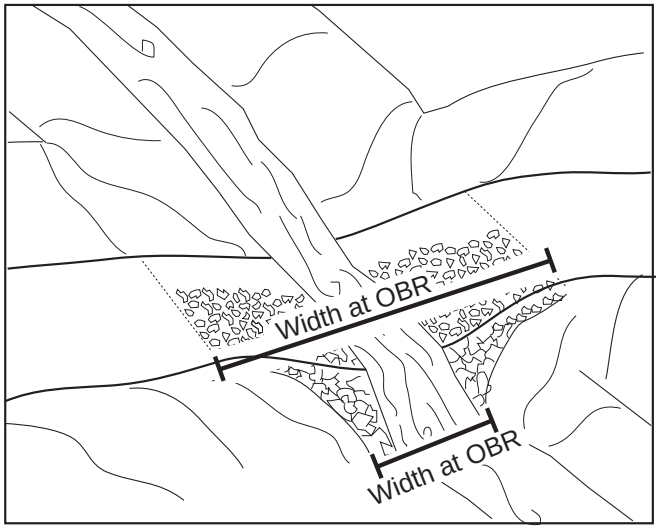
Typical Drawing #4

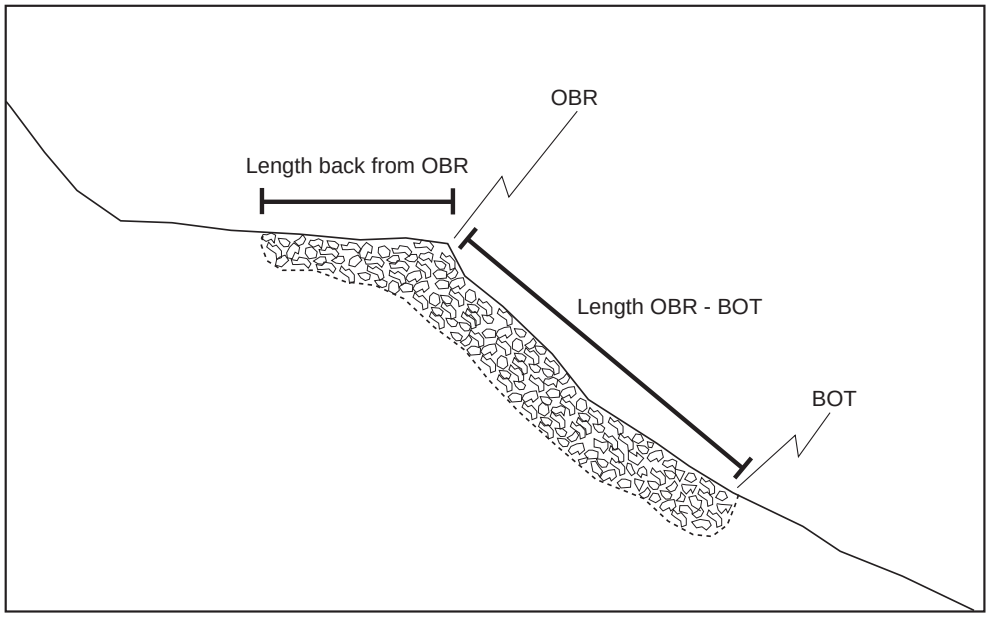
Typical Dimensions Refered to for Armored Fill Crossings

Widths in oblique view



OBR - Outboard edge of road

Lengths in profile view



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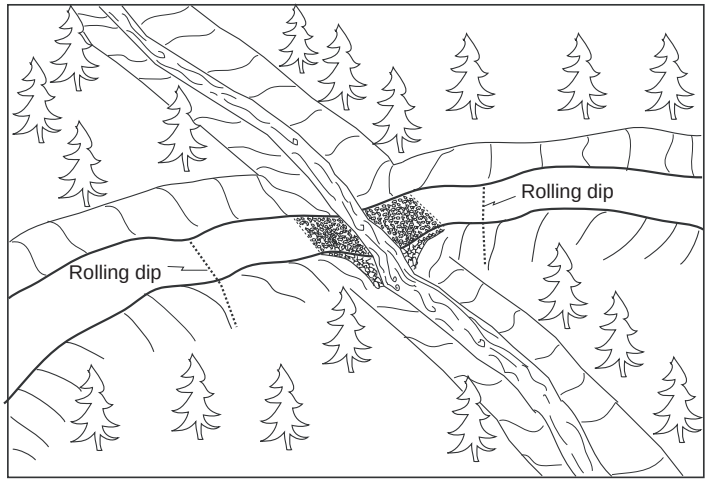
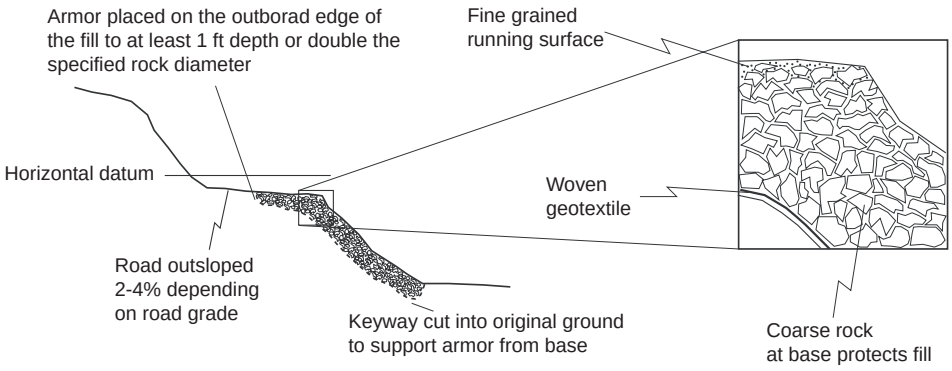
Typical Drawing #5

Typical Armored Fill Crossing Installation

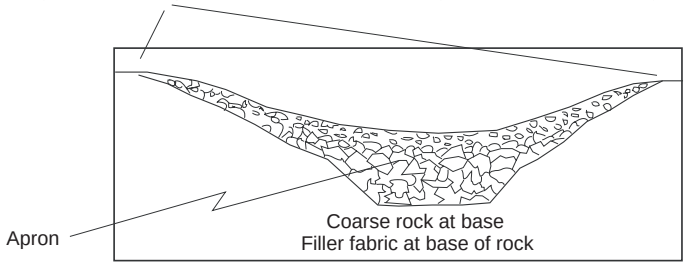


Cross section parallel to watercourse



Cross section perpendicular to watercourse

Erosion resistent running surface armored with angular rock similar to or greater in size than existing rocks found up or downstream from crossing. Armor extends to 100 year flood level.



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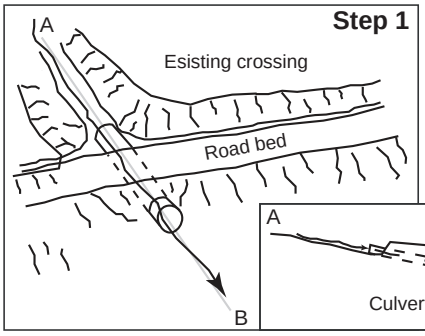
Typical Drawing #6

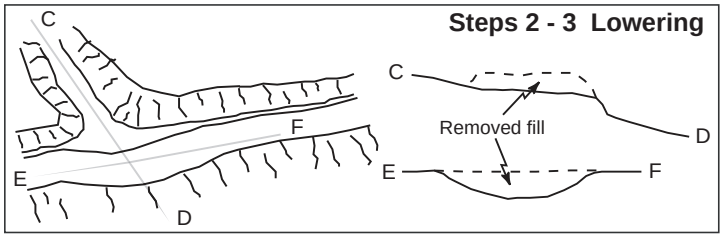
Ten Steps for Constructing a Typical Armored Fill Stream Crossing



1. The two most important points are:

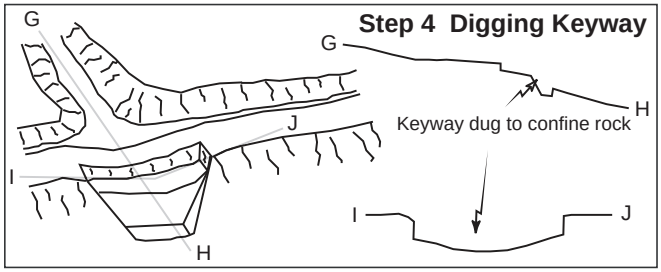
A) **The rock must be placed in a "U" shape across the channel to confine flow within the armored area.** (Flow around the rock armor will gully the remaining fill. Proper shape of surrounding road fill and good rock placement will reduce the likelihood of crossing failure).

B) **The largest rocks must be used to buttress the rest of the armor in two locations:** (i) The base of the armored fill where the fill meets natural channel. (This will butress the armor placed on the outboard fill face and reduce the likelihood of it washing downslope). (ii) The break in slope from the road tread to the outer fill face. (This will butress the fill placed on the outer road tread and will determine the "base level" of the creek as it crosses the road surface).



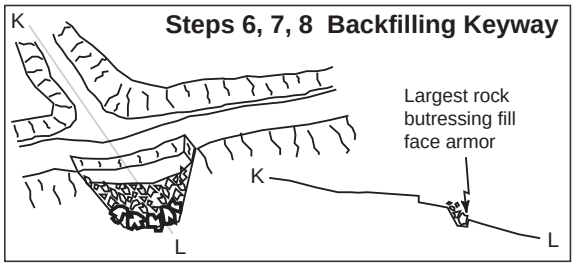
2. Remove any existing drainage structures including culverts and Humboldt logs.

3. Construct a dip centered at the crossing that is large enough to accomodate the 100-year peak storm flow and prevent diversion (C-D, E-F).



4. Dig a keyway (to place rock in) that extends from the outer 1/3 of the road tread down the outboard road fill to the point where outbaord fill meets natural channel (up to 3 feet into the channel bed depending on site specifics) (G-H, I-J).

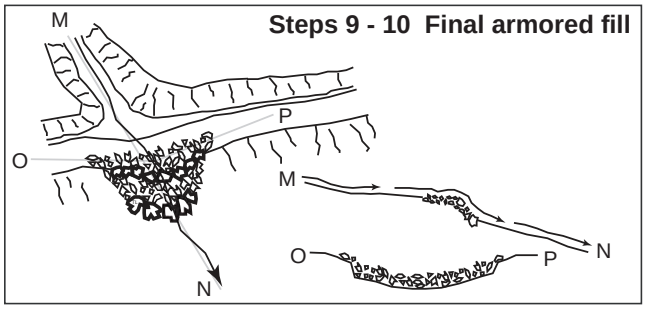
5. Install geofabric (optional) within keyway to support rock in wet areas and to prevent winnowing of the crossing at low flows.



6. Put aside the largest rock armoring to create 2 buttresses in the next step.

7. Create a buttress using the largest rock (as described in the site treatments specifications) at the base of fill. (This should have a "U" shape to it and will define the outlet of the armored fill.)

8. Backfill the fill face with remaining rock armor making sure the final armored area has "U" shape that will accomodate the largest expected flow (K-L).



9. Install a second buttress at the break in slope between the outboard road and the outboard fill face. (This should define the base level of the stream and determine how deep the stream will backfill after construction). (M-N)

10. Back fill the rest of the keyway with the unsorted rock armor making sure the final armored area has a "U" shape that will accommodate the largest expected flow (O-P).

Typical Drawing #7

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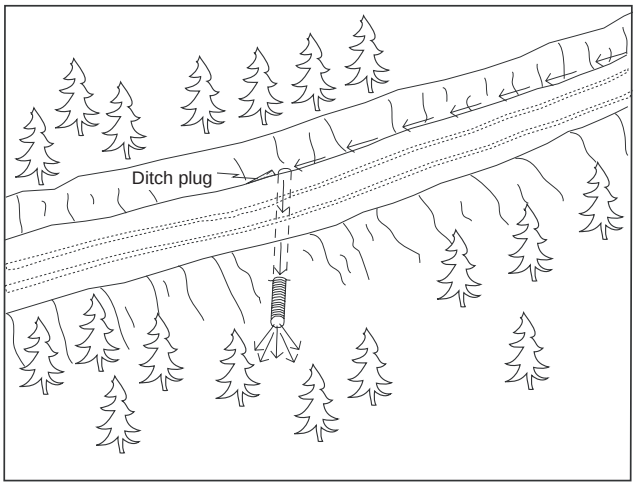
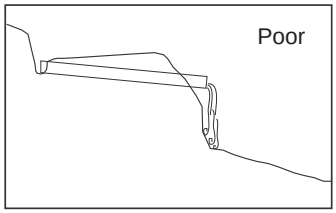
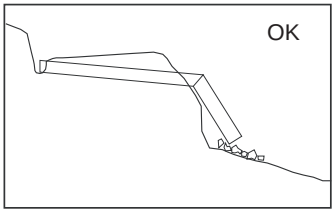
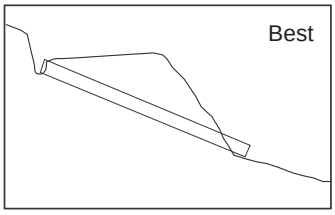
Typical Ditch Relief Culvert Installation









Ditch relief culvert installation

1) The same basic steps followed for stream crossing installation shall be employed.
2) Culverts shall be installed at a 30 degree angle to the ditch to lessen the chance of inlet erosion and plugging.
3) Culverts shall be seated on the natural slope or at a minimum depth of 5 feet at the outside edge of the road, whichever is less.
4) At a minimum, culverts shall be installed at a slope of 2 to 4 percent steeper than the approaching ditch grade, or at least 5 inches every 10 feet.
5) Backfill shall be compacted from the bed to a depth of 1 foot or 1/3 of the culvert diameter, which ever is greater, over the top of the culvert.
6) Culvert outlets shall extend beyond the base of the road fill (or a flume downspout will be used).
7) Culverts will be seated on the natural slope or at a depth of 5 feet at the outside edge of the road, whichever is less.

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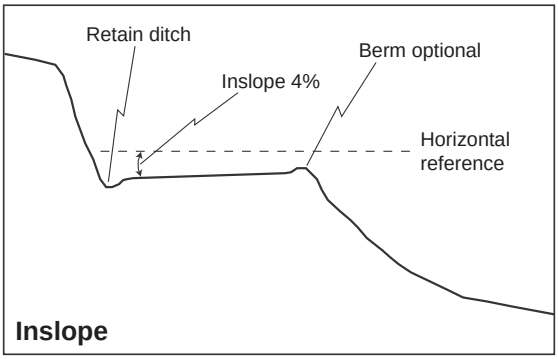
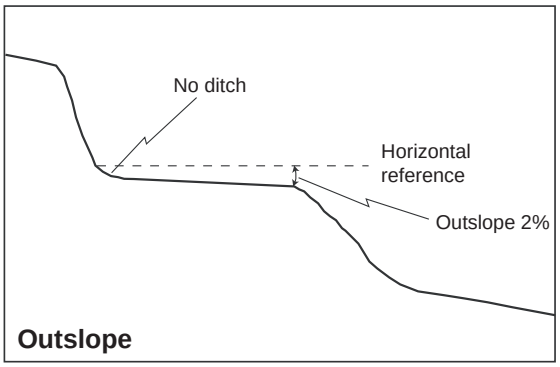
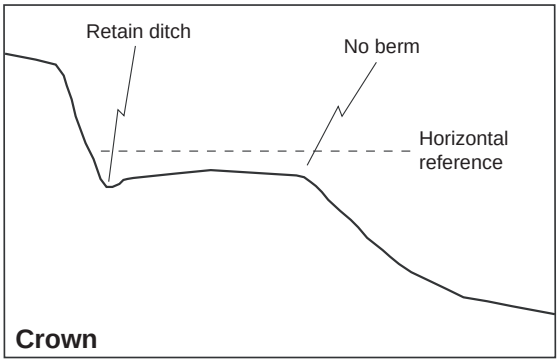
Typical Drawing #8

Typical Designs for Using Road Shape to Control Road Runoff







Outsloping Pitch for Roads Up to 8% Grade		
Road grade	**Unsurfaced roads**	**Surfaced roads**
4% or less	3/8" per foot	1/2" per foot
5%	1/2" per foot	5/8" per foot
6%	5/8" per foot	3/4" per foot
7%	3/4" per foot	7/8" per foot
8% or more	1" per foot	1 1/4" per foot

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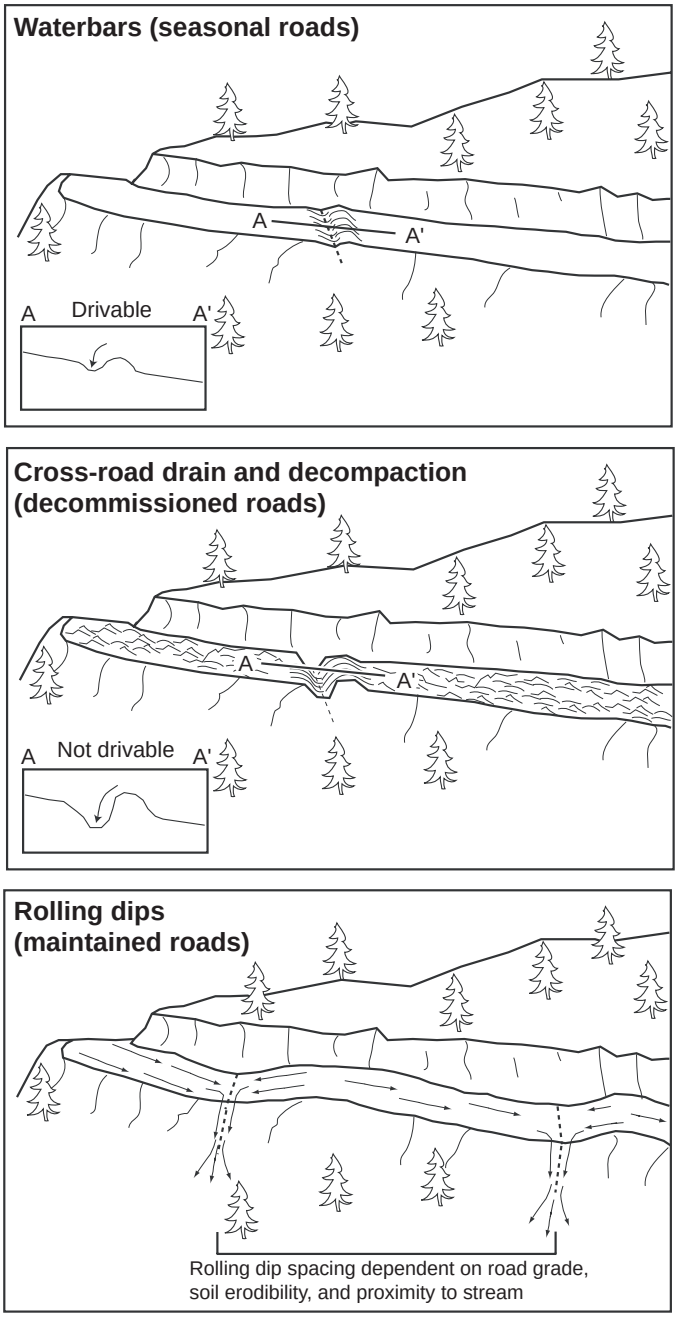
Typical Drawing #9

Typical Methods for Dispersing Road Surface Runoff with Waterbars, Cross-road Drains, and Rolling Dips



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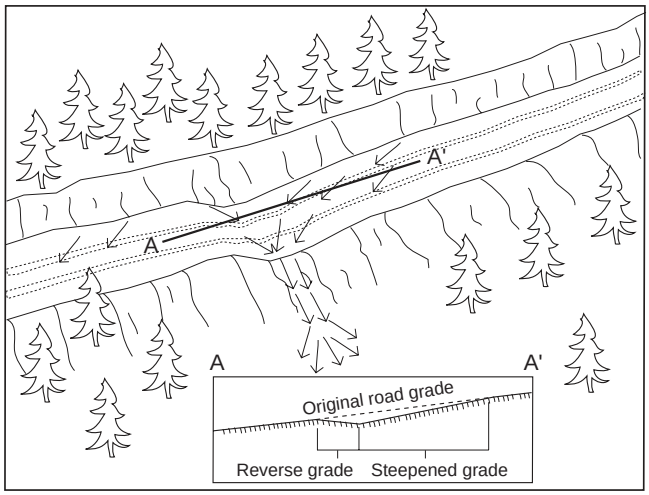
Typical Drawing #10

Typical Road Surface Drainage by Rolling Dips



Rolling dip installation:

1. Rolling dips will be installed in the roadbed as needed to drain the road surface.
2. Rolling dips will be sloped either into the ditch or to the outside of the road edge as required to properly drain the road.
3. Rolling dips are usually built at 30 to 45 degree angles to the road alignment with cross road grade of at least 1% greater than the grade of the road.
4. Excavation for the dips will be done with a medium-size bulldozer or similar equipment.
5. Excavation of the dips will begin 50 to 100 feet up road from where the axis of the dip is planned as per guidelines established in the rolling dip dimensions table.
6. Material will be progressively excavated from the roadbed, steepening the grade unitl the axis is reached.
7. The depth of the dip will be determined by the grade of the road (see table below).
8. On the down road side of the rolling dip axis, a grade change will be installed to prevent the runoff from continuing down the road (see figure above).
9. The rise in the reverse grade will be carried for about 10 to 20 feet and then return to the original slope.
10. The transition from axis to bottom, through rising grade to falling grade, will be in a road distance of at least 15 to 30 feet.

Table of rolling dip dimensions by road grade

Road grade %	**Upslope approach distance** (from up road start to trough) ft	**Reverse grade distance** (from trough to crest) ft	**Depth at trough outlet** (below average road grade) ft	**Depth at trough inlet** (below average road grade) ft
<6	55	15 - 20	0.9	0.3
8	65	15 - 20	1.0	0.2
10	75	15 - 20	1.1	0.01
12	85	20 - 25	1.2	0.01
>12	100	20 - 25	1.3	0.01

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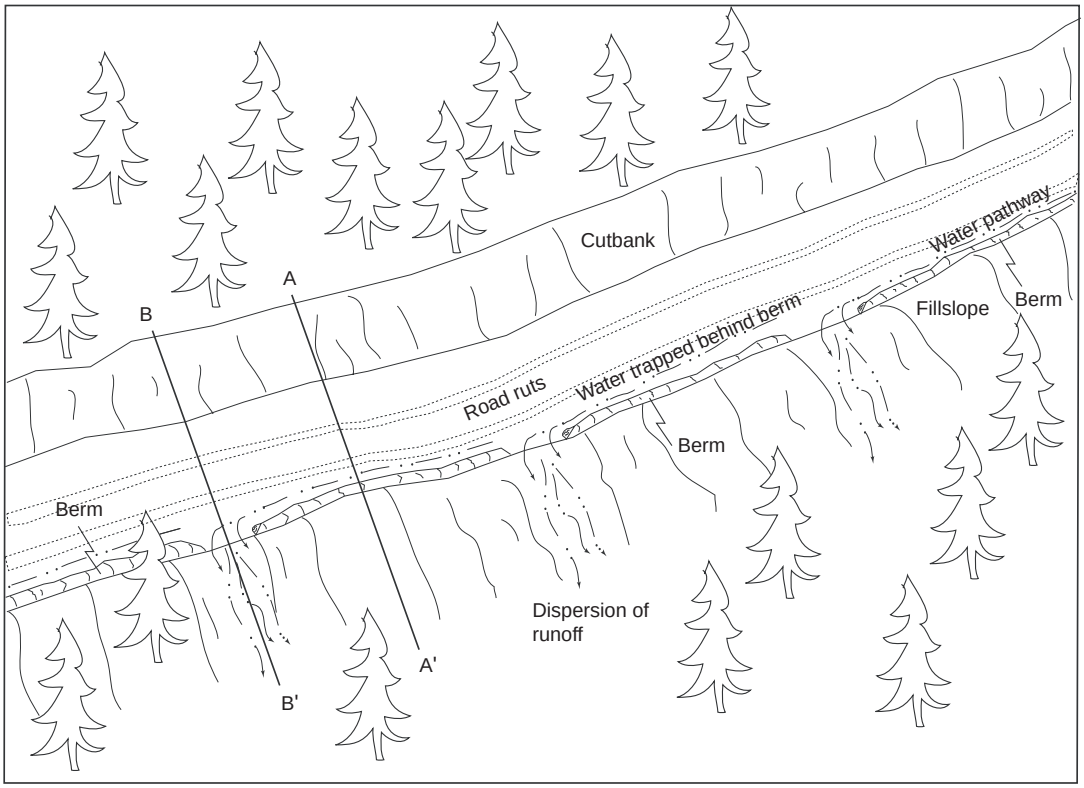
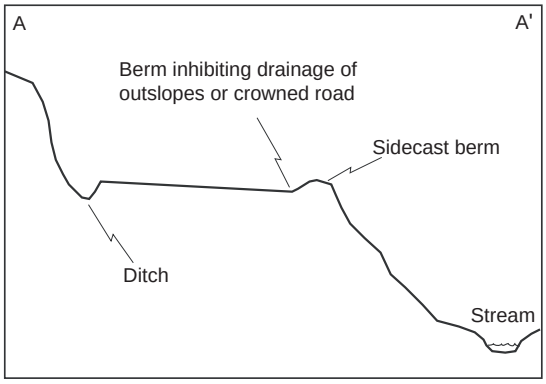
Typical Drawing #11

Typical Sidecast or Excavation Methods for Removing Outboard Berms on a Maintained Road

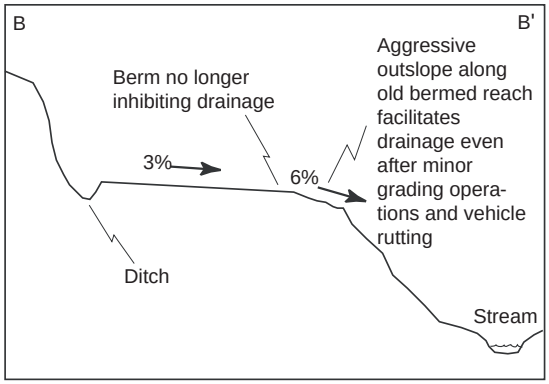
1. On gentle road segments berms can be removed continuously (see B-B').
2. On steep road segments, where safety is a concern, the berm can be frequently breached (see A-A' & B-B') Berm breaches should be spaced every 30 to 100 feet to provide adequate drainage of the road system while maintaining a semi-continuous berm for vehicle safety.



Road cross section between berm breaches



Road cross section at berm breaches



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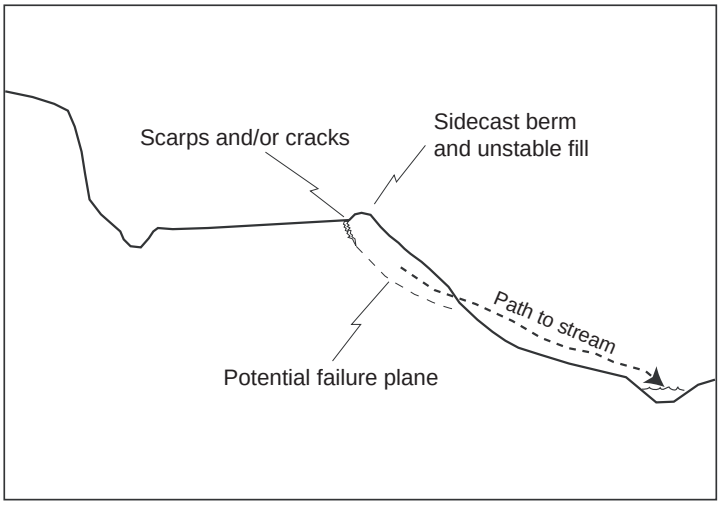
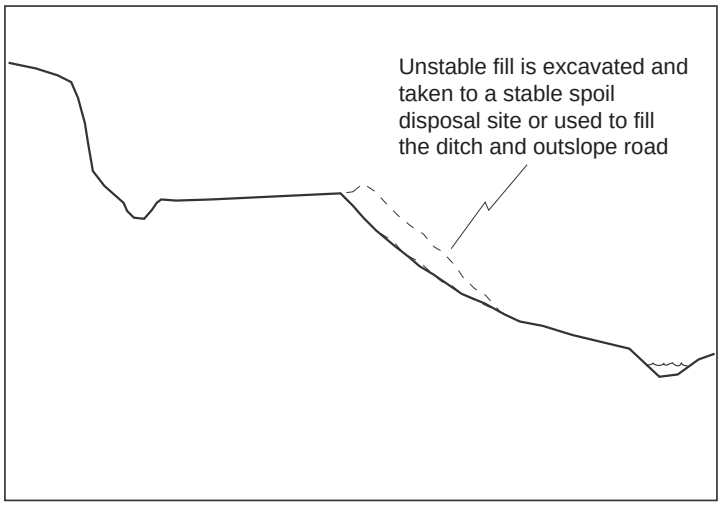
Typical Drawing #12

Typical Excavation of Unstable Fillslope on an Upgraded Road

Before



After



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Typical Drawing #13

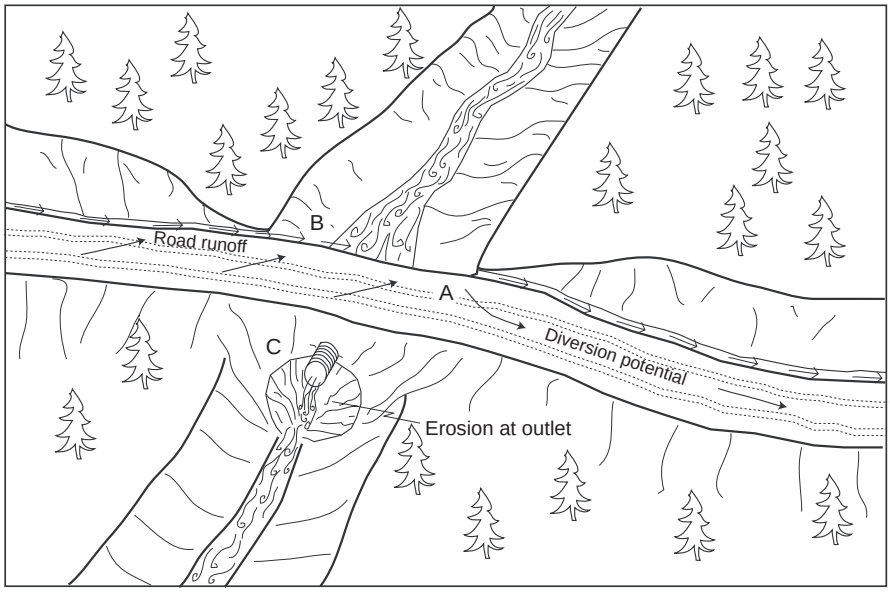
Typical Problems and Applied Treatments for a Decommissioned Stream Crossing

Problem condition (before)

A - Diversion potential

B - Road surface and ditch drain to stream

C - Undersized culvert high in fill with outlet erosion

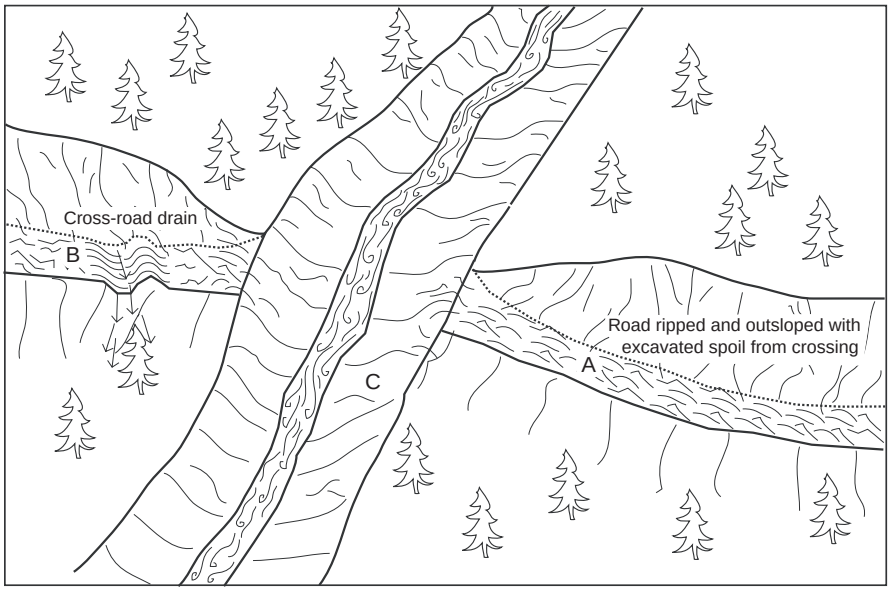


Treatment standards (after)

A - Diversion prevented by road surface ripping and outsloping using excavated spoils

B - Road surface and ditch disconnected from stream by road surface decompaction and cross-road drains

C - Stream crossing fill completely excavated



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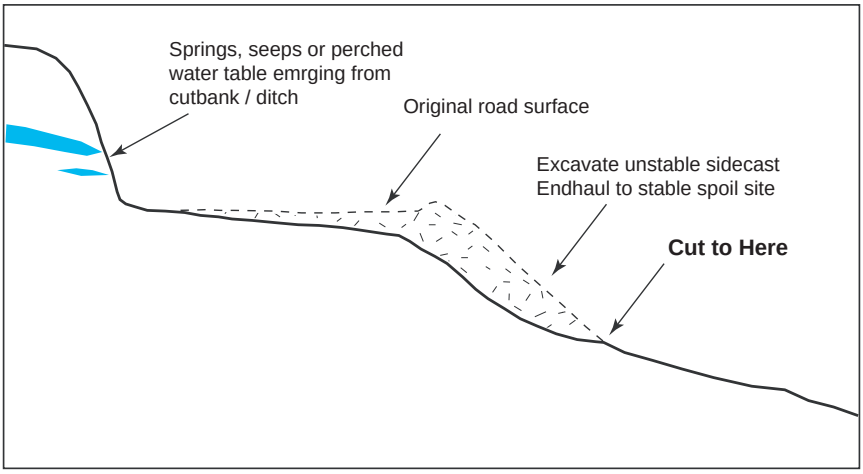
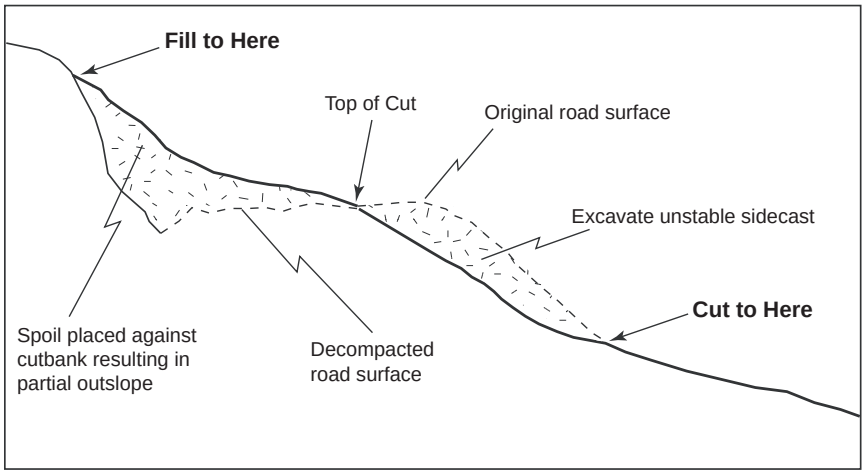
Typical Drawing #14

Typical Design for Road Decommisioning Treatments Employing Export and In-Place Outsloping Techniques

Export outslope (EPOS)



In-place outslope (IPOS)



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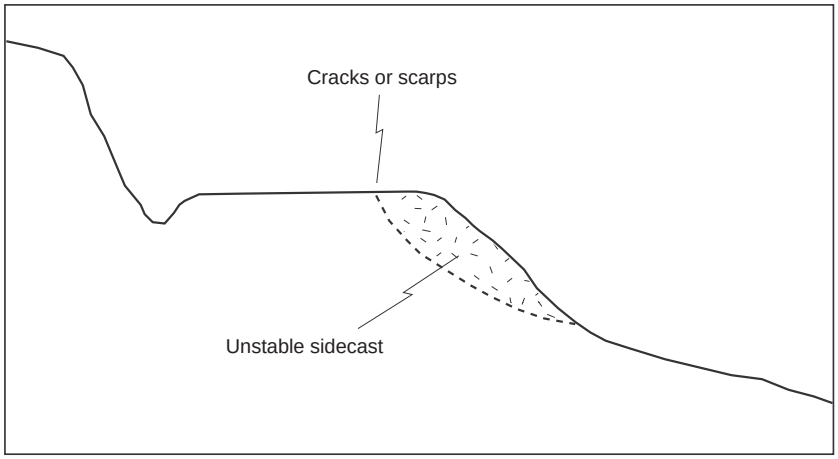
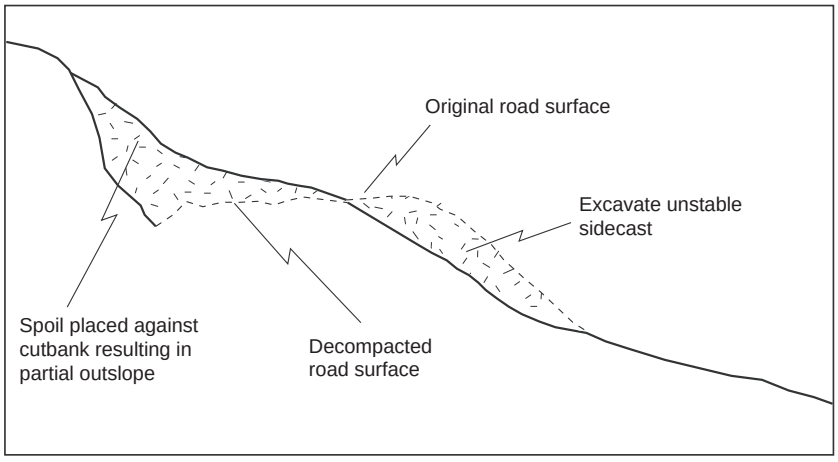
Typical Drawing #15

Typical Excavation of Unstable Fillslope on a Decommissioned Road

Before



After



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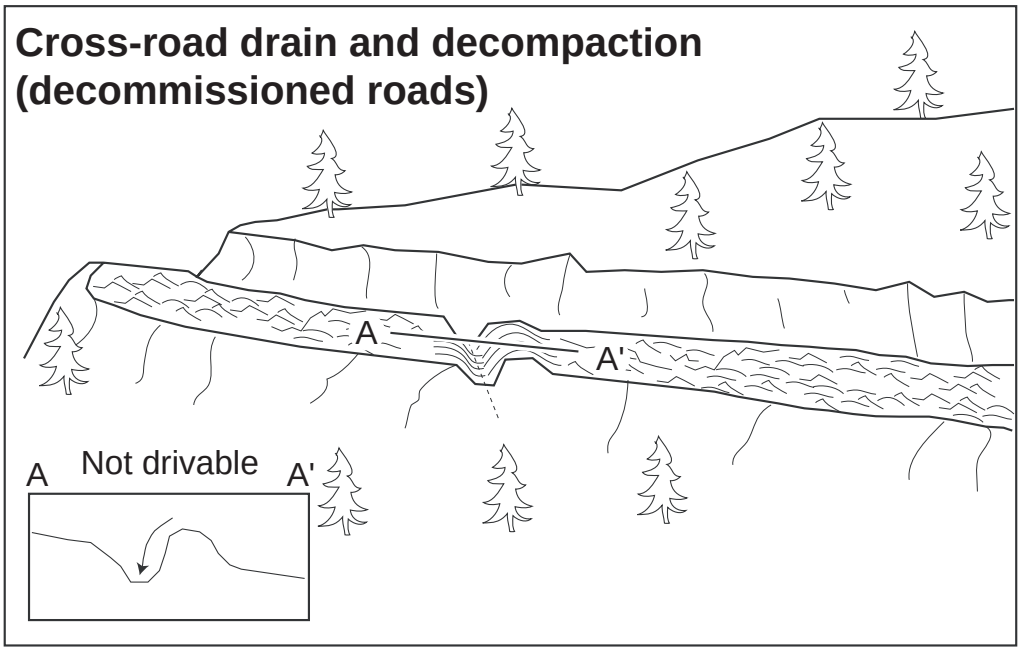
Typical Drawing #16



Cross road drain construction will ensure gullies, springs, road runoff and other concentrated flow will no longer collect over long lengths of road causing gully erosion and sediment delivery to streams. Cross road drains will be constructed at approximately 75 ft spacing intervals and these cross road drains will direct road surface runoff off the road onto stable hillslope locations.

Ripping the road surface 16 to 24 inches deep will increase road surface infiltration rates, decompact the road surface, and prevent concentrated runoff. Road ripping will also pulverize the compacted road surface or hardpan and allow for vegetation to establish and recover naturally.

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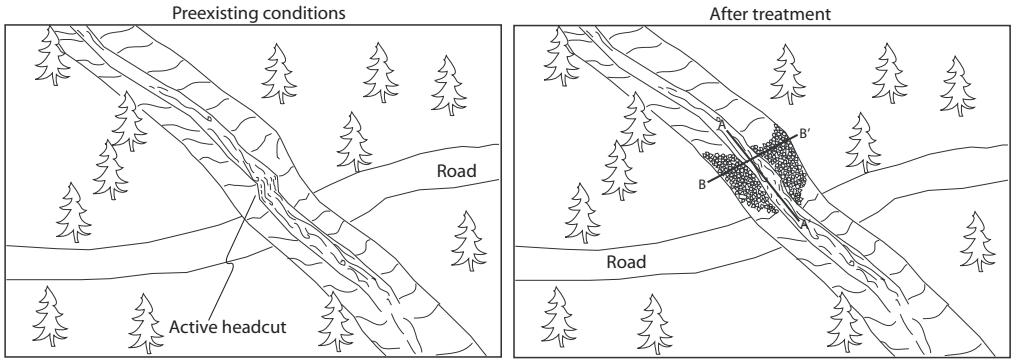
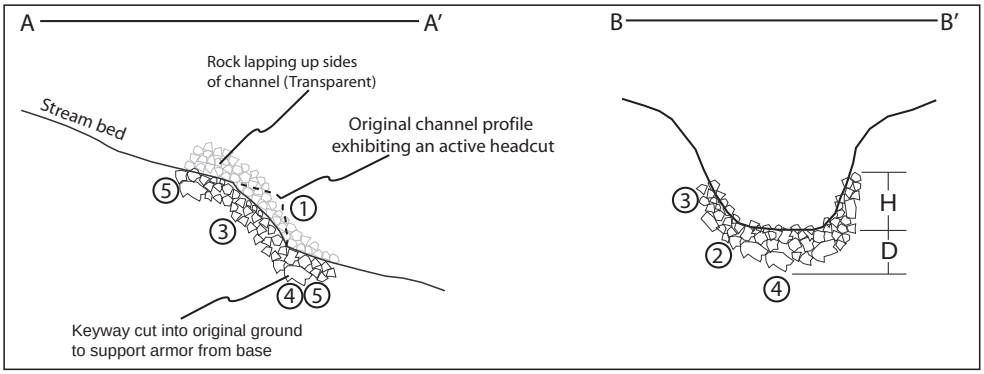
PWA Typical Drawing #17

Typical Rock Grade Control Structure Installation at man-made headcuts/knickpoints in a non-fish bearing stream channel



Cross section parallel and perpendicular to watercourse



Notes

The main objective is to create a structure that will not be flanked, undercut, or eroded by the stream.

The critical elements of a successful grade control structure are:

1) Excavating the headcut to a gentler channel gradient over a distance of stream (See road log for details)
2) rock selection- rock should be selected that is resistant to transport during design flows, and has a bell shaped distribution of sizes with the median diameter equivalent to the D50 particle size of the stream at the site of installation (See road log for range of rock diameters).
3) The rock must be placed in a "U" shape that will contain the 100 yr. return interval stream flow, won't constrict the channel cross sectional area, and be flush with the streambed and not deflect flow.
4) The rock must be imbedded into the channel at least two rock diameters in thickness.
5) The largest rock should be used at the base and top of the grade control structure to buttress the other rock

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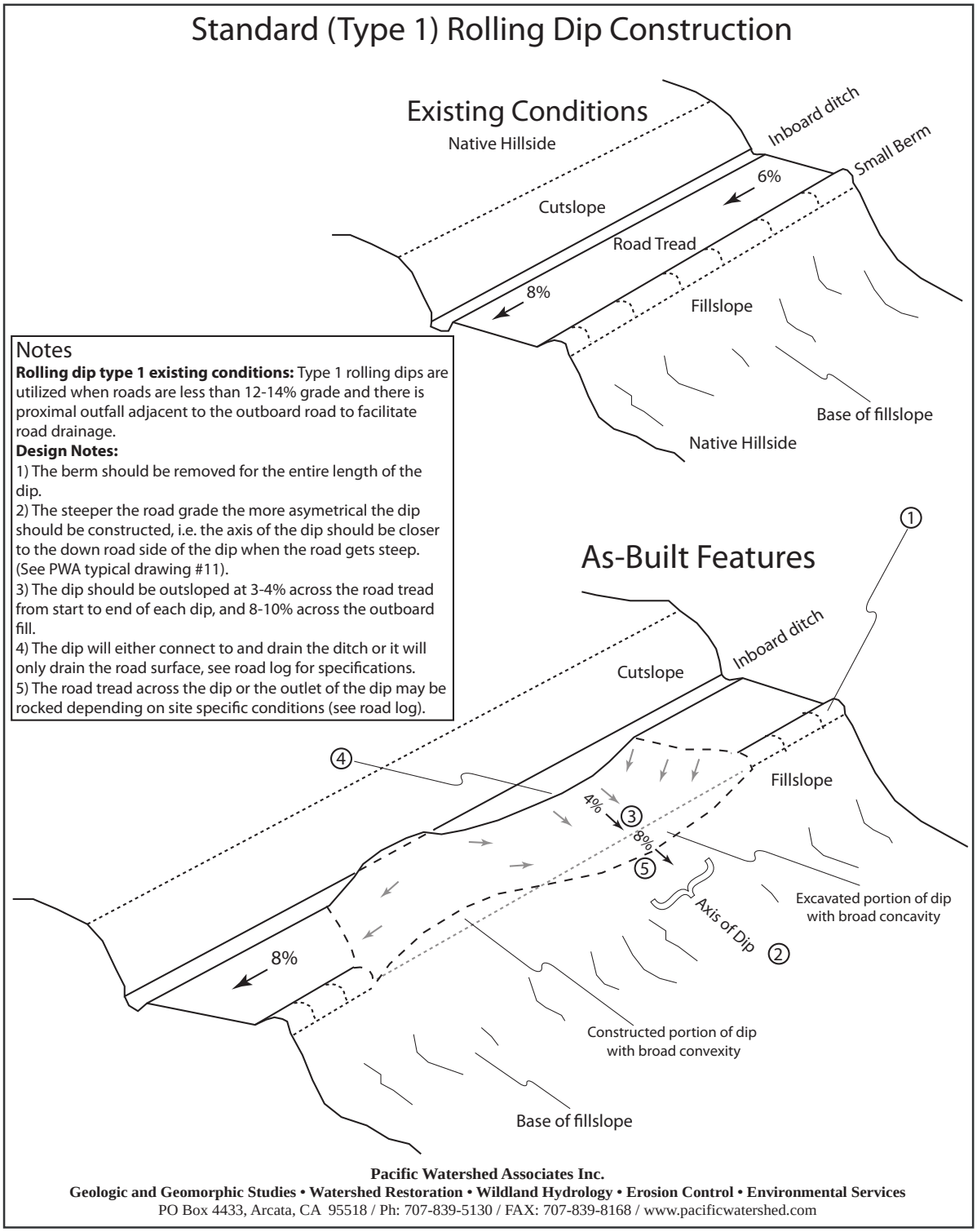
PWA Typical Drawing #18

Standard (Type 1) Rolling Dip Construction



Notes

Rolling dip type 1 existing conditions: Type 1 rolling dips are utilized when roads are less than 12-14% grade and there is proximal outfall adjacent to the outboard road to facilitate road drainage.

Design Notes:

1) The berm should be removed for the entire length of the dip.
2) The steeper the road grade the more asymetrical the dip should be constructed, i.e. the axis of the dip should be closer to the down road side of the dip when the road gets steep. (See PWA typical drawing #11).
3) The dip should be outsloped at 3-4% across the road tread from start to end of each dip, and 8-10% across the outboard fill.
4) The dip will either connect to and drain the ditch or it will only drain the road surface, see road log for specifications.
5) The road tread across the dip or the outlet of the dip may be rocked depending on site specific conditions (see road log).

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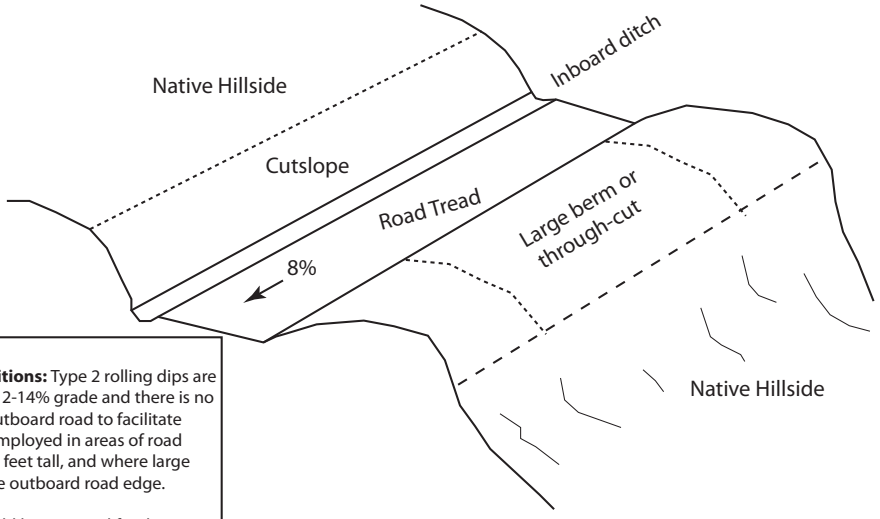
PWA Typical Drawing #19a

Type 2 Rolling Dip Construction

(Through-cut or thick berm road reaches)



Notes

Rolling dip type 2 existing conditions: Type 2 rolling dips are utilized when roads are less than 12-14% grade and there is no proximal outfall adjacent to the outboard road to facilitate road drainage. These should be employed in areas of road through-cuts generally less than 3 feet tall, and where large wide and/or tall berms exist on the outboard road edge.

Design Notes:

1) The berm or native hillside should be removed for the entire length of the excavated portion of the dip, or, at a minimuim through the axis of the dip.

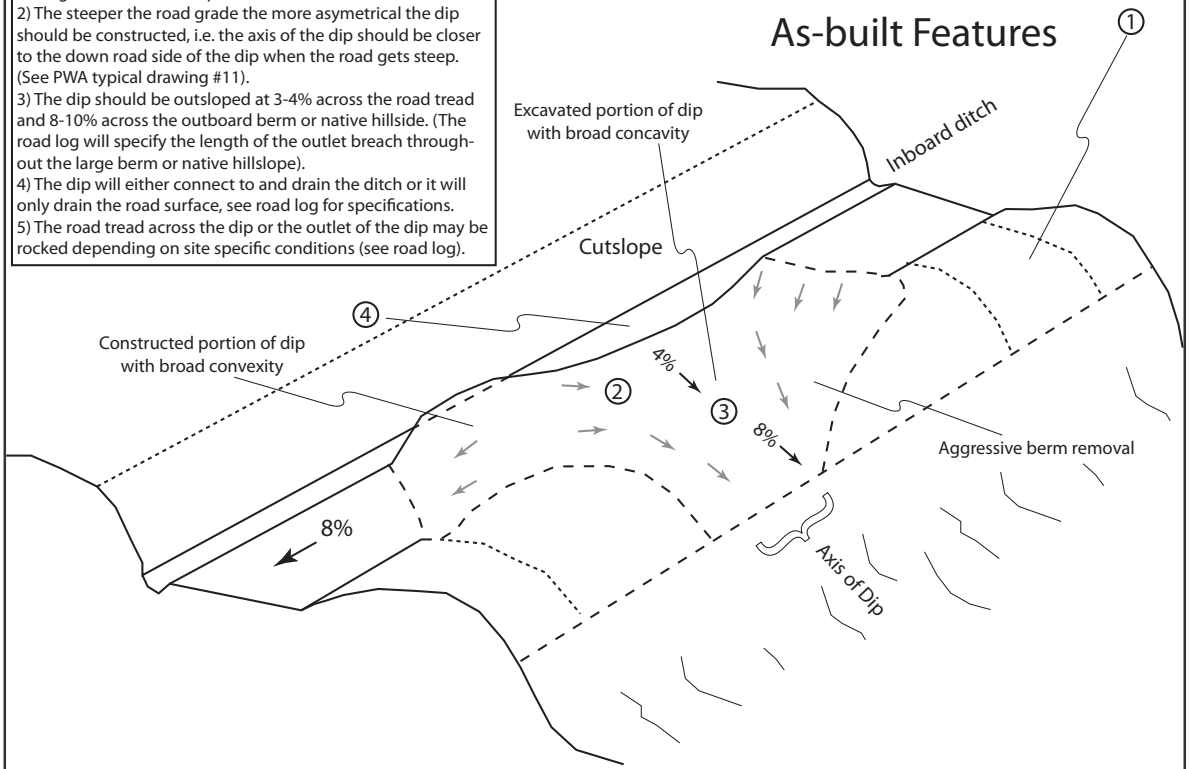
2) The steeper the road grade the more asymetrical the dip should be constructed, i.e. the axis of the dip should be closer to the down road side of the dip when the road gets steep. (See PWA typical drawing #11).

3) The dip should be outsloped at 3-4% across the road tread and 8-10% across the outboard berm or native hillside. (The road log will specify the length of the outlet breach through-out the large berm or native hillslope).

4) The dip will either connect to and drain the ditch or it will only drain the road surface, see road log for specifications.

5) The road tread across the dip or the outlet of the dip may be rocked depending on site specific conditions (see road log).

As-built Features



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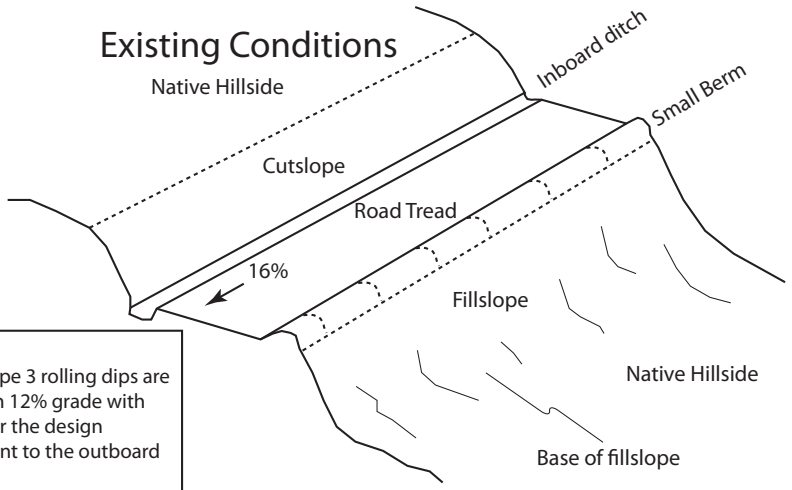
PWA Typical Drawing #19b

Type 3 Rolling Dip Construction (steep slope outslope)

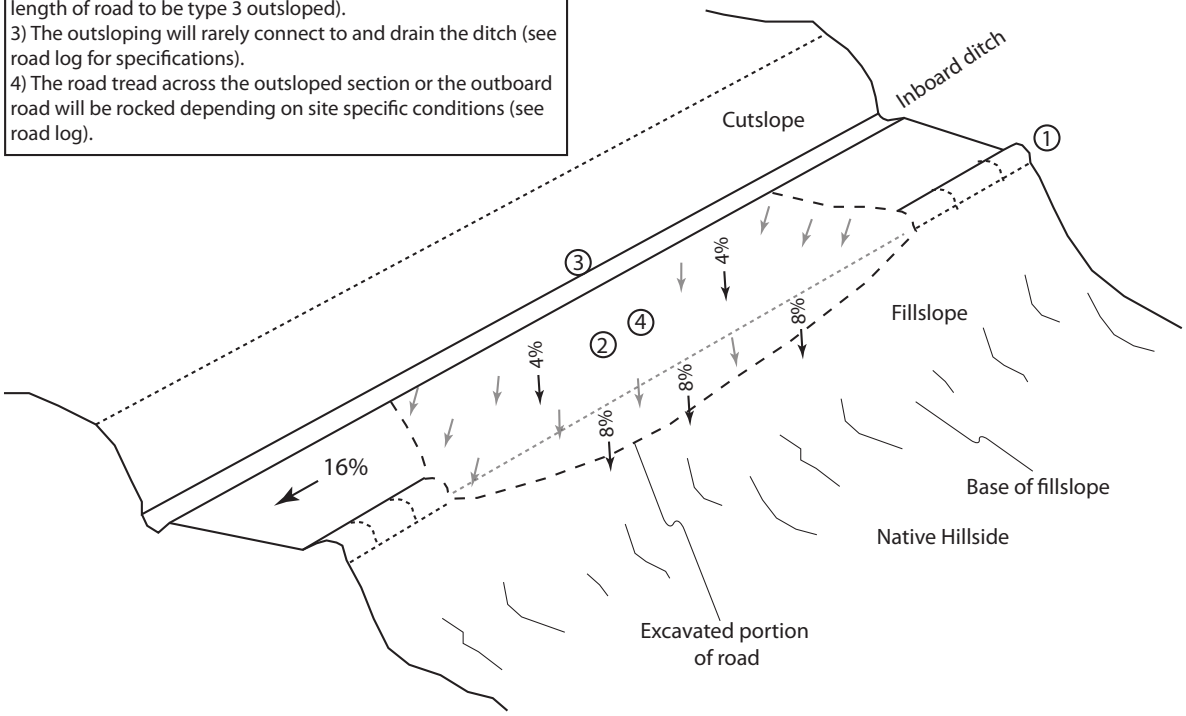


Notes

Rolling dip type 3 existing conditions: Type 3 rolling dips are utilized when roads grades are steeper than 12% grade with little opportunity to create reverse grade for the design vehicle, and there is proximal outfall adjacent to the outboard road to facilitate road drainage.

Design Notes:

1) The berm should be removed for the entire length of the outsloped section.
2) The dip should be outsloped at 2-4% across the road tread and 4-8% across the outboard fill. (The road log will specify the length of road to be type 3 outsloped).
3) The outsloping will rarely connect to and drain the ditch (see road log for specifications).
4) The road tread across the outsloped section or the outboard road will be rocked depending on site specific conditions (see road log).



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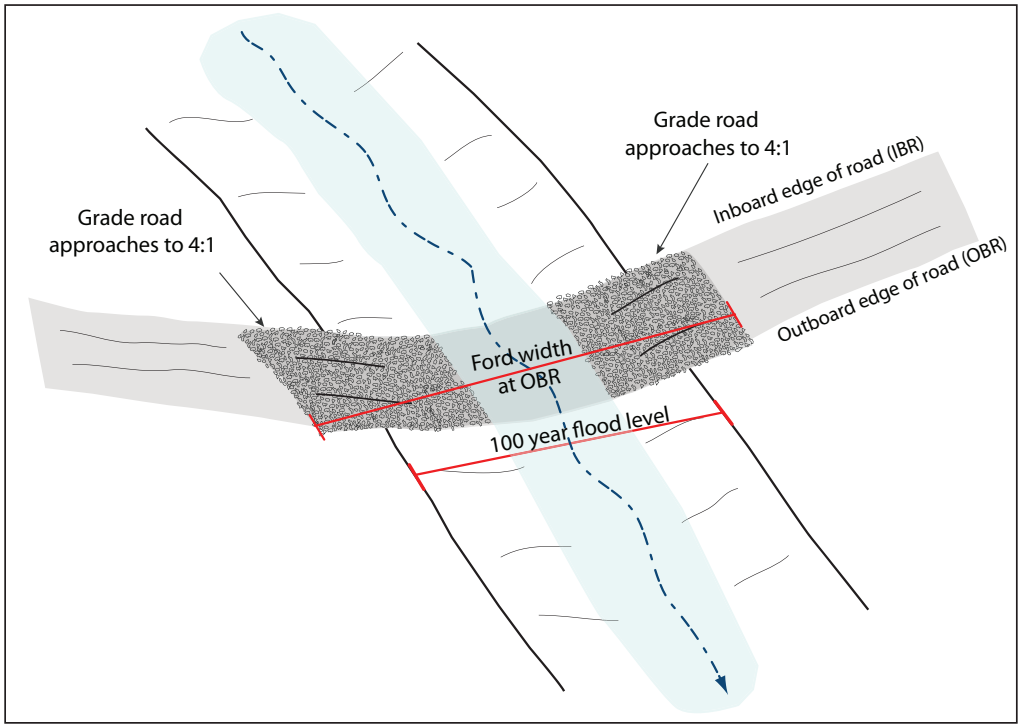
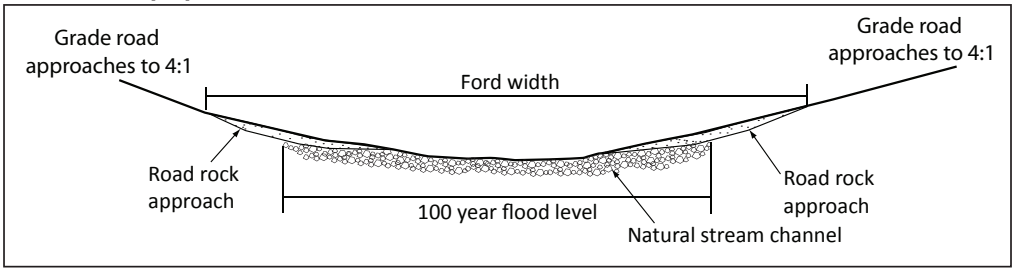
PWA Typical Drawing #19c

Typical Ford Crossing Installation

Oblique view



Cross-section perpendicular to watercourse



Steps for ford crossing construction:

1. Remove any existing structures (culverts, logs, large boulders, etc.)
2. Remove all road fill as you dip through the crossing to reach natural stream channel.
3. Establish a "U" shape across the channel at the width specified in the road logs.
4. Grade road approaches to specified slope angle (e.g., 4:1). Approaches may or may not be rocked; follow specifications in the road logs.

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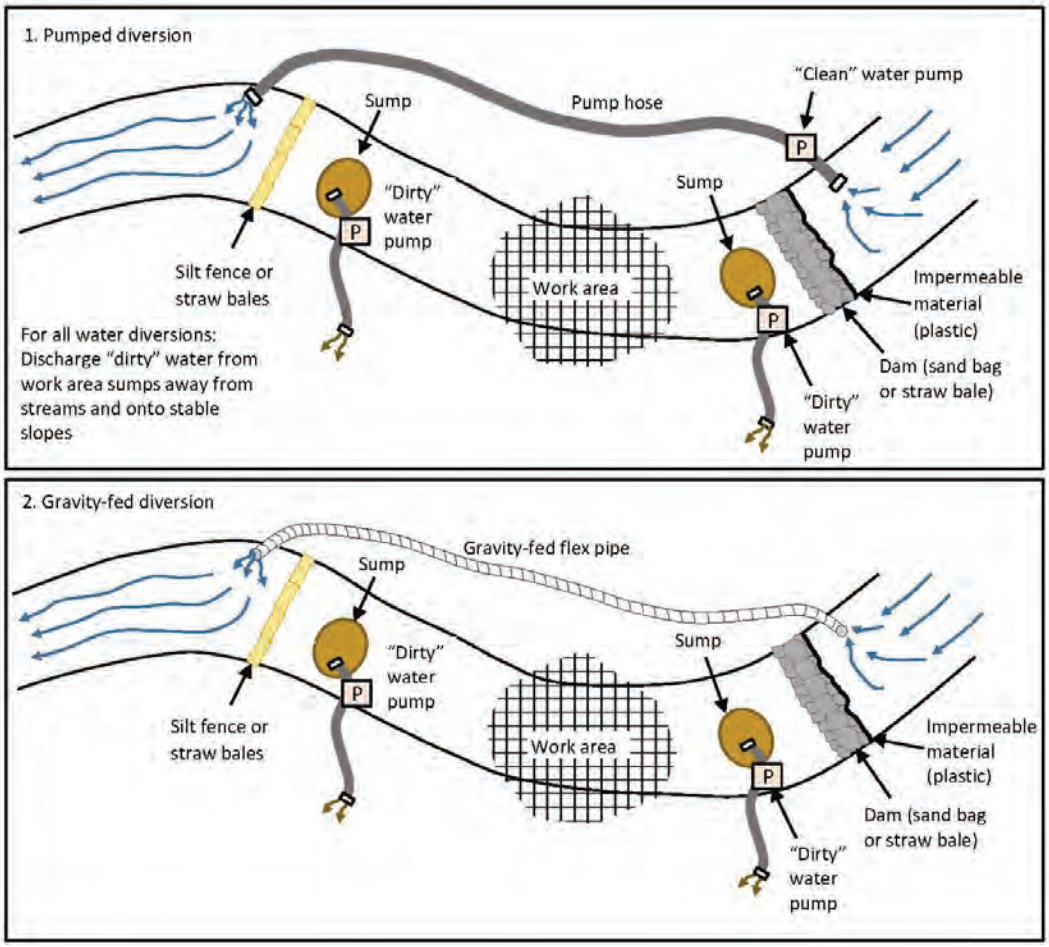
Typical Drawing #20

Typical Design for De-watering Streams



Stream crossing de-watering

Prior to working in and around the active stream channel, proper stream dewatering and avoidance of increasing downstream turbidity should be employed. Stream flows will be isolated upstream of the work area using cofferdams and transported downstream / around the work site through either a pumped diversion (Type 1) or by gravity diversion (Type 2) to keep the stream "live" (flowing) below the work area. An additional dam will be installed downstream of the work areas to capture any subsurface flow that might travel through the construction area. Any "dirty" water will be collected at this location and pumped away from the site where it can infiltrate into the ground without the potential to delivery to the stream and/or be used to wet fill being deposited in the spoil disposal areas.

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PWA Typical Drawing #21

Appendix D
Representative Photos

Quarry Park Watershed Assessment and Erosion Prevention Planning Project San Mateo County, California

Feature Description	Site #	Photo #	Page #
Dolphine Fire Road	-	1	D-2
Miranda East Fire Road	-	2	D-2
Meadow Trail	-	3	D-3
Pond	4	4	D-3
Pond	4	5	D-4
Pond	4	6	D-4
Pond	4	7	D-5
Pond	4	8	D-5
Stream crossing	2	9	D-6
Stream crossing	2	10	D-6
Stream crossing	19	11	D-7
Stream crossing	19	12	D-7
Stream crossing	39	13	D-8
Stream crossing	39	14	D-8
Stream crossing	39	15	D-9
Ditch relief culvert	40	16	D-9
Ditch relief culvert	40	17	D-10
Ditch relief culvert	40	18	D-10
Stream crossing	41	19	D-11
Stream crossing	41	20	D-11
Stream crossing	9	21	D-12
Stream crossing	16	22	D-12
Stream crossing	16	23	D-13
Stream crossing	23	24	D-13
Stream crossing	24	25	D-14
Stream crossing	31	26	D-14
Stream crossing	36	27	D-15
Stream crossing	38	28	D-15
Landslide	11	29	D-16
Coastal Bluff Trail	-	30	D-16
Coastal Bluff Trail	-	31	D-17
Coastal Bluff Trail	-	32	D-17
Quarry Vista Lookout	73	33	D-18
Quarry Vista Lookout	73	34	D-18
Urban drainage interface Santa Maria	AOC #2	35	D-19
Urban drainage interface Moro Avenue	AOC #3	36	D-19
Urban drainage interface Moro Avenue	AOC #3	37	D-20

Photo 1 (Dolphine Fire Road): View of the existing road conditions of the native surfaced Dolphine Fire Road near the road intersection with the Middle Ridge Fire Road.

Photo 2 (Miranda East Fire Road): View of the existing road conditions on the Miranda East Fire Road at Gate 4 as shown on Map 2.

Photo 3 (Meadow Trail): View of active gully erosion along the Meadow trail. Combined diverted steam flow and concentrated road runoff are eroding the road surface along this native surfaced road.

Photo 4 (Site #4): View of the on-stream pond located at Site #4 looking upstream from the left edge of the levee. Note the aggraded sediment at the upstream edge of the pond.

Photo 5 (Site #4): View of the levee associated with the on-stream reservoir Site #4, looking west-southwest across the top of the dam face.

Photo 6 (Site #4): View of temporary dysfunctional sandbag spillway at the southwest corner of the on-stream pond Site #4.

Photo 7 (Site #4): View of a road fill failure caused by diverted pond outflow. This erosion feature is located down the right road from the levee. Note the road prism is completely washed out.

Photo 8 (Site #4): View of the seeping drainage valve at base of the dam fillslope in the axis of the valley downstream of pond.

Photo 9 (Site #2): View of stream crossing through this shallow sediment filled pond. Stream sediment transport has deposited a large volume of fine sediment in this old pond, inundating the pond and trail.

Photo 10 (Site #2): View of an active 5.5ft tall headcut at the downstream extent of the inundated pond at stream crossing Site #2 on the Meadow trail shown in the previous photo.

Photo 11 (Site #19): View of failing cutbank immediately upslope of the right edge of stream crossing Site #19. This cutbank failure delivers directly to the Class III stream in the axis of the crossing fill crossing.

Photo 12 (Site #19): View of failing outboard fillslope, looking downslope at the fill failure deposits below the right hingeline of the fill crossing at Site #19. This photo was taken from the outboard edge of the road.

Photo 13 (Site #39): View looking downstream from the upstream extent of the of the failing stream crossing. Note the recently deposited sediments that have plugged the culvert inlets. The sediment is causing the stream flow to divert down the left road which is inducing a delivering fill failure.

Photo 14 (Site #39): View of an outboard fill failure to the left of the stream crossing. The fill failure was induced by the diverted streamflow from the plugged stream crossing at Site #39 and excessive concentrated road surface runoff.

Photo 15 (Site #39): View looking upstream at the failing outboard fillslope of this plugged stream crossing. The photo was taken standing approximately 8ft downstream of the culvert outlets.

Photo 16 (Site #40): View of a section of disconnected culvert downspout at the top of an actively migrating headcut and gully below the paved Private Drive at Site #40. Oxidation exposed on the stake is indicative of the previous depth of burial prior to the episodic hillslope failure.

Photo 17 (Site #40): View looking upslope at the same disconnected downspout and active erosion as shown in the previous photo. The photo was taken from the base of the gully downslope of the headcut standing on top of one of the failed sections of culvert.

Photo 18 (Site #40): View of active hillslope gully below Site #40 looking upstream. This photo was taken from the edge of the tree-line near the headwaters of a small Class III stream that drains to Site #16 downstream. The gully is conveying sediment from the gully erosion upslope to the Class III stream.

Photo 19 (Site #41): View looking upstream at a washed out fill crossing on a near origin Class III stream downslope from residential area on Santa Maria Avenue. This view of the scoured stream channel was taken from the outboard edge of road at Site #41.

Photo 20 (Site #41): View of a hillslope failure and undermined residences upstream from Site #41. This area upslope extent of AOC 4 as discussed in the text of the report. This photo was taken from the outboard edge of the Fire Break Road upslope from the Upper Pond Legacy Road as shown on Map 2.

Photo 21 (Site #9): View of the perched culvert outlet at stream crossing Site #9. The culvert at this crossing is undersized and installed high and short in the fill with a 6ft drop at the outlet and subsequent outboard fill erosion.

Photo 22 (Site #16): View of the fill crossing at Site #16 on the Dolphine Fire Road. Diverted stream flow is actively eroding gullies down the left road from this stream crossing.

Photo 23 (Site #16): View of the left road approach to fill crossing Site #16. Diverted stream flow is actively eroding gullies down the left road from this stream crossing and delivering to a watercourse at Site #15.

Photo 24 (Site #23): View of the outlet of the culvert at stream crossing Site #23 at the edge of the main parking lot. This culvert is undersized and stream flow avulses out of the drainage alignment and onto the parking lot surface.

Photo 25 (Site #24): View of a makeshift foot bridge at stream crossing Site #24. The active erosion at this site is minimal, and a formal crossing should be established.

Photo 26 (Site #31): View of an outboard fill failure at Site #31 on the Vista Point Trail. Concentrated road run off had saturated the steep outboard fill and subsequently destabilized the fillslope leading to failure.

Photo 27 (Site #36): View of a culvert inlet on a small Class III stream at Site #36. This site is downstream of the pond Site #37 in the base of the quarry.

Photo 28 (Site #38): View of the right road approaches to a fill on crossing on a Class III stream on the South Ridge Trail.

Photo 29 (Site #11): View of the hydrologically connected left road approach to landslide Site #11. Long reaches of concentrated road runoff have eroded a gully down the outboard fillslope and induced a failure.

Photo 30 (Coastal Bluff Trail): View of bluff retreat looking south along unpaved coastal trail. The gullies located along the wave cut bluffs are exacerbated by concentrated runoff from the trail and upslope marine terrace meadows.

Photo 31 (Coastal Bluff Trail): View of bluff retreat looking northward along unpaved coastal trail. This photo is looking up the hydrologically connected right road reach to the gullies displayed in the previous photo.

Photo 32 (Coastal Bluff Trail): View of road surface erosion along the coastal trail due to concentrating runoff. Note the exposed beach protection rock armor at the edge of the park boundary in the distance.

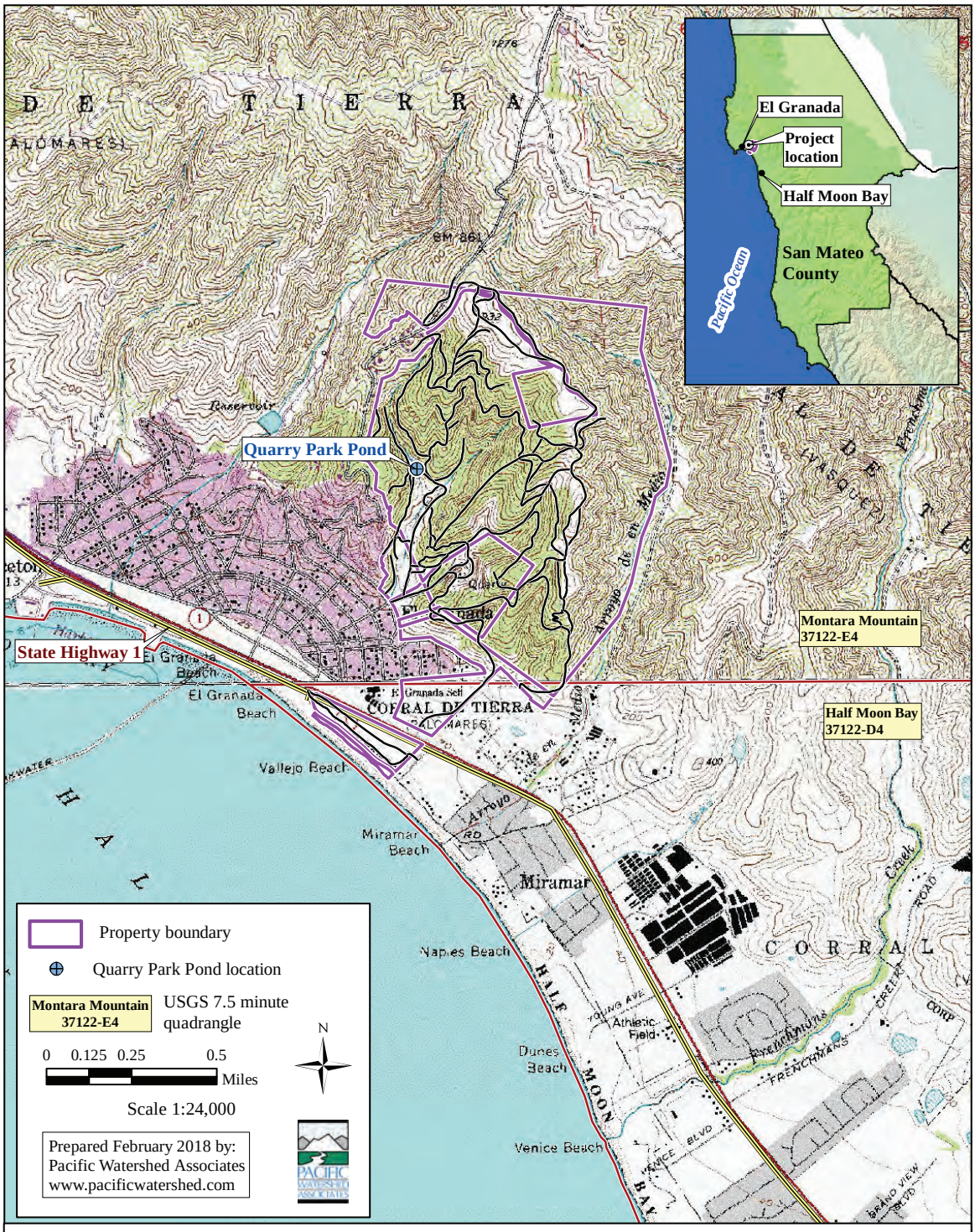
Photo 33 (Lookout Vista): View of the lookout deck and failing hillslope below the outermost footing. This photo was taken looking upslope from the base of the quarry floor.

Photo 34 (Lookout Vista): View of the failing hillslope below the wooden lookout vista platform. The quarry cutslope is oversteep and is actively failing in multiple locations along the upper edge of the quarry area.

Photo 35 (Urban Drainage Interface - AOC 2): View of uncontrolled Class II stream flow exiting the Park at Santa Maria Avenue (AOC2, Map 2). Combined flow from the stream and road surface runoff travel down Santa Maria Ave. The majority of the Park's drainage area evacuates the Property into the residential area downstream at this location.

Photo 36 (Urban Drainage Interface - AOC 3): View of a seasonal Class II stream channel downstream from Site #39, ~30 ft upstream from an uncontrolled urban drainage interface (AOC 3) at Moro Drive on the south western boundary of the Park (AOC3, Map 2).

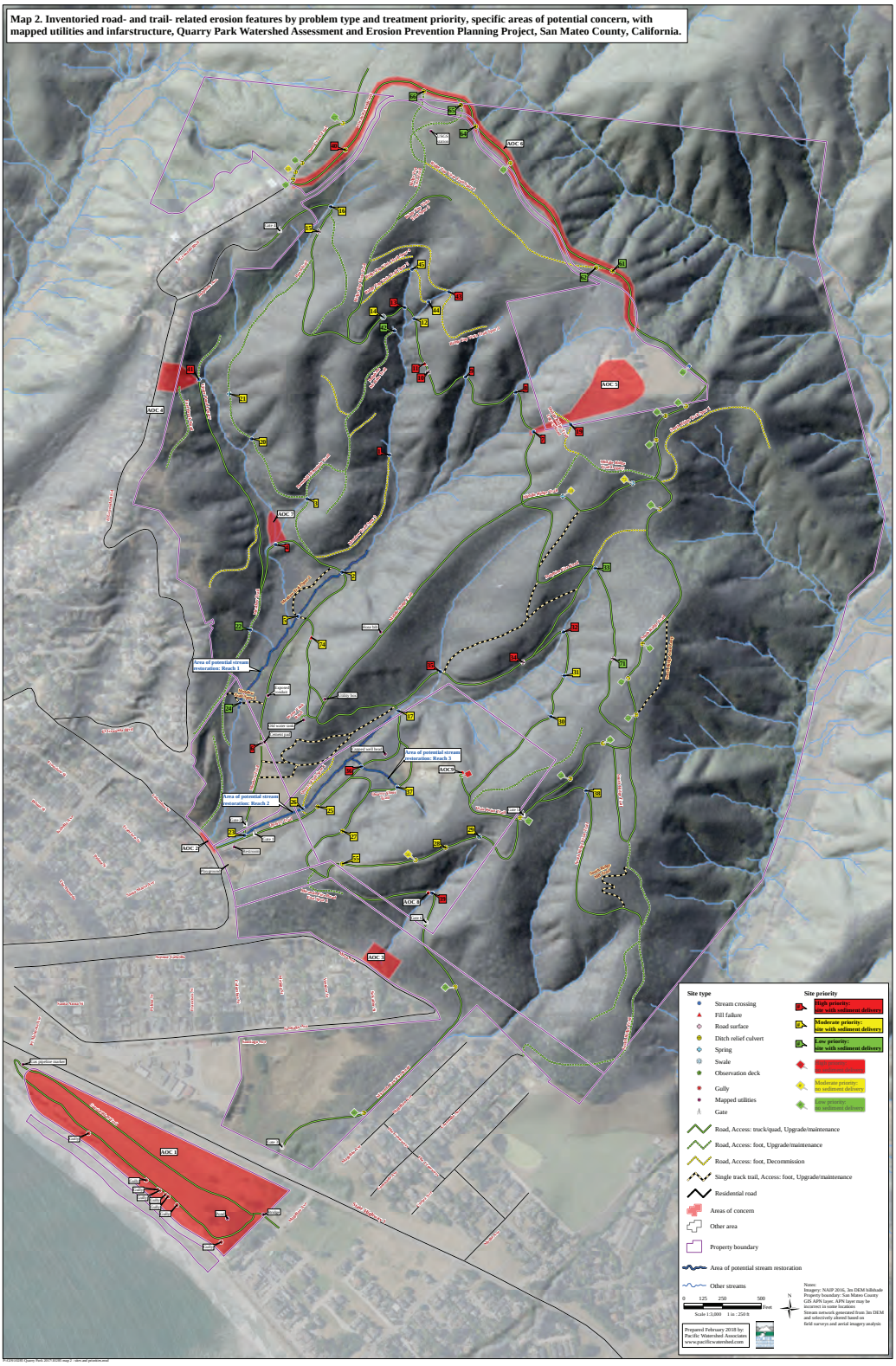
Photo 37 (Urban Drainage Interface – AOC 3): View of the urban drainage interface located on Moro Ave, (AOC 3, Map 2). Flow is conveyed down the inboard ditch for ~325' to a ditch relief culvert at the intersection of Santiago Ave. and Moro Ave. The crowned road surface keeps the majority of the stream flow on the inboard edge of the road.



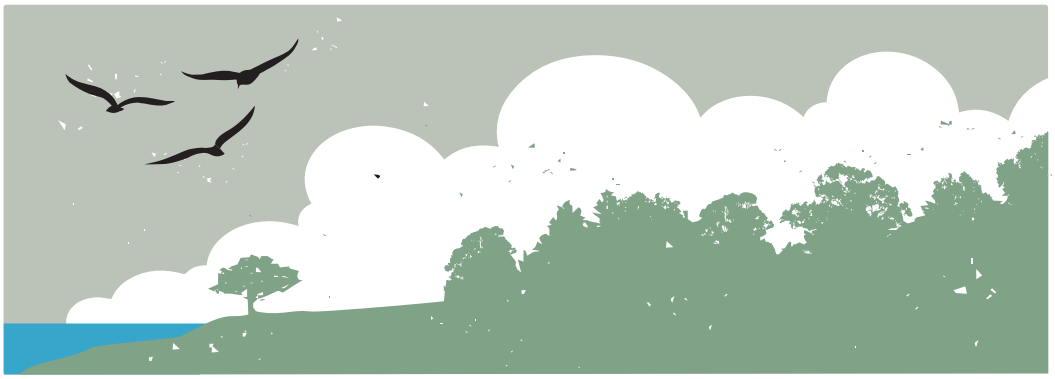
Map 1. Location of the Quarry Park Watershed Assessment and Erosion Prevention Planning Project, San Mateo County, California.

P:\GIS\10285 Quarry Park 2017\10285 map 1 - location.mxd

Map 2. Inventoried road- and trail- related erosion features by problem type and treatment priority, specific areas of potential concern, with mapped utilities and infarstructure, Quarry Park Watershed Assessment and Erosion Prevention Planning Project, San Mateo County, California.



APPENDIX C | DAM AND RESERVOIR ASSESSMENT



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Notes:

1. The State Water Board has named the pond the Wicklow Reservoir due to water rights. Throughout the Master Plan, the body of water is referenced as the Wicklow Reservoir.

   The 2018 Quarry Park Pond Stability Analysis refers to the Wicklow Resevoir as a 'pond.' The water body's classification has been modified since the 2018 Assessment Report was published, and all references to a pond in the report are about the Wicklow Resevoir.

2. At the time of report publishing, the park unit was known as Quarry Park.

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Draft Quarry Park Pond Stability Analysis
Quarry Park San Mateo County, California

PWA Draft Report No. 181028504
April 2018

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Table of Contents

Attachments:
Map 1. Quarry Park Location Map, San Mateo County, California.
Sheet 1. Plan View – Pond Existing Ground Survey
Sheet 2. Section View – Pond Embankment
Subsurface Boring Logs of Pond Embankment Fill (2)

1 BACKGROUND

The 26 year old Quarry Park pond and earthen dam site (hereinafter the site) is located on a moderately sized intermittent Class II stream located along the San Mateo County, California coastline and drains to Half Moon Bay and the Pacific Ocean. Quarry Park is comprised of 517-acres of newly acquired San Mateo County Park lands and is located about 25 miles south of San Francisco and about 4 miles north of central Half Moon Bay. The pond and park locations are shown on Map 1.

Pacific Watershed Associates (PWA), Petaluma, CA on behalf of Gates & Associates (G&A), San Ramon, CA has been under contract with San Mateo County Parks to develop a Master Plan for the recently acquired Quarry parklands. Based on a property-wide assessment of watershed conditions and infrastructure, questions arose as to the overall stability and long term disposition of the Quarry Pond and its' earthen dam and spillway conditions.

At the request of San Mateo County Parks, G&A and PWA was retained to perform a rapid and preliminary engineering and geologic assessment of the pond for structural competence and stability, and make recommendations for necessary repairs, modifications, or potential removal, if necessary. The pond is hydrologically isolated from anadromy and fish passage is not a concern at the site.

2 HISTORY OF SITE DEVELOPMENT

Based on information contained in the Water Rights Permit #19186, issued by the California State Water Resources Control Board, pond construction was completed sometime prior to 1992. Given the short timeframe for completing the preliminary assessment, detailed construction plans for the pond and its dam were not available for review. Relatively recent site development activities were assessed using digital imagery from Google Earth (GE). The pond is visible in the earliest available GE image, which is dated July 9, 1993. There are no notable changes to the pond site in any of the subsequent images. The most recent GE image reviewed was dated September 1, 2017.

3 GEOLOGIC, GEOMORPHIC, AND HYDROLOGIC SETTING

3.1 Structural geologic setting

The site lies within the Coast Range geomorphic province of northern California, characterized by northwest trending mountains and valleys which generally mirror the dominant strike slip San Andreas Fault system and smaller, en eschelon fault systems including the nearby strike slip San Gregorio fault zone, which includes the Denniston Creek fault and Sea Cove fault (Pampeyan, 1994).

This is a seismically active area where active and potentially active faults can credibly generate earthquakes producing significant ground motion. Recognized active seismic risk zones that could affect the site include the Alquist-Priolo (AP) San Andreas fault zone, which lies

approximately 4.5 miles east of the Park; and the San Gregorio fault zone, the Pilarcitos fault, and the Serro fault; all of which lie within 7 miles of the site. (Brabb, 1998).

Strong ground acceleration may reduce slope stability and play an integral role in the initiation or reactivation of landslides on native hillslopes and man-made fills. Ground motion maps created under the California Seismic Hazards Mapping Act identify the delineation of seismic hazards zones as determined by the California Department of Conservation. According to the California Geological Survey (CGS) Ground Motion Interpolator, there is a 10% probability that the area will experience mean Peak Ground Acceleration (PGA) of approximately 0.513g within 50 years and a 2% probability that the site will experience PGA of 0.880g (CGS, 2008).

3.2 Surface lithology

The distribution of mapped lithological units within the Park was compiled from GIS provided by the NPS Geologic Resources Inventory Program (NPS, 2009). Over half of the Property is underlain by Quaternary lithologies with colluvial slope and ravine debris (Qsr) being the dominant lithology. Slope and ravine debris of Qsr are primarily found in the steeper, upper half portions of amphitheater shaped sub-basins. The Qsr colluvial deposits are a result of shallow landslides, bioturbation and soil creep geomorphic processes, and are comprised of unconsolidated deposits of weathered rock and soil. Poorly consolidated sands, silts, clays, and gravels comprise the remaining Quaternary age alluvium (Qalo) as you approach the urban interface. Cretaceous age Granitic rocks of Montara Mountain (Kgr) underlie a small portion of the ridgetops along the outer edges of the Park, consisting of highly fractured, deeply weathered, crystalline granitic rock (quartz diorite and granite). These rocks are foliated and found to primarily dominate the higher elevations. In general, the underlying geologic units develop friable sandy soils, with moderate to high erosion potential, particularly when disturbed by natural episodic events or anthropogenic activities.

3.3 Hydrology

The site is located on a moderately sized intermittent Class II stream (locally known as Santa Maria Creek) and drains to Half Moon Bay. Elevations within the Quarry Park range from approximately 115 feet to 935 feet above sea level. Rainfall in the area averages 22” per year as recorded at the Pacifica USCG rain gage, DWR #E70 6586 20. Most of this precipitation falls between November-March.

4 POND SITE RECONNAISSANCE

On February 8, 2018, Brad Job, Sr. Civil Engineer; Clay Allison, Staff Geologist; and Kyle Spongberg, Geologic Technician, conducted a site reconnaissance visit to characterize the embankment properties, pond overflow conditions, and potential for future erosion and sediment delivery associated with the area surrounding the pond. Site reconnaissance activities consisted of installation of two soil borings, hand texturing of soils, preparation of subsurface boring logs, and performance of a topographic / bathymetric survey of the pond and its immediate vicinity.

Refer to the attachments for soil descriptions of subsurface boring logs. Representative photos of the pond and associated area are included within the PWA watershed assessment report, *Quarry Park Watershed Assessment and Erosion Prevention Planning Project San Mateo County, California, Appendix D.*

4.1 Topographic Survey

The pond is semi-oval in shape, about 190 feet long, and about 105 feet at its widest dimension. The maximum water depth at the time of the survey is about 11 feet (Sheets 1 and 2). The estimated volume of the pond at various water surface elevations is shown in Table 1; Stage – Storage Table. The maximum impounded storage volume is about 2.39 acre-feet.

The California Department of Water Resources (CDWR) requires registration of dams where the storage volume is greater than 15 feet and the vertical distance measured from the lowest point at the downstream toe of the earthen dam to its maximum storage elevation is greater than 25 feet. In addition, alterations to or removal of dams in excess of these limits must be approved by CDWR. Based on the results of the topographic survey, the maximum fill depth at the toe of the embankment was 30 feet. Although this depth is greater than the CDWR regulatory threshold, the 2.39 acre-foot maximum pond volume is well below the 15 acre-feet volume threshold. Thus, CDWR registration of the embankment as a “dam” is not necessary nor must CDWR be notified if the dam is to be removed. However, prior to construction of any recommended treatments, appropriate local, state, and/or federal regulatory agencies may need to be notified and applicable permits secured.

4.2 Subsurface Investigation

Two 2-inch diameter borings were advanced using a hand auger to final depths of approximately 14 feet bgs. Pleases refer to subsurface boring logs attached for complete details. Generally speaking, clean mineral soil fill was used to construct the embankment (dam). It appears that clay was mixed on site with decomposed granite sand and gravel to construct the fill. Lenses of sandier and clayier material were encountered in the borings, indicating that the clay and sand were likely windrow mixed while the embankment was being placed. All of the fill was well compacted and both compressive and shear strength increased with depth. Although a few small fragments of wood were encountered in the borings, the organic content was not significant enough to cause concern about the stability of the fill. Boring B-1 encountered the contact between the embankment fill and the interpreted native underlying geology, which appeared to have been properly stripped to mineral soil prior to placement of fill (Sheet 1).

Neither of the borings encountered saturated conditions, poor-quality fill, or other conditions that bring into question the stability of the embankment. In summary, the embankment fill appears structurally competent, to have been placed in accordance with good engineering and construction practices and has low potential for liquefaction.

Table 1: Stage – Storage Relationship.

Contour Elevation (Arbitrary Datum)	Storage Volume (cu. ft.)	Storage Volume (acre-ft.)
470	0	0.00
472	320.91	0.01
474	850.9	0.02
476	1,792.42	0.04
478	2,989.47	0.07
480	4,417.77	0.10
482	6,133.94	0.14
484	7,496.31	0.17
486	13,398.29	0.31
488	22,397.2	0.51
490	34,279.08	0.79
492	49,100.81	1.13
494	67,400.37	1.55
496	71,843.74	1.65
498	90,191.84	2.07
500	104,122.13	2.39

5 ANALYSES AND INTERPRETATION

5.1 Stability

Embankment stability is a function of a number of geologic and hydrologic factors including percent saturation, pore water pressure, soil friction angle, shear strength, compressive strength, and seismic loading. The upstream and downstream fill slopes of the embankment were both within acceptable slope steepness limits based on guidance from the US Department of Agriculture Natural Resources Conservation Service (NRCS, 1997) (Sheet 2).

It is generally agreed that the modes of catastrophic embankment failure under seismic loading include liquefaction and loss of shear strength, differential movements of the dam foundation, overtopping by earthquake induced seiches or waves, and damaged outlet works or cracks in the embankment that might lead to leakage, piping and/or internal and external erosion of the embankment. However, there is no widely accepted methodology to assess the seismic stability of small embankment ponds like this site. Therefore, we present a qualitative matrix to determine if this embankment has an unusual risk of failure as a result of an earthquake (Table 2).

Table 2: Seismic Risk Factors.

Risk Factor	Present
PGA greater than 0.2g	Yes
Capable faults beneath the embankment	No
Hydraulic fill embankments	No
Saturated sand embankments	No
Loose, saturated alluvial foundations	No
Fine-grained soils susceptible to cyclic failure	No
Thin impervious cores	No
Thin filter zones	No
Conduits embedded in embankment	Yes
History of seismic damage	No
Small freeboard	No

Well-constructed earthen embankment ponds have been observed to be relatively resistant to earthquake-induced damage. This is likely because they are flexible and are typically constructed with large factors of safety. The pond embankment is constructed of granitic sand amended with a substantial cohesive clay component, the embankment fill appears to have been properly compacted, and mineral soil was used to construct the embankment, so the structural stability of the embankment appears to be acceptable. Well-compacted cohesive soils, such as that observed in the embankment are not particularly susceptible to liquefaction. Calculations of static loads based on the limiting cross-section in the deepest portion of the embankment show that it resists failure with a factor of safety of 3.7 (Sheet 2).

We consider a minimum factor of safety of 3 to be acceptable for earthen embankment ponds. Thus, this pond is nominally safe from failure by translation, even when seismic loading is considered. In a less seismically active location, the pond would be considered exceptionally safe. It is important to note a factor of safety greater than 3 does not equate to certainty that an embankment cannot fail, but rather that there is a very small risk of catastrophic failure.

The other method of seismic failure is settlement of the embankment crest as a result of shaking. We assessed the embankment using the empirical methods presented in Singh and Roy (2009). These approximations indicate that although the embankment appears to have been properly constructed, there may be as much as 15 feet of settlement of the dam crest in the maximum credible earthquake. This could result in the rapid discharge of the entire impounded volume of water. While this would result in a downstream flash flood, it is likely that water depths at the downstream park boundary would be on the order of 3 feet or less. We note that a decision to drain or remove the pond is a risk management decision and PWA is not aware of any statutory requirement to abandon this pond as a result of the earthquake risk.

5.2 Large Trees Growing on Embankment

The presence of a fairly dense stand of average 1-2 foot diameter trees in the embankment is also a significant concern. This is because trees can topple and displace a large volume of soil from

the embankment. Roots from large trees can also create macropores that can serve as a conduit for flowing water, which can breach or damage an embankment. Both of these conditions could result in progressive failure of the embankment. However, continued growth of shallow-rooted ground cover vegetation on the downstream face of the embankment is necessary and desirable to reduce chronic surface erosion and sediment delivery to the stream channel below the embankment.

5.3 Risk of Embankment Failure Due to Erosion of the Existing Overflow Channel

The existing spillway is structurally incompetent, hydraulically inadequate, and lacks redundancy resulting in unsafe conditions. Spillway failure is the most likely mode of failure for this pond. We recommend that the pond have both a primary and secondary spillway constructed in the very near future. PWA generally recommends that embankment ponds have a culverted spillway and an emergency overflow spillway. In this case, a 54-inch diameter corrugated metal pipe (CMP) spillway with trash rack will convey the anticipated 100-year discharge from the catchment. A rock lined chute will provide a margin of safety in the event of a beyond 100-year precipitation event occurs or if the CMP spillway becomes plugged by debris.

One means of reducing the consequences of earthquake-induced settlement would be to set the spillway elevation lower than the current condition. Although this would not significantly alter the estimated settlement, it would reduce the volume of impounded water and the extent and depth of potential downstream inundation.

5.4 Accreted Sediment

We estimate that roughly 1,000 cubic yards of deltaic fine gravels and sand sediments have been deposited at the upstream extent within the original pond. This represents about 25% of the estimated original water storage volume. If the pond was completed in 1992, this represents about 40 cubic yards of sequestered sediment per year. At the present historic rate of erosion and sediment transport into the pond, it will likely fill completely with sediment in about 100 years. Although we have identified measures to reduce production of sediment in the upslope contributing sub-watershed catchment, sediment retention almost certainly benefits downstream water quality and community and private infrastructure.

6 PROPOSED REMEDIAL ACTIONS

PWA recommends several measures to improve the resilience of the pond or, depending on management objectives, abandoning it through some form of dam removal and site rehabilitation. It is unlikely that the dam will fail by translation (sliding). It is more likely that the dam could fail through either: 1) a breach caused by spillway failure, or 2) settle catastrophically in the maximum credible earthquake and rapidly release up to 2.4 acre-feet of water into the downstream watershed and neighborhoods. More detailed hydraulic modelling would be required to assess these dam breach scenarios and determine the potential depth and extent of the resulting inundation and sediment delivery.

6.1 Pond Retention

If management objectives involve retention of the pond, the specific measures that should be undertaken include:

1. The bottom drain structure/plumbing should be inspected closely during the dry season when the pond can be safely emptied and the plumbing can be safely accessed. It is likely that the existing drain pipe located near the bottom of the reservoir may be in need of maintenance. Depending on the consistency of the accreted sediment, it may be necessary for the pond to stay dry for several weeks in order to safely access the pond drain.
2. A culvert spillway should be installed at the outlet to the pond. We recommend installation of a 54-inch diameter CMP extending from the outlet down to the bottom of the slope. The CMP should be installed with culvert stakes driven into the slope no more than 40 feet apart in accordance with the manufacturer's recommendations. A 3/8" galvanized wire rope should extend from the top set of culvert stakes to the bottom set and bonded to the CMP at every joint to distribute the load. The outlet of the pipe should have a CMP "T" as an energy dissipater surrounded by large rocks with a mean diameter (D_{50}) of 12 inches. In addition, an emergency spillway rock-lined chute should be constructed to provide for a drainage relief in case the culvert spillway becomes plugged by debris.
3. Large trees growing on the embankment should be cut down, but it is not necessary to excavate the stumps at this time. Because a significant percentage of the trees are eucalyptus, stump sprouts will be ubiquitous and require annual maintenance and removal if not treated with a targeted herbicide when cut.
4. The pond, primary spillway, emergency spillway, and bottom drain should be thoroughly visually inspected annually in the late summer to assess structural integrity. Any observed holes in the embankment, earth movement, failed pipe joints, or other evidence of instability should be noted and repairs should be affected as soon as possible.
5. The embankment should be thoroughly inspected immediately following any earthquake that results in other significant structural damage in the site vicinity.

All remedial work should be performed during the dry weather period during the summer or fall. Work should be performed during a period where no precipitation is forecast for a period of 7 days or a period long enough to perform all recommended treatments and apply all surface erosion best management practices (BMP). All necessary surface erosion BMP materials should be onsite prior to the initiation of the remediation treatments.

6.2 Pond Decommissioning

There are at least two potential options if the decision is made to decommission the pond: complete removal or wetland creation. The complete removal option would involve excavation and removal of substantially all of the constructed embankment. The dam embankment soils are almost certainly suitable for reuse as a structural fill. The aggraded stored sediment will be relatively difficult to handle and is likely unsuitable for reuse as a fill. This option would likely be the more expensive of the two, would require a larger area for spoils disposal involving trucking of considerable fill material, and would not provide much, if any, residual amenity for the park.

The wetland creation option would entail lowering the embankment height to retain a minor volume of impounded water for the purpose of creating emergent wetland habitat. The wetland creation option would maintain the visual amenity of a water feature in the park along with creating wildlife habitat, while reducing the volume of impounded water would significantly reduce the potential downstream hazard and minimize the costs required to end-haul the embankment and dispose of the aggraded fine sediments.

Lowering the height of the embankment accompanied by a resulting reduction in water surface elevation (while maintain at least 3 feet of freeboard at the embankment crest) would have the effect of reducing the volume of water impounded in the pond. Because the most significant threat from the pond is an uncontrolled discharge of the pond's contents as a result of settlement under the maximum credible seismic loading, reducing the volume of impounded water would have the beneficial effect of reducing the extent and magnitude of potential downstream flood impacts.

In terms of structural stability, reducing the depth of impounded water would beneficially affect the calculated stability of the embankment. Because the hydrostatic pressure exerted on the embankment face is a function of the depth of impounded water, reducing the depth of impounded water by 50% will reduce the pressure of the water on the embankment by roughly 50%. Lateral stability is a function of the hydrostatic pressure versus lateral resistance of the embankment to sliding. Lowering the height of the embankment would slightly reduce the resistance to sliding because of a resulting reduction in mass, but the reduction in resistance to sliding would significantly be less than the reduction in hydrostatic pressure as a result of a lowered water surface. In addition, the width of the crest of the embankment will increase significantly if the top of the embankment is lowered, which also increases the margin of safety because more material would have to erode before the embankment fails, were it to overtop.

Important decisions that would need to be made for either option include selection of a spoils location (or locations) where the excavated clayey sand and aggraded fine sediment could be placed for reuse or long-term disposal. We estimate that the embankment removal option will entail end-hauling and placement of approximately 10,000 cubic yards of clayey sand and 2,000 cubic yards of loose silty clay. The wetland creation option would require end-hauling and placement of about 5,000 cubic yards of clayey sand. These volume estimates are for planning purposes only and could vary by as much as 20%. More detailed designs would refine these preliminary estimates.

7 CONCLUSIONS

Based on the field inspection and analyses performed by PWA, the embankment fill appears structurally competent, to have been placed in accordance with good engineering and construction practices, has low potential for liquefaction and is nominally safe from failure by translation, even when seismic loading is considered. In a less seismically active location, the pond would be considered exceptionally safe. However, given the local seismic risk, it is important to note that its safety factor of greater than 3 does not equate to certainty that an embankment cannot fail, but rather that there is a very small risk of catastrophic failure. During a

credible earthquake event, another concern is the rapid discharge of impounded water resulting in a downstream flash flood and mobilization of impounded sediments.

The highest priority remedial actions for retaining the dam and pond to increase pond stability and decrease risk to park infrastructure and downstream neighbors include: designing and constructing a primary and an emergency spillway, tree removal from the dam embankments, draining the pond and inspecting the current underdrain plumbing, and performing annual dam, pond and embankment surveys, especially following earthquakes. The recommended remedial treatments require the use of heavy earthmoving equipment and hand labor. Effective implementation of the recommended treatments as soon as possible will suitably improve the stability of the spillway and reduce the potential for embankment failure, erosion, and sediment delivery to nearby streams and downstream receptors.

The two recommended remedial options for decommissioning the dam and include: complete removal or wetland creation to increase pond stability and decrease risk to park infrastructure and downstream neighbors. Both options also require the use of heavy earthmoving equipment and hand labor. Effective implementation factors to consider with decommissioning options include: spoil management, determining proper storage locations and/or use of excavated material; maintaining specific water storage capacity; and opportunities for wetland/habitat restoration and education.

8 CERTIFICATION AND LIMITATIONS

The interpretations and conclusions presented in this report are based on a study of inherently limited scope. Observations are qualitative, or semi-quantitative, and excepting two shallow borings, are confined to surface expressions of limited extent and artificial exposures of subsurface materials. Interpretations of problematic geologic and geomorphic features (such as unstable hillslopes) and erosion processes are based on the information available at the time of the study and on the nature and distribution of existing features.

The conclusions and recommendations contained in this report are professional opinions derived in accordance with current standards of professional practice and are valid as of the submittal date. No other warranty, expressed or implied, is made. PWA is not responsible for changes in the conditions of the property with the passage of time, whether due to natural processes or to the works of man, or changing conditions on adjacent areas. Furthermore, to be consistent with existing conditions, information contained in the report should be reevaluated after a period of no more than three years, and it is the responsibility of the landowner to ensure that all recommendations in the report are reviewed and implemented as stated and according to the conditions existing at the time of construction. Finally, PWA is not responsible for changes in applicable or appropriate standards beyond our control, such as those arising from changes in legislation or the broadening of knowledge, which may invalidate any of our findings.

Certified by:

Brad Job, California Registered Civil Engineer #C55699

9 REFERENCES

Brabb, E.E., Graymer, R.W., and Jones, D.L., 1998, Geology of the onshore part of San Mateo County, California: A digital database: U.S. Geological Survey Open-File Report OF 98-137, scale 1:62,500.

Brabb, E.E., Graymer, R.W., and Jones, D.L., 1998, Geology of the Palo Alto 30 x 60 minute quadrangle, San Mateo County, California: A digital database: U.S. Geological Survey Miscellaneous Field Studies Map MF 2332, scale 1:100,000.

California Building Standards Commission, 2013. California Building Code http://www.bsc.ca.gov/Home/Current2013Codes.aspx.

CGS, 2002, California Geomorphic Provinces: Sacramento, CA, California Geological Survey, Note 36, 4 p. Available from: http://www.consrv.ca.gov/cgs/information/publications/cgs_notes/note_36/Documents/note_36.pdf

CGS, 2008, Ground Motion Interpolator (2008), California Geologic Survey Web site: http://www.quake.ca.gov/gmaps/PSHA/psha_interpolator.html

Gotvald, A.J., Barth, N.A., Veilleux, A.G., and Parrett, Charles, 2012, Methods for determining magnitude and frequency of floods in California, based on data through water year 2006: U.S. Geological Survey Scientific Investigations Report 2012–5113, 38 p., 1 pl.

National Park Service (NPS), 2009. *Geologic Resources Inventory Map Document for Golden Gate National Recreation Area*, Geologic Resources Incentive Program.

NPS GRI Program, 2009, Digital Geologic Map of the Golden Gate Recreation Area and Vicinity, California [digital layer], NPS Geologic Resources Inventory Program.

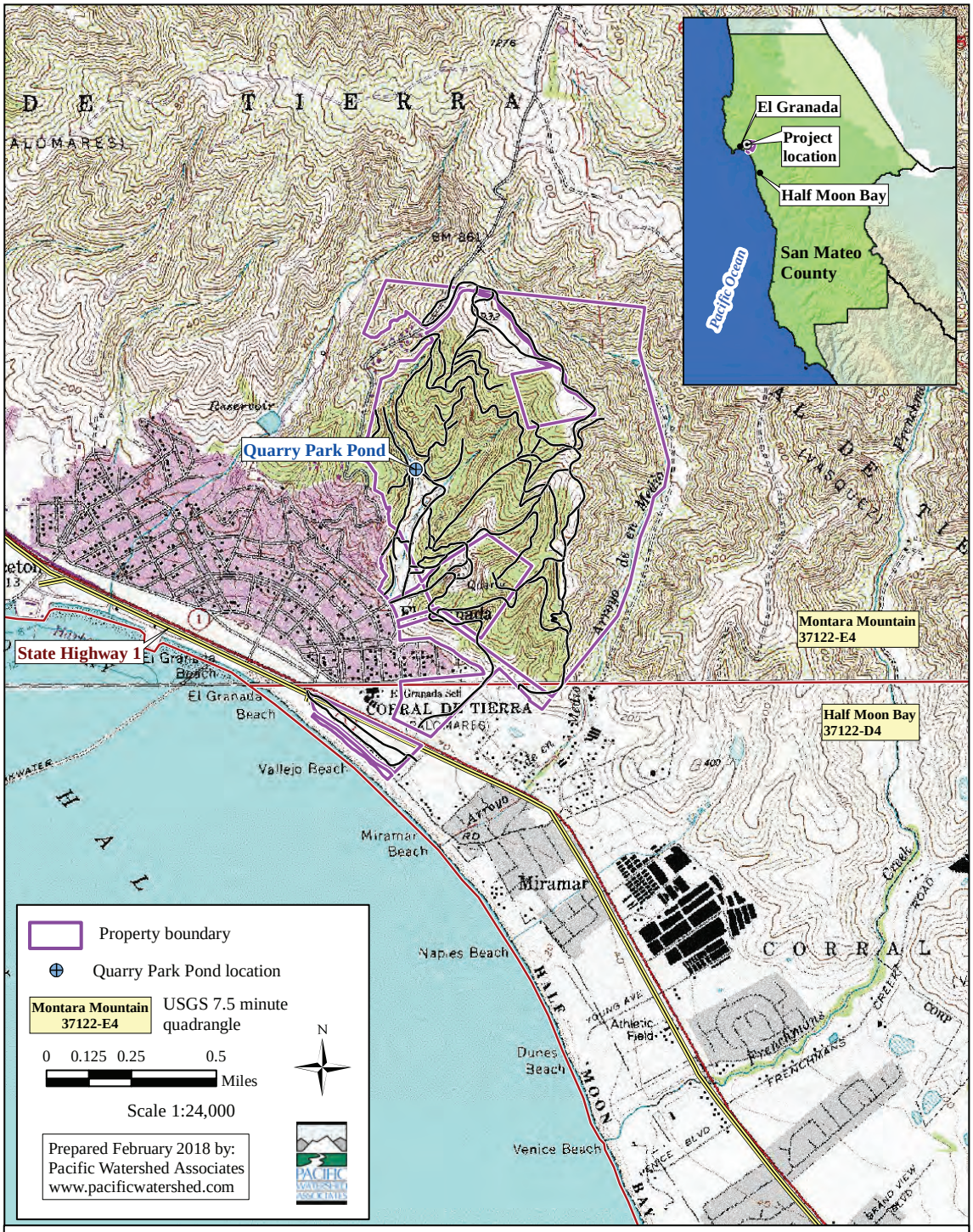
Pampeyan, E.H., 1994, Geologic Map of the Montara Mountain and San Mateo 7.5' Quadrangles, San Mateo County, California, .U.S. Geological Survey, Miscellaneous Investigations Series Map I-2390, 1:24,000 scale (GRI Source Map ID 4100).

Ries, K.G., III, 2006, The National Streamflow Statistics Program: A computer program for estimating streamflow statistics for ungaged sites: U.S. Geological Techniques and Methods Report TM Book 5, Chapter A6, 45 p.

Singh, R. and Roy, D., 2009, Estimation of Earthquake-Induced Crest Settlements of Embankments, American Journal of Engineering and Applied Sciences, Volume 2, Issue 3

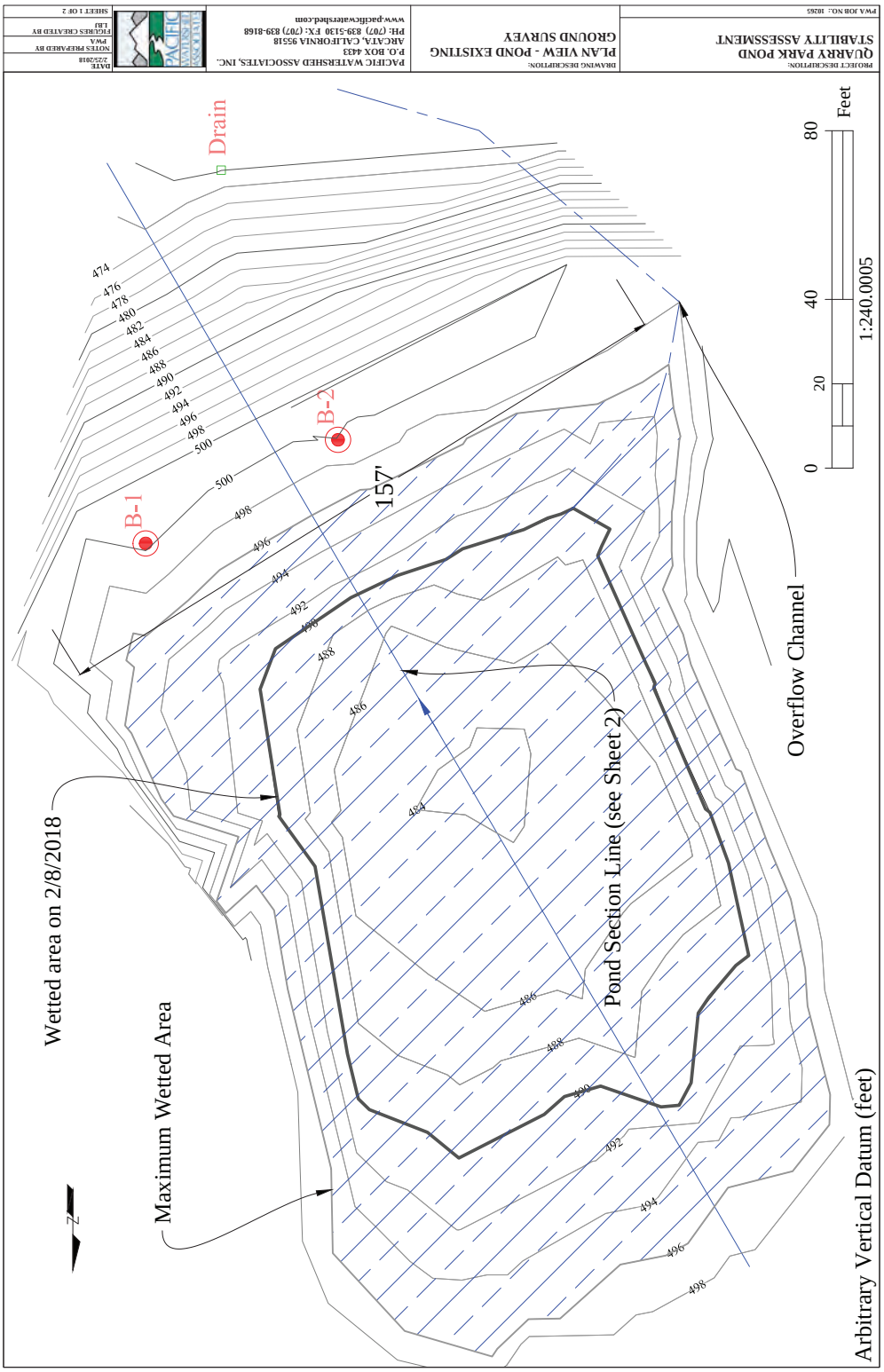
U. S. Department of Agriculture, Natural Resources Conservation Service (NRCS), 1997, Agriculture Handbook 590 Ponds — Planning, Design, and Construction, Available from: http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb1246427.pdf

U.S. Department of the Interior, Bureau of Reclamation, 1987, Design of Small Dams; Third Edition.



Map 1. Location of the Quarry Park Watershed Assessment and Erosion Prevention Planning Project, San Mateo County, California.

P:\GIS\10285 Quarry Park 2017\10285 map 1 - location.mxd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QUARRY PARK POND
STABILITY ASSESSMENT
PWA JOB NO.: 18265
DRAWING DESCRIPTION:
PLAN VIEW - POND EXISTING
GROUND SURVEY
PACIFIC WATERSHED ASSOCIATES, INC.
P.O. BOX 4433
ARCATA, CALIFORNIA 95518
PH: (707) 839-5130 FX: (707) 839-8168
www.pacificwatersheds.com
DATE
2/25/2018
NOTES PREPARED BY
PWA
FIGURES CREATED BY
LBJ
SHEET 1 OF 2
Drain
B-1
B-2
157'
Wetted area on 2/8/2018
Maximum Wetted Area
Pond Section Line (see Sheet 2)
Overflow Channel
Arbitrary Vertical Datum (feet)
N
0
20
40
80
Feet
1:240.0005

PROJECT DESCRIPTION:
QUARRY PARK POND
STABILITY ASSESSMENT
PWA JOB NO.: 10265
DRAWING DESCRIPTION:
SECTION VIEW - POND
EMBANKMENT
PACIFIC WATERSHED ASSOCIATES, INC.
P.O. BOX 4433
ARCATA, CALIFORNIA 95518
PH: (707) 839-5130 FX: (707) 839-8168
www.pacificwatersheds.com
DATE
2/25/2018
NOTES PREPARED BY
PWA
FIGURES CREATED BY
LBJ
SHEET 2 OF 2
Pond Section
Maximum Water Surface Elevation
Inferred Location of Bottom Drain
52%
32%
41%
16%
Relative
Elevation (ft)
510
505
500
495
490
485
480
475
470
465
460
455
450
0+00
1+00
2+00
3+00
Station (ft)
Vertical Exxageration = 3X
Arbitrary Vertical Datum

Project Name Quarry Park Pond Stability Project Number 10285

Hole Number B-1 Hole Size 2" Date Drilled 2/8/2017

Excavation Method hand auger Logged By LBJ Hole Elevation Approx. 490'

Unconfined Compressive Strength	Moisture Content (%)	Dry Density (pcf)	Sampled Interval	Depth (ft)	Field Classification Based on Unified Soil Classification System (texture, consistency, moisture, color, symbol, remarks)
2,500 psf	~8%	135 pcf		1	SC - Clayey sand (decomposed granite ammended with clay), 60% sand, 20% clay, 20% rock fragments <0.5" dia, 7.5YR/3/3, fine roots, dry, hard
				2	SC - Clayey sand, 50% sand, 30% clay, 20% gravel, few rock fragments <1.5" dia, 7.5YR/4/3, firm, moist
				3	SC - Clayey sand, 60% sand, 20% clay, 20% gravel, 7.5YR/4/4, firm, moist, few roots, few redox features
				4	CL - Sandy clay, 30% sand, 60% clay,10% gravel, 7.5YR/4/2, dry, occasional fine organic (wood) fragment, firm, moist
				5	
				6	SC - Clayey sand, 60% sand, 30% clay, 10% rock fragments <1.75" dia, 7.5YR/4/2, firm, moist
				7	
				8	CL - Clayey sand, 30% sand, 60% clay,10% rock fragments <0.5" dia, 7.5YR4/2, firm, moist, few lenses of SP (decomposed granite) >3" thick
				9	
1,500 psf	~10%			10	CL - Clayey sand, 15% sand, 85% clay, 7.5YR4/2, medium soft, moist7.5YR/3/4

Start Time 08:10 AM Completion Time 9:15 AM Page 1 of 2

Project Name Quarry Park Pond Stability Project Number 10285

Hole Number B-1 Hole Size 2" Date Drilled 2/8/2017

Excavation Method hand auger Logged By LBJ Hole Elevation Approx. 490'

Unconfined Compressive Strength	Moisture Content (%)	Dry Density (pcf)	Sampled Interval	Depth (ft)	Field Classification Based on Unified Soil Classification System (texture, consistency, moisture, color, symbol, remarks)
2,200 psf	~10%			11	SC - Clayey sand , 60% sand, 10% clay, 30% rgravel and rock fragments, 7.5YR/3/1, hard, moist, possible native contact
				12	
				13	BOB
				14	
				15	
				16	
				17	
				18	
				19	
				20	

Start Time 08:10 AM Completion Time 09:15 PM Page 2 of 2

Project Name Quarry Park Pond Stability Project Number 10285

Hole Number B-2 Hole Size 2" Date Drilled 2/8/2017

Excavation Method hand auger Logged By LBJ Hole Elevation Approx. 490'

Unconfined Compressive Strength	Moisture Content (%)	Dry Density (pcf)	Sampled Interval	Depth (ft)	Field Classification Based on Unified Soil Classification System (texture, consistency, moisture, color, symbol, remarks)
2,500 psf	~8%	135 pcf		1	SC - Clayey sand (decomposed granite ammended with clay), 60% sand, 20% clay, 7.5YR/4/4, fine roots, dry, hard
				2	
				3	SC - Clayey sand, 60% sand, 40% clay, few organic fragments (wood) 7.5YR/4/3, firm, moist
				4	SC - Clayey sand, 60% sand, 40% clay, few organic fragments (wood) 7.5YR/4/3, firm, moist
				5	SC - Clayey sand, 60% sand, 40% clay, few organic fragments (wood) 7.5YR/4/3, firm, moist
				6	
2,000 psf	~10%			7	CH - Clay with sand, 20% sand, 70% clay,10% gravel, 7.5YR/4/4, firm, moist
				8	
				9	
				10	

Start Time 09:20 AM Completion Time 10:15 AM Page 1 of 2

Project Name Quarry Park Pond Stability Project Number 10285

Hole Number B-2 Hole Size 2" Date Drilled 2/8/2017

Excavation Method hand auger Logged By LBJ Hole Elevation Approx. 490'

Unconfined Compressive Strength	Moisture Content (%)	Dry Density (pcf)	Sampled Interval	Depth (ft)	Field Classification Based on Unified Soil Classification System (texture, consistency, moisture, color, symbol, remarks)
2,000 psf	~10%			11	CH - Clay with sand, 10% sand, 85% clay, 5% gravel, 7.5YR/3/2, hard, moist
				12	
				13	BOB
				14	
				15	
				16	
				17	
				18	
				19	
				20	

Start Time 09:20 AM Completion Time 10:15 AM Page 2 of 2

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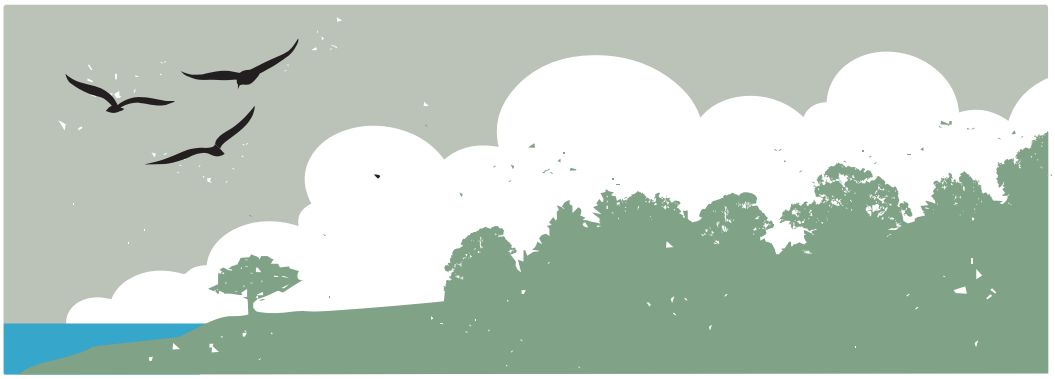
APPENDIX D | OUTREACH



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COMMUNITY MEETING 1

QUARRY PARK
MASTER PLAN

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Agenda for Meeting #1

GATES +ASSOCIATES LANDSCAPE ARCHITECTURE · LAND PLANNING · URBAN DESIGN

WORKING AGENDA

Tuesday May 16, 2017
Quarry Park Master Plan Community Meeting #1
Wednesday 7:00-9:00 pm
El Granada Elementary School
Multipurpose Room

Time Frame	Topic	Presenter	Props
15 minutes	**Introduction / Welcome** • Team/Contacts	County Staff	• Sign-in sheet • Name tags
5 minutes	**Meeting Overview** • Purpose of Meeting • How to Participate	Gates	• PowerPoint
30 minutes	**Background Presentation** • Efforts to-date • Going forward	County Staff / Gates	• Powerpoint
40 minutes	**Station Break Out** • Site Analysis • Uses • Trails	Station Leaders	Exhibits
20 minutes	**Station Summary** • 5 mins per station	Station Leaders	Exhibits
10 minutes	Next Steps	Gates	

2671 Crow Canyon Road San Ramon, California 94583 T 925.736.8176 www.dgates.com

Presentation Slides From Meeting #1

COMMUNITY MEETING #1

MAY 16, 2017

INTRODUCTION

THE MASTER PLAN TEAM

San Mateo County Parks

- Gates + Associates
  (Park & Recreation Planning/Lanscape Architecture)
- WRA Environmental Consultants
  (Biological Resources Assessment)
- Pacific Watershed Associates
  (Erosion Inventory and Assessment)

Presentation Slides From Meeting #1

MEETING OVERVIEW

TODAY'S AGENDA

1. Background Presentation
2. Input Stations
3. Share Feedback/Summary
4. Next Steps

QUARRY PARK
MASTER PLAN

INTRODUCTION

GOALS OF WORKSHOP

» Team Introduction
» Scope and Schedule of Master Plan Project
» Efforts to Date
» Site History
» Update on Technical Studies
» Existing Uses, Potential Uses
» Gather Input - Desired Uses, Priorities, Preferences, etc.
» Summarize Input
» Next Steps

QUARRY PARK
MASTER PLAN

Presentation Slides From Meeting #1

INTRODUCTION

SCOPE OF MASTER PLAN DOCUMENT

Existing Conditions Assessment
- » Biological Assessment
- » Sediment Source Reduction Plan
- » Existing Uses
- » ADA accessibility

Community Outreach Process/Input

Preferred Plan
- » Park Uses and Amenities
- » Vehicle and Trail Access and Travel
- » Infrastructure
- » Signage and Interpretive Opportunities

Management Guidelines

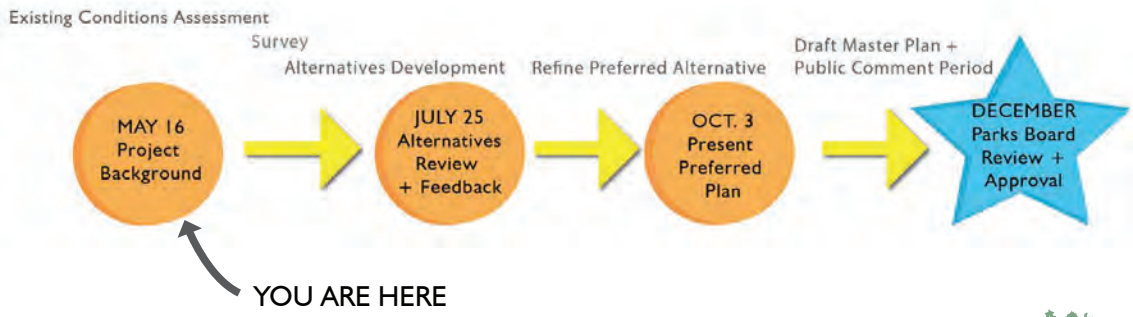
Partnerships

Implementation and Phasing

QUARRY PARK
MASTER PLAN

INTRODUCTION

PROJECT SCHEDULE



Check web site for updates on survey
parks.smcgov.org/quarry-park

QUARRY PARK
MASTER PLAN

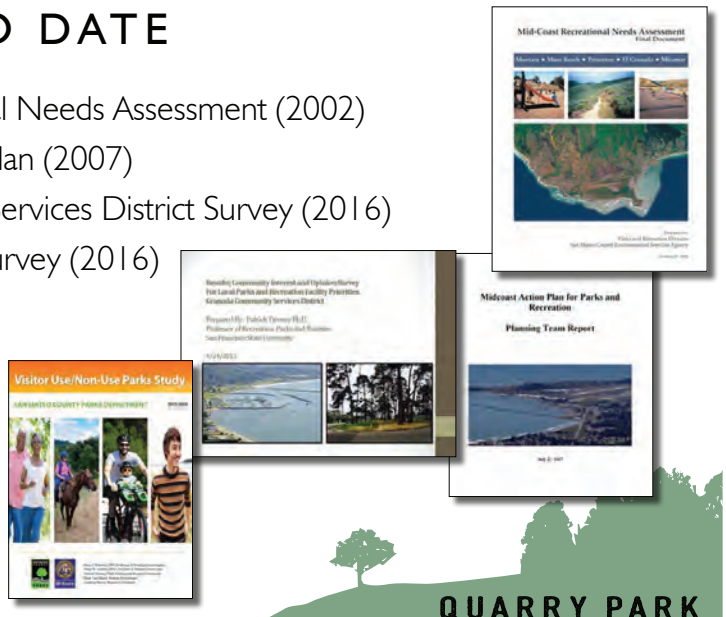
Presentation Slides From Meeting #1

BACKGROUND

EFFORTS TO DATE

Mid-Coast Recreational Needs Assessment (2002)
Midcoast Park Action Plan (2007)
Granada Community Services District Survey (2016)
County Parks Visitor Survey (2016)

Consistent Priorities
- » Hiking
- » Dog Walking
- » Cycling
- » Swimming
- » Picnic
- » Playgrounds



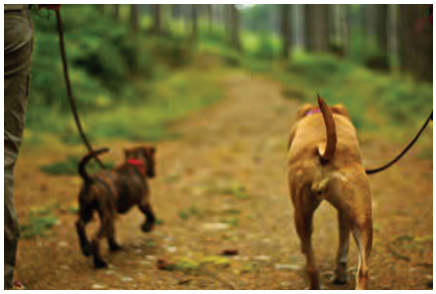
QUARRY PARK MASTER PLAN

BACKGROUND

DOGS IN PARKS

- » Dog management committee currently developing policy recommendations

- » Upcoming meetings:
  - June 19
  - July 17
  - August 21



Dog Committee web page:

parks@smcgov.org/dogs-at-SMC-parks

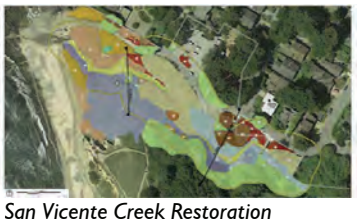
QUARRY PARK MASTER PLAN

Presentation Slides From Meeting #1

BACKGROUND

RECENT IMPROVEMENTS

- Surfer's Beach Coastal Trail Improvements
- Mirada Surf Coastal Trail
- San Vicente Creek Restoration
- Moss Beach Park
- Clipper Ridge Playground
- Quarry Park Playground



San Vicente Creek Restoration

Surfer's Beach

Moss Beach Playground

Mirada Surf Phase III

QUARRY PARK
MASTER PLAN

BACKGROUND

PARALLEL TRAIL

QUARRY PARK
MASTER PLAN

Presentation Slides From Meeting #1

BACKGROUND

SITE HISTORY

Quarry / Wicklow

» Daniel Burnham's plan for open space
» Used for grazing, then as a quarry
» Wicklow planted with Eucalyptus for harvest
» Quarry acquired from Mid-coast Parklands (2008)
» Wicklow acquired from POST (2014)

Mirada Surf

» Cattle grazing and agriculture from 1860s
» Mirada Road eroded into the ocean (1960s)
» Designated as community park (1978)
» Acquired by County (2002)
» 36-mile-long section of California Coastal Trail

QUARRY PARK
MASTER PLAN

BACKGROUND

EXISTING CONDITIONS UPDATE

» Recommendations from assessments will inform Master Plan

San Mateo County Parks Priorities

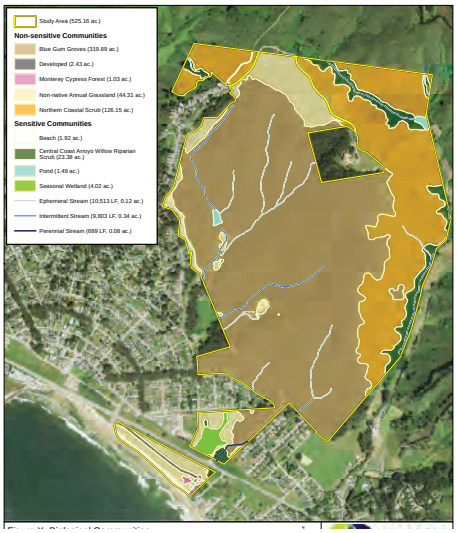
» Recreation opportunities
» Environmental Protection Programs
» Interpretative and Education Programs
» Volunteer Programs and Community Engagement

QUARRY PARK
MASTER PLAN

Presentation Slides From Meeting #1

BACKGROUND

EXISTING CONDITIONS UPDATE



Draft Bilogical Communities Map (WRA)

Biological Assessment

» Sensitive Communities

- Stream features
- Ponds
- Willow scrub
- Vegetation that supports rare plant occurances

» Protected Wildlife

- California Red Legged Frog (confirmed)
- San Francisco Dusky Footed Woodrat (confirmed)
- Monarch butterfly
- Additional potential species

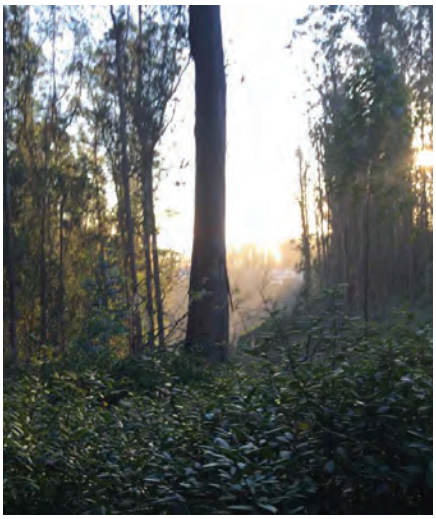
» Nesting birds

» Invasive species

QUARRY PARK MASTER PLAN

BACKGROUND

EXISTING CONDITIONS UPDATE



Fire Management

» Current approach to fire management is to maintain fuel breaks

» Key considerations for Master Plan

- equipment access
- protection of natural resources
- potential uses and/or use locations

QUARRY PARK MASTER PLAN

Presentation Slides From Meeting #1

BACKGROUND

EXISTING CONDITIONS UPDATE

Quarry Park

Mirada Surf

Sediment Source Assessment

» Severe weather 2016/2017

» Evaluate approach to manage erosion and sediment conditions.

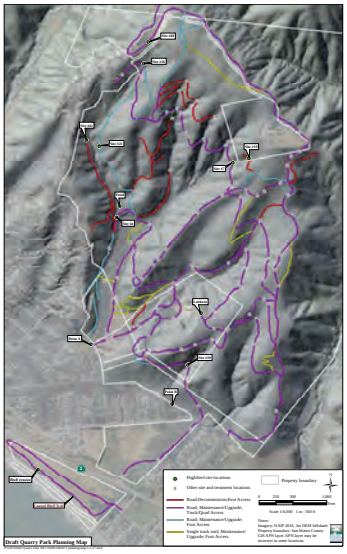
» Considerations in developing and prioritizing recommendations

- public health and safety
- biological sensitivity
- ecological function
- accessibility
- preferred road/trail network and park uses
- aesthetics
- costs

QUARRY PARK
MASTER PLAN

BACKGROUND

EXISTING CONDITIONS UPDATE



» Site areas of concern

» Assessment of existing roads/trails

» Park management to evaluate options for treatment

- upgrade to full road bed
- convert to trail (ATV access for maintenance)
- create connector segments
- decommission (retire)

QUARRY PARK
MASTER PLAN

Presentation Slides From Meeting #1

EXISTING USES

QUARRY

Playground

Vista Point

Picnic

- Parking Lot
- Dog Walking
- Mountain Biking
- Events -e.g. movie nights
- Planned - maintenance shop and storage area

Community Garden

Tree House

Hiking

Restroom

Book share

QUARRY PARK
MASTER PLAN

EXISTING USES

MIRADA SURF WEST

Paved multi-use trail

Restroom/Benches

Dirt Trail

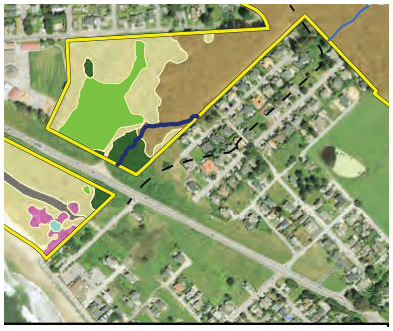
Educational Signage

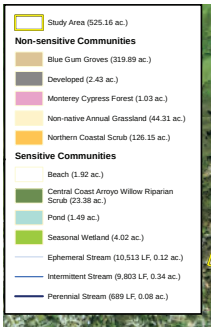
QUARRY PARK
MASTER PLAN

Presentation Slides From Meeting #1

EXISTING USES

MIRADA SURF EAST



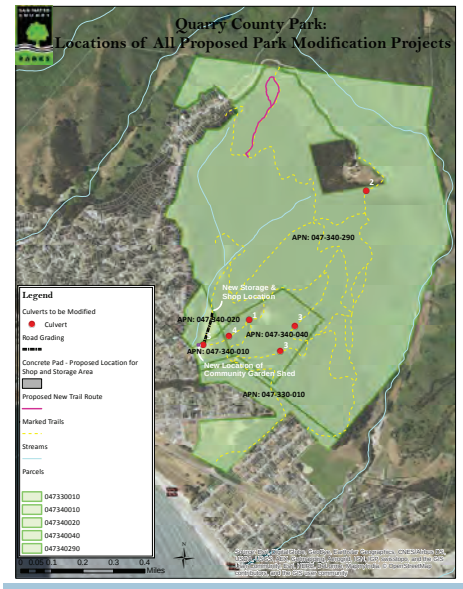


Sensitive Communities

Unpaved trail connection from Hwy. 1 to Quarry Park

QUARRY PARK
MASTER PLAN

UPCOMING IMPROVEMENTS



- Shed relocation to community garden
- New shop, storage and landscaping
- Vista Trail connection

Possible additional trails

QUARRY PARK
MASTER PLAN

Presentation Slides From Meeting #1

POTENTIAL USES

Pump Track

Dog Access

Educational/Interpretive Programs

OTHERS?

PLEASE TELL US

QUARRY PARK
MASTER PLAN

INPUT STATIONS

TRAILS NETWORK

EXISTING AND POTENTIAL USES

EXISTING CONDITIONS

QUARRY PARK
MASTER PLAN

Presentation Slides From Meeting #1

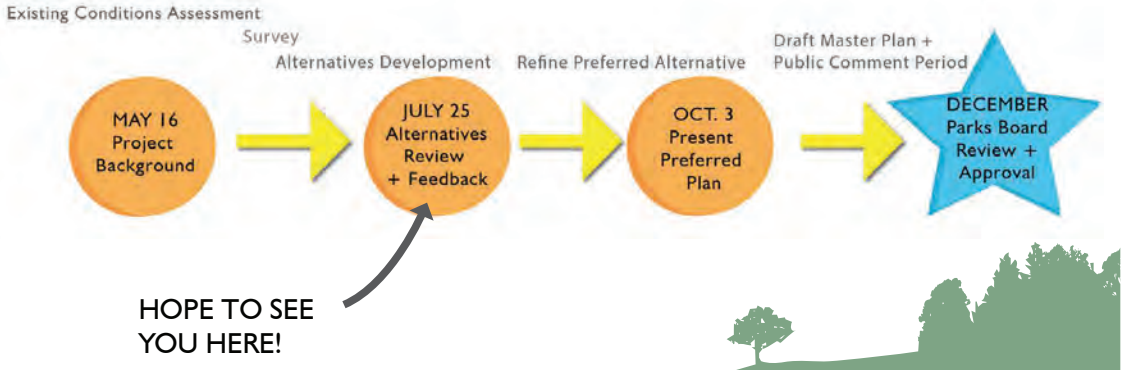
INPUT STATIONS

STATION SUMMARIES

QUARRY PARK
MASTER PLAN

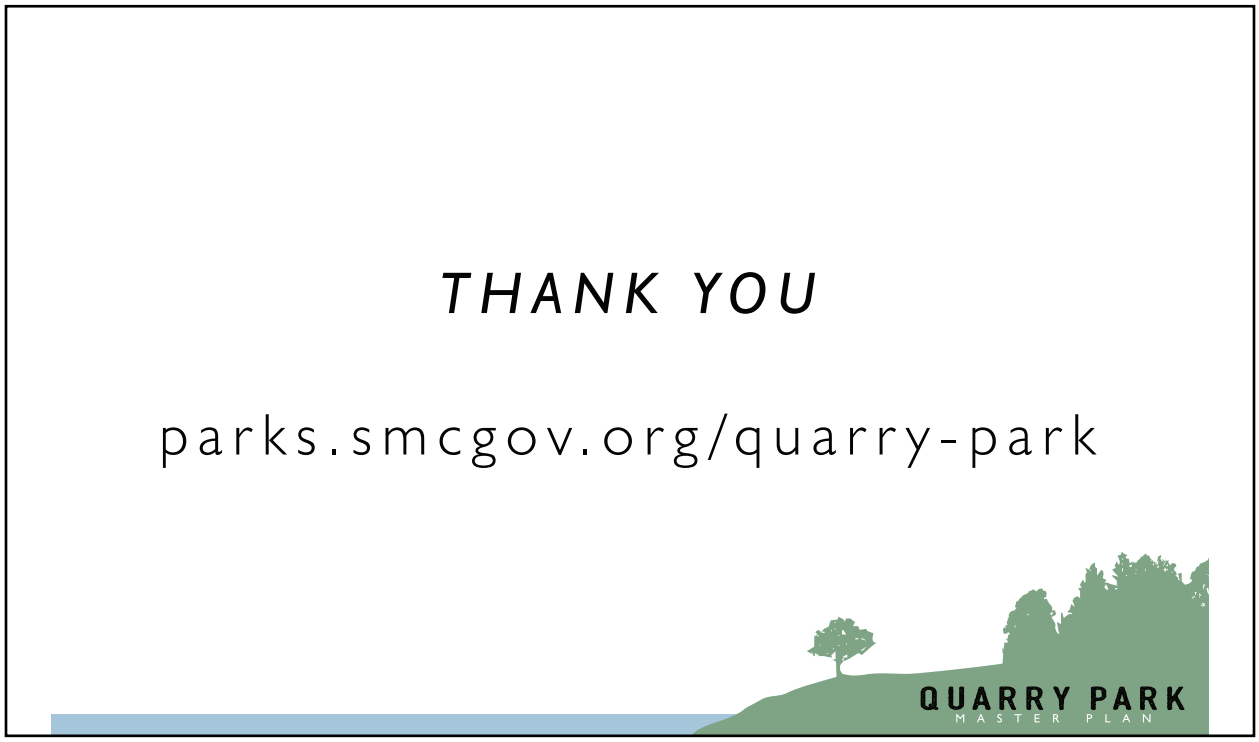
NEXT STEPS

» Finalize existing conditions assessments
» Conduct survey (see project web page for survey updates)
» Develop Alternatives
» Bring Alternatives to You for Feedback (July 25)

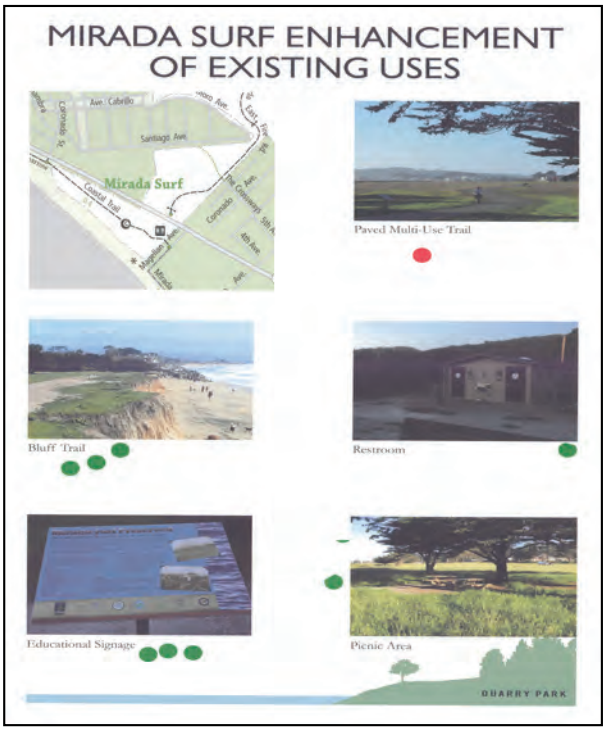


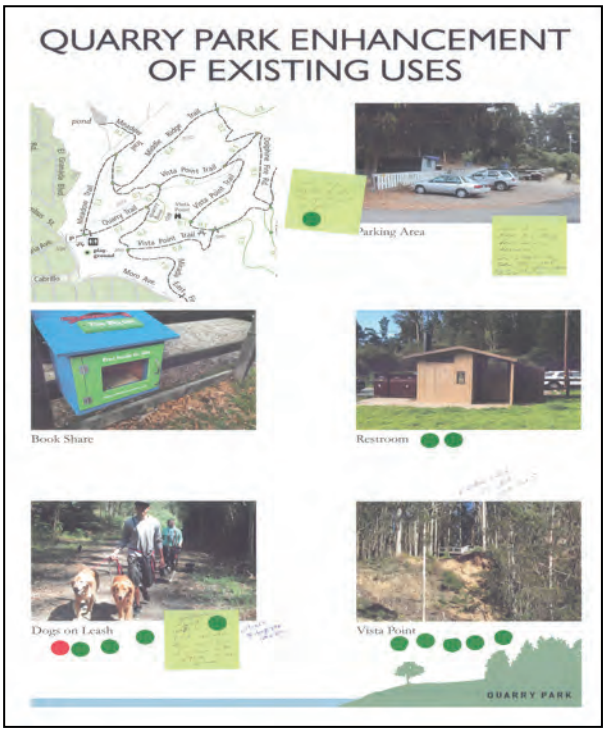
QUARRY PARK
MASTER PLAN

Presentation Slides From Meeting #1



Input Boards From Meeting #1





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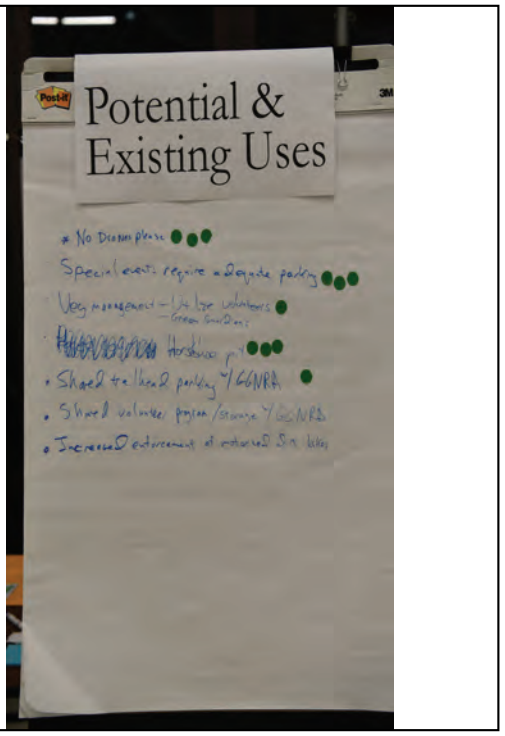

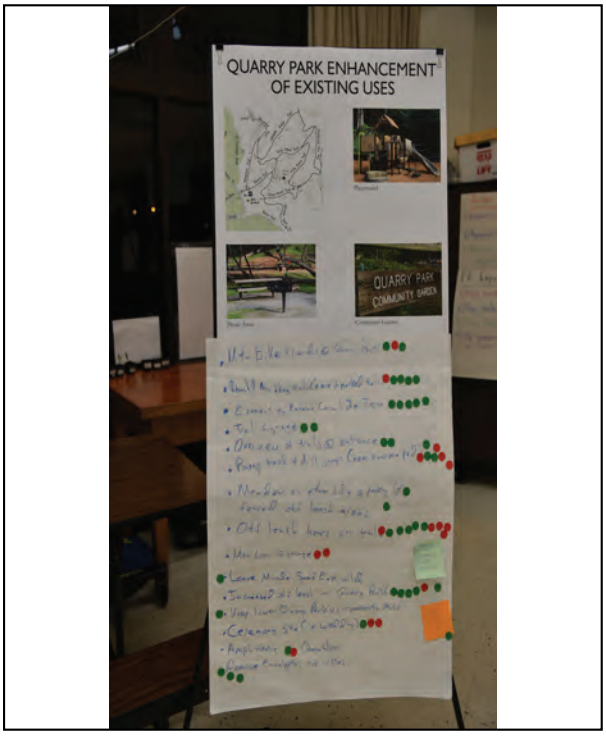

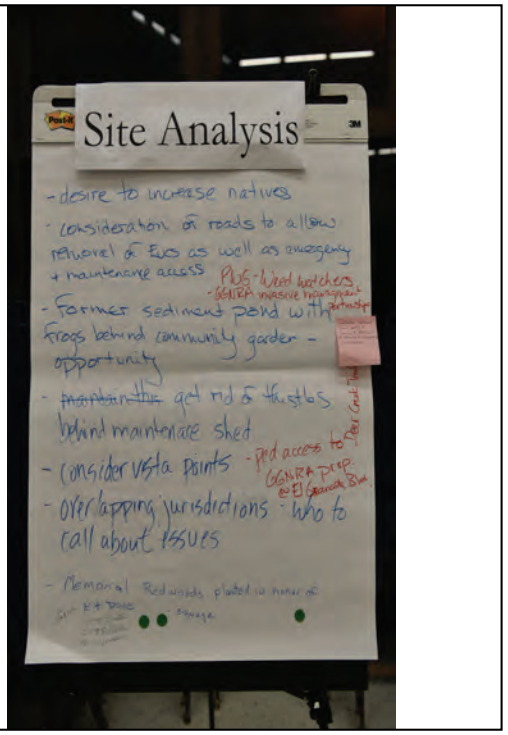

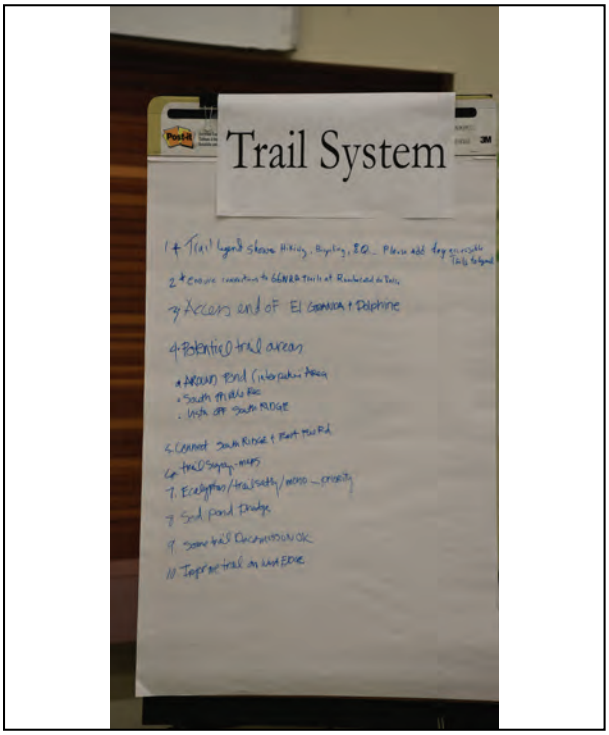

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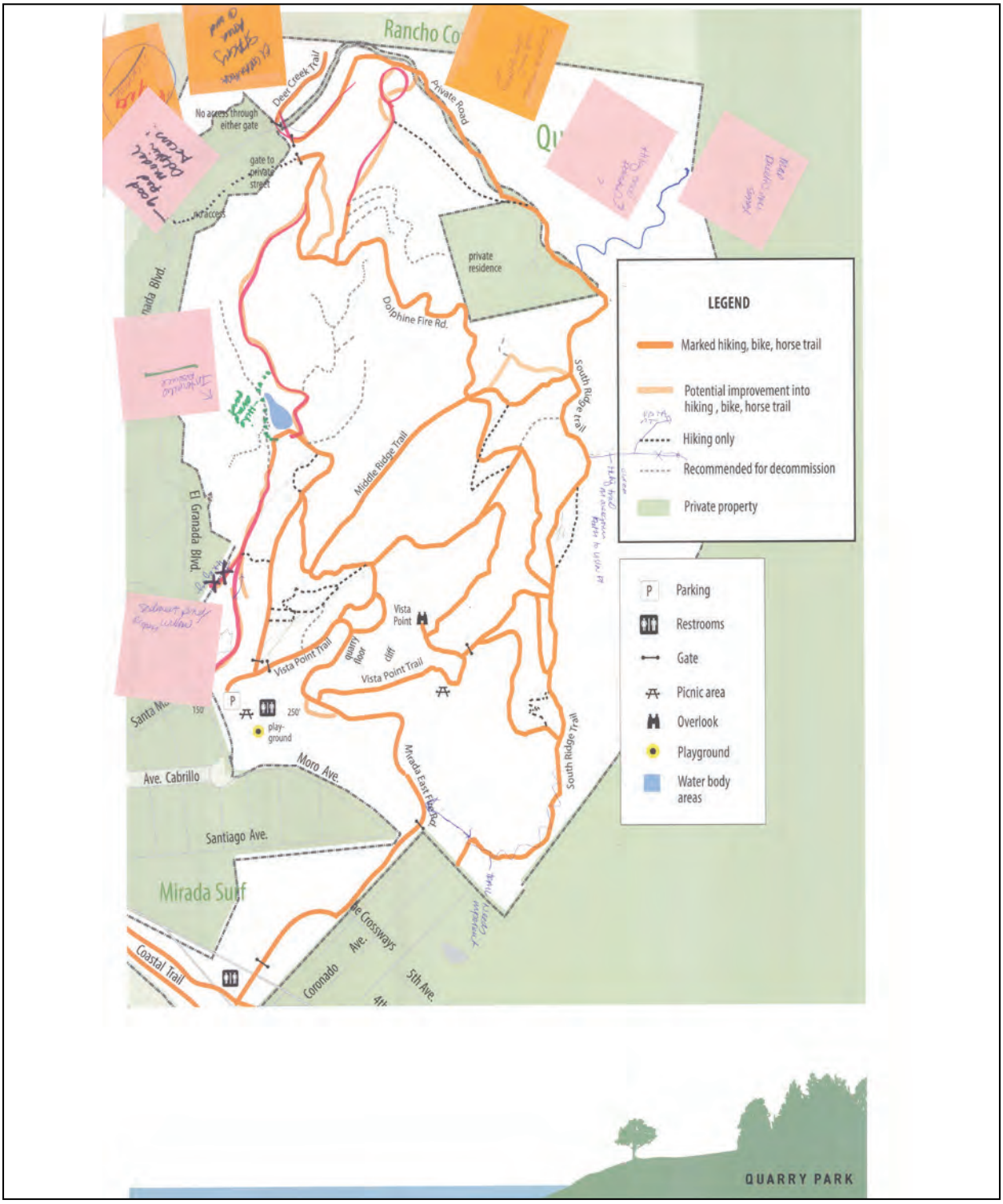

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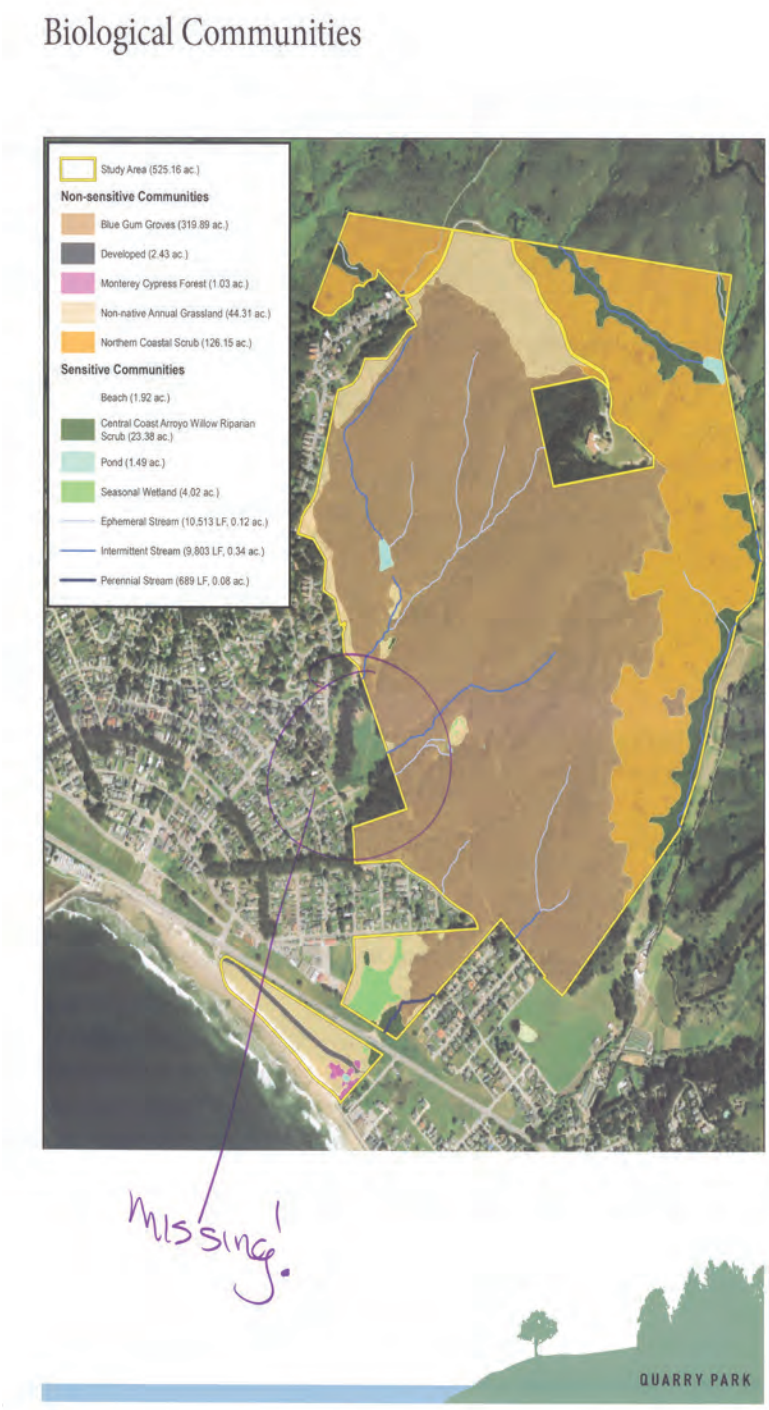
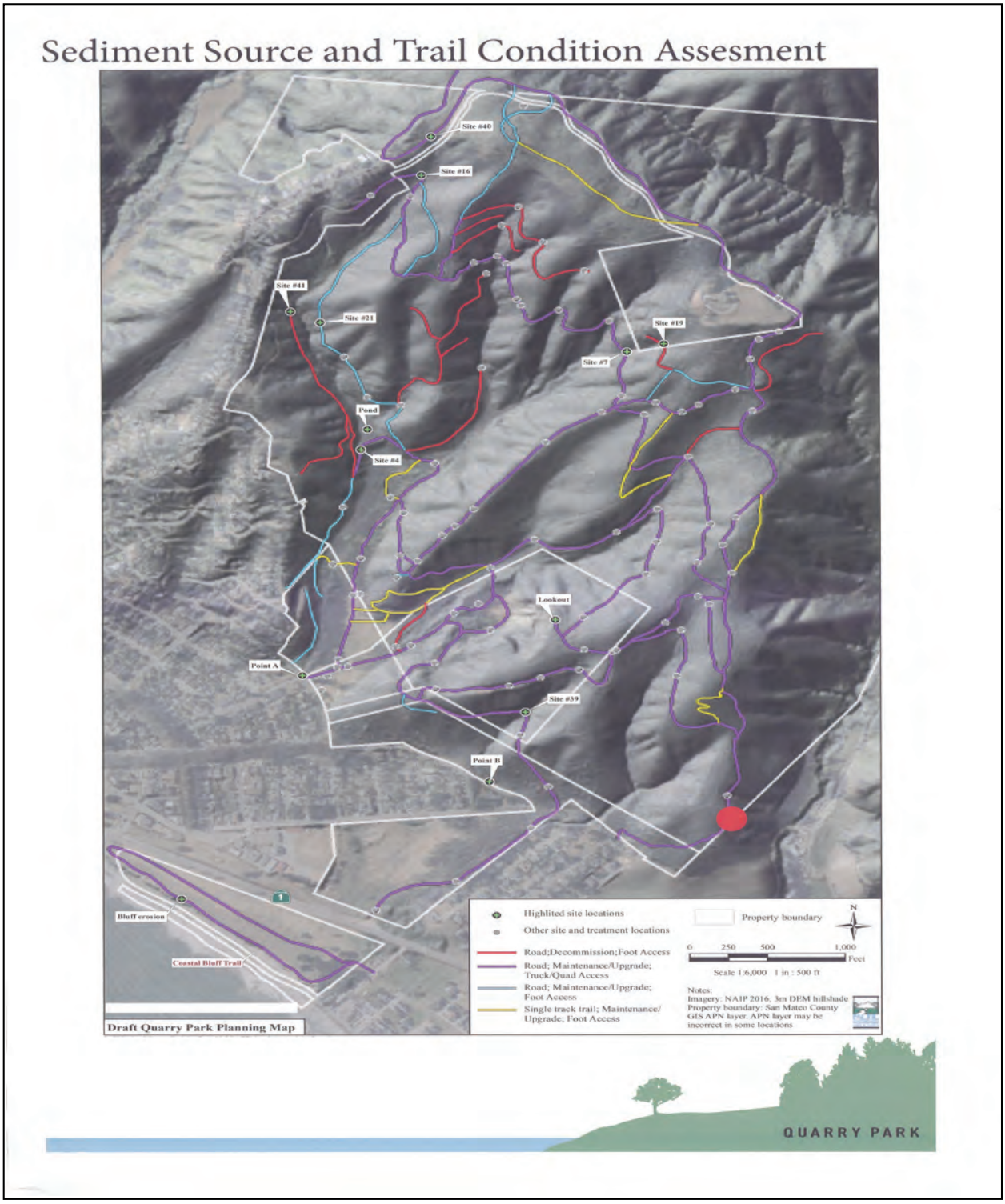


Input Boards From Meeting #1



Input Summary From Meeting #1

QUARRY PARK Community Meeting #1 – 3/21/2014					
Quarry Park – Potential & Existing Uses					
Topic	For	Against	Total	Ranking	Comments
Parking	6	0	6	6	• Need larger Parking lot go to beyond the gate (1 green). • Need to cut trees before they fall on our house. Don't have to take them out, just cut them down to size – in Y2! • Meadow on either side or parking lot (1 green) • Special events require adequate parking (3 green) • Shared trailhead parking w/ GGNRA (1 green)
Restroom	2	0	2	10	
Dogs	25	7	32	2	• No professional dog walking in park – sometimes there are 3 vans at a time with 6 dogs each. 18 dogs at once. (1 green). • Off Leash dog walking (4 green) • Dog off leash area (6 green) • Fenced off leash areas (1 green) • Off leash hours on trail (5 red; 5 green] • Increased off leash in Quarry Park (1 red; 5 green)
Vista Point	8	0	8	4	• Make sure it's safe, but like it. • Remove Eucalyptus for vistas (3 green)
Mountain Biking	22	12	34	1	• Pump track (10 green): • Downhill only trails; Marked skill levels; Bellingham Washington Trail Network (3 green) • Old pump track, now bulldozed. – Kids Build. (1 green) • Working in QP (6 red) • BMX track going in across f/ Brewery by Highway (small, bad location) (1 red) • Put near Meadow. Not isolated, but exposed (made of dirt) • Downhill Mtn biking trails (none of marked trails) (1 red; 5 green) • Pump track and dirt jumps (near concrete pad) (4 red; 3 green) • Increased enforcement of motorized dirt bikes
Interpretive Opportunity	2	0	2	10	
Events	6	4	10	3	• Stage for events (4 green) • Traffic / Parking? (1 red) • Ceremony site (i.e. Wedding) (2 red; 1 green) • Amphitheater (1 red; 1 green)
Day Camp	2	0	2	10	• Kids had a pump park that they dug and designed. Let them do it again in the same place. (1 green)
Signage	4	0	4	7	• Trail Signage (2 green) • Overview of trails @entrance (2 green) • Mtn. Lion signage (2 red)

Input Summary From Meeting #1

Other: Horseshoe Pit	3	0	3	9	• Horseshoe pit (3 green)
Trail/Park	7	0	7	5	• Connect to Ranch Corral Tierra (5 green) • Keep lower Quarry Park as community park (1 green) • Quarry floor • Veg management – Utilize volunteers – Green Guardians (1 green) • Shared volunteer program / storage w/GCNRA
Mirada Surf - Potential & Existing Uses					
Topic	For	Against	Total	Ranking	Comments
Dogs	5	0	3	3	• Dogs on leash (5 green)
Building	4	1	5	2	• Small Community Building at Mirada Surf (1 red; 3 green) • Mirada Surf - a community center • Restroom (1 green)
Parking	0	0	0	7	
Trail	4	9	13	1	• Paved connection to Quarry Park (8 red) • Paved multi-Use Trail (1 red) • Bluff Trail (3 green) • Leave Mirada Surf East Wild (1 green)
Signage	3	0	3	3	• Educational signage (3 green)
Picnic	1	0	1	6	• Picnic Area (1 green)
Drones	0	3	3	3	• No drones please (3 green)

Existing Conditions Station Feedback Summary

- Would like to increase native plants/reduce invasive species at Quarry Park.
- In developing trails, consider roads to allow for the eventual thinning/removal of Eucalyptus, as well as emergency and maintenance access
- There was a pond with frogs behind community garden at Columbus and Santa Maria Ave, which has filled with sediment and no longer serves a drainage function. Could dredge the pond to restore function.
- Get rid of thistles behind the maintenance shed
- Consider vista points
- Concern about overlapping jurisdictions along Coastal Trail and who to contact with issues. They all seem to defer to each other.
- GGNRA would be interested in partnering on invasives management – "Weed Watchers"
- Check ebird.org for bird sightings
- Create pedestrian access to GGNRA property from El Granada Blvd.

Trails System Station Feedback

Concur with trail designation and decommission shown on plan with following comments:

- Marked hiking, bicycle and horse trails should also be accessible to dogs on leash.
- Provide connections to GGNRA trails.
- Provide pedestrian access at end of El Granada Blvd. and Dolphine Avenue.
- Add "hiking only" around pond (interpretive area).
- Add "hiking only" trail in canyon below private residences.
- Reclaim overgrown hiking spur to vista point from South Ridge Trail.
- Connect South Ridge Trail and Miranda East Fire Road trail on site.
- Add trail signage maps and difficulty rating throughout trail system.
- Removal of Eucalyptus along trails for safety should be priority.
- Improve trail on along western edge of property to marked hiking, bike and horse trail status.

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ONLINE SURVEY

QUARRY PARK
MASTER PLAN

Online Survey Questions

QUARRY PARK MASTER PLAN
DRAFT SURVEY QUESTIONS
May 30, 2017

Demographic Information

1. **Please provide the following information:**

   a. Address (zip code only)

   b. Age Range
      - under 21 years
      - 21-44 years
      - 45-65 years
      - 65+ years

   c. When you visit Quarry Park and/or Mirada Surf, are you typically
      - alone
      - with children
      - with other adults
      - other (please describe)?

Additional Uses

2. **How important to you are the following potential uses?** ***(Very important, Somewhat Important, Neither important nor unimportant, Somewhat unimportant, Not at all important)***
   - Pump Track
   - Stage for Performances
   - Downhill Mountain Biking Trails
   - Fenced Off-leash Dog Park
   - Disc Golf
   - Horseshoes
   - Bocce
   - Community Building (Mirada Surf East)
   - Additional Parking
   - Educational Signage
   - Interpretive Programs (guided hikes)
   - Other (Please describe)

3. **With regard to educational signage and/or interpretive programs, are there particular stories, natural systems or history you feel are of particular interest?**

Trails

4. **Please tell us how important the following improvements/policies regarding trails are to you. Where specific locations in the park are discussed, please refer to the above map with locations indicated by letter.** ***(Very important, Somewhat***

Online Survey Questions

Important, Neither important nor unimportant, Somewhat unimportant, Not at all important).

1. Designate/restrict trails for specific uses (e.g. mountain biking, on-leash dog walking, equestrian).
2. Create a connection to Golden Gate National Recreation Area (Rancho Corral de Tierra) trail system. (A)
3. Provide trail access from end of El Granada Blvd.(B)
4. Provide trail access from end of Dolphine Avenue. (C)
5. Provide trail maps with difficulty levels.
6. Improve trail along western edge of park. (D)
7. Connect Mirada Fire Trail and South Ridge Trail on site. (E)
8. Add spur hiking trail and vista point off South Ridge Trail. (F)
9. Thin non-native Eucalyptus in strategic locations for views.

5. If you have preferences for locations for vista points in Quarry Park please provide the approximate locations using the map with grid provided. Additional information/description can also be provided in the comment box.

6. Please let us know if you have any additional comments regarding trails at Quarry Park/Mirada Surf.

<u>Natural Resource Management</u>

7. **Understanding that there are significant challenges (cost and implementation) involved, how important to you are the following natural resource management activities? *(Very important, Somewhat Important, Neither important nor unimportant, Somewhat unimportant, Not at all important)***

   - Thinning of non-native Eucalyptus for fuel (fire) management

- Selective thinning/removal of non-native species and planting of native species for vegetation/habitat restoration
- Creek/wetland restoration
- Sensitive species habitat enhancement
- Management for improved sediment and drainage
- Other (Please describe)

Dog Management

8. **San Mateo County Parks Department is currently developing dog management policies for County Parks. Please indicated your preferences regarding dogs at Quarry Park/Mirada Surf.** ***(Very important, Somewhat Important, Neither important nor unimportant, Somewhat unimportant, Not at all important)***

- Dogs permitted on-leash (all trails)
- Dogs permitted on-leash (restricted trails)
- Dogs permitted on-leash (restricted hours)
- Dogs permitted off-leash in a fenced area (small/large dog separation)
- Restrict number of dogs permitted per visitor
- No dogs permitted at Quarry Park/Mirada Surf
- Friends of Dogs Group
- Other (Please describe)

Overall Priorities

9. **Given limited resources with which to undertake improvements, please rank the following issues discussed above in order of importance to you** ***(1=most important, 3=least important)***:

Additional Uses (1,2,3)
Trail Improvements (1,2,3)
Natural Resource Management (1,2,3)

Your Participation

10. **Please tell us how you would like to participate in the future of Quarry Park/Mirada Surf. (check all that apply)**

- Fundraising through San Mateo County Parks Foundation (please describe)
- Volunteer as Individual (clean up, weed abatement, trail maintenance)
- Volunteer/partner as part of existing group/organization (Please describe)
- Volunteer to help form new group with specialized focus, i.e. Friends of Dogs, Pump Track, Biking, Equestrian
- Other (Please describe)

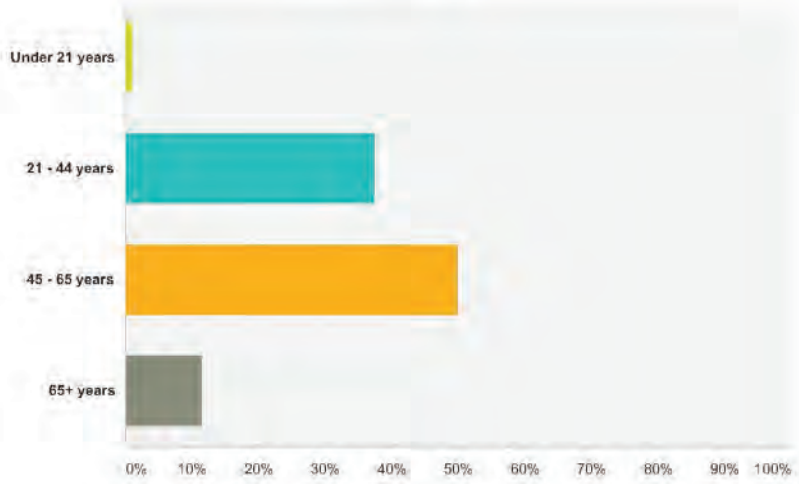
Contact Information

Online Survey Responses

Quarry Park Master Plan Survey, June 2017

Q2 Please indicate your age from the options below.

Answered: 190 Skipped: 4



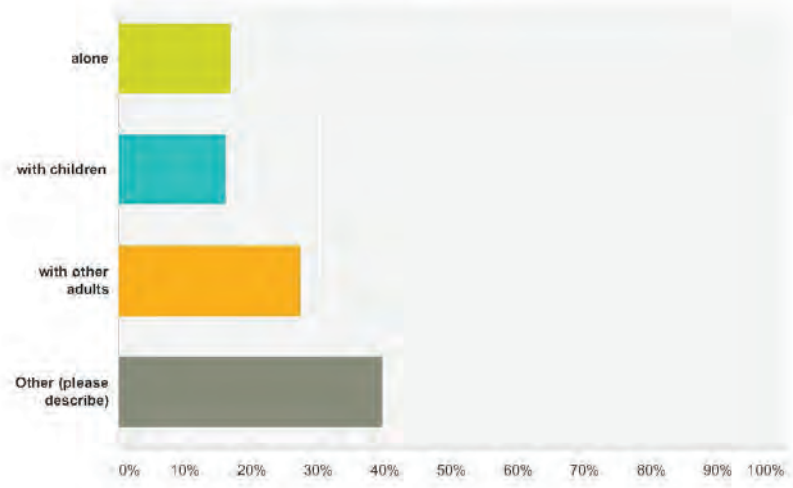
Answer Choices	Responses	
Under 21 years	1.05%	2
21 - 44 years	37.37%	71
45 - 65 years	50.00%	95
65+ years	11.58%	22
Total		190

Online Survey Responses

Quarry Park Master Plan Survey, June 2017

Q3 When you visit Quarry Park or Mirada Surf, are you typically ...

Answered: 194 Skipped: 0



Answer Choices	Responses	
alone	17.01%	33
with children	15.98%	31
with other adults	27.32%	53
Other (please describe)	39.69%	77
Total		194

#	Other (please describe)	Date
1	All of the above	7/7/2017 6:06 PM
2	And my dogs	7/3/2017 4:35 PM
3	With my dogs and sometimes other adults	6/30/2017 7:07 PM
4	all of the above	6/30/2017 8:53 AM
5	alone or with a friend, but always with my dog (and possibly theirs)	6/28/2017 12:25 PM
6	Walking my dogs	6/26/2017 6:55 PM
7	I am with my dogs	6/26/2017 3:33 PM
8	with my dog	6/26/2017 1:53 AM
9	with dog	6/25/2017 2:23 PM
10	with my dog	6/25/2017 1:21 PM
11	dog walker	6/25/2017 9:41 AM
12	with a dog	6/25/2017 7:53 AM

Online Survey Responses

Quarry Park Master Plan Survey, June 2017

13	with my dogs	6/24/2017 6:34 PM
14	with dog	6/24/2017 10:55 AM
15	Dogs	6/24/2017 9:39 AM
16	Walking/hiking with my dog	6/24/2017 9:12 AM
17	With children and my dog	6/23/2017 10:57 PM
18	with my dogs	6/23/2017 3:41 PM
19	all three in pretty equal amounts.	6/23/2017 1:48 PM
20	I ride my bike and walk with my dog and friends	6/23/2017 1:24 PM
21	With my dogs.	6/23/2017 12:40 PM
22	with friends, family an our dogs	6/23/2017 12:28 PM
23	With my dogs	6/23/2017 11:48 AM
24	with dogs	6/23/2017 11:46 AM
25	I	6/23/2017 11:44 AM
26	with other adults and dogs	6/23/2017 11:38 AM
27	With my dog!	6/23/2017 11:14 AM
28	Walking family dog with children	6/23/2017 10:48 AM
29	I like to bike or walk with wife, child, dogs	6/23/2017 10:28 AM
30	with my dog	6/23/2017 10:24 AM
31	Dogs and adults	6/23/2017 9:27 AM
32	W/Dogs	6/23/2017 2:04 AM
33	adults + dog	6/22/2017 6:31 PM
34	With my dog and (sometimes) other adults with their dogs.	6/22/2017 6:14 PM
35	Walking my dogs, sometimes with other adults	6/22/2017 5:25 PM
36	with a dog.	6/22/2017 4:45 PM
37	With dog and other adult	6/22/2017 3:44 PM
38	With my neighbor and our dogs	6/22/2017 2:46 PM
39	Dog	6/22/2017 2:17 PM
40	With dogs	6/22/2017 1:59 PM
41	Walking my dogs	6/22/2017 1:58 PM
42	with my dogs	6/22/2017 1:42 PM
43	my dog and many times with a friend who brings their dog.	6/22/2017 1:29 PM
44	With my dog	6/22/2017 1:16 PM
45	With dogs	6/22/2017 1:09 PM
46	with dogs and family	6/22/2017 1:05 PM
47	walking dog	6/22/2017 1:05 PM
48	With our dog	6/22/2017 1:04 PM
49	With others and our dogs	6/22/2017 1:00 PM
50	Alone and with my dog	6/22/2017 12:59 PM
51	with my dogs	6/22/2017 12:42 PM
52	I am with my dog	6/22/2017 12:28 PM

Online Survey Responses

Quarry Park Master Plan Survey, June 2017

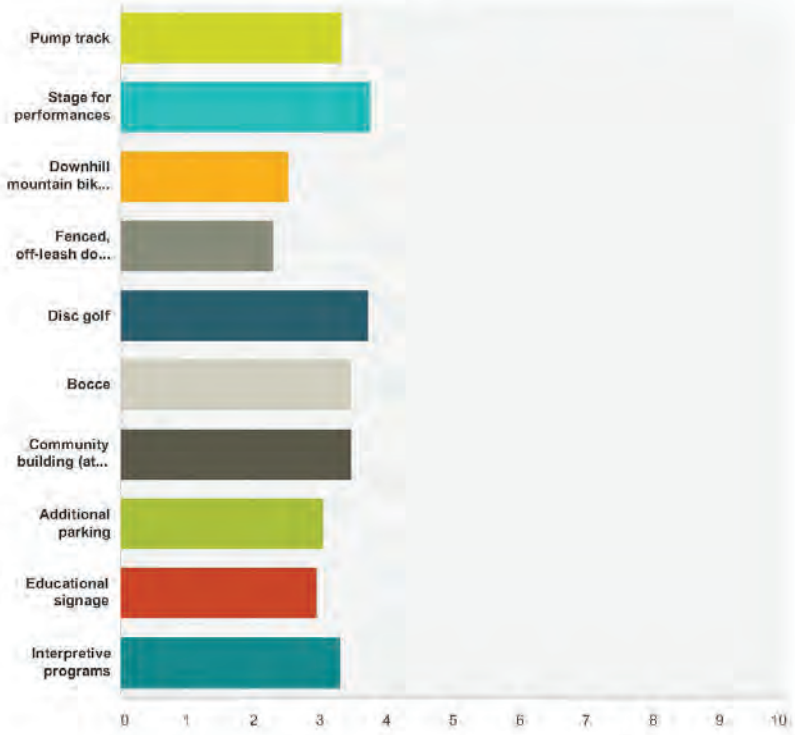
54	all of the above + my dogs	6/22/2017 12:06 PM
55	with my dog	6/22/2017 12:04 PM
56	dogs	6/22/2017 11:26 AM
57	With my two dachshunds	6/22/2017 11:25 AM
58	with friend and dogs, one each	6/22/2017 11:15 AM
59	with my dog	6/22/2017 11:08 AM
60	dog	6/22/2017 11:03 AM
61	Kids and adults	6/22/2017 10:46 AM
62	Other adults, children, and dogs	6/22/2017 10:45 AM
63	With dogs and adults	6/22/2017 10:28 AM
64	With my dog	6/22/2017 10:23 AM
65	Alone, with my dogs	6/22/2017 10:04 AM
66	With my two dogs and husband.	6/22/2017 10:02 AM
67	with dogs	6/22/2017 9:55 AM
68	with dogs	6/22/2017 9:53 AM
69	walking the dog	6/22/2017 9:47 AM
70	all of the above	6/22/2017 9:10 AM
71	50:50 alone or with other adults	6/22/2017 7:35 AM
72	with our dog.	6/21/2017 10:46 PM
73	Alone, but often with others, hiking, biking, dog walking	6/21/2017 9:40 PM
74	w dogs	6/21/2017 8:23 PM
75	All the above	6/21/2017 7:39 PM
76	I visit with children and also for personal hiking and biking	6/21/2017 7:00 PM
77	I go with my son and wife or I bike alone in the hills.	6/21/2017 6:08 PM

Online Survey Responses

Quarry Park Master Plan Survey, June 2017

Q4 Park Improvements: How important are the following potential park improvements?

Answered: 190 Skipped: 4



	Very	Somewhat	Neither important nor unimportant	Somewhat unimportant	Not important	Not familiar with this	Total	Weighted Average
Pump track	30.05% 55	15.85% 29	13.11% 24	1.09% 2	13.66% 25	26.23% 48	183	3.31
Stage for performances	5.52% 10	18.23% 33	21.55% 39	8.29% 15	43.09% 78	3.31% 6	181	3.75
Downhill mountain bike trails	39.78% 72	18.23% 33	15.47% 28	3.31% 6	22.65% 41	0.55% 1	181	2.52
Fenced, off-leash dog area	46.96% 85	17.13% 31	13.26% 24	4.42% 8	17.68% 32	0.55% 1	181	2.30
Disc golf	7.78% 14	16.67% 30	18.89% 34	13.33% 24	40.56% 73	2.78% 5	180	3.71
Bocce	8.33% 15	22.22% 40	22.22% 40	11.11% 20	33.89% 61	2.22% 4	180	3.47
Community building (at Mirada Surf East)	6.25% 11	25.57% 45	24.43% 43	8.52% 15	30.11% 53	5.11% 9	176	3.46

Online Survey Responses

Quarry Park Master Plan Survey, June 2017

Additional parking	**13.89%** 25	**31.11%** 56	**18.89%** 34	**10.56%** 19	**24.44%** 44	**1.11%** 2	180	3.04
Educational signage	**13.59%** 25	**35.33%** 65	**19.02%** 35	**8.70%** 16	**22.28%** 41	**1.09%** 2	184	2.94
Interpretive programs	**7.82%** 14	**27.93%** 50	**24.02%** 43	**9.50%** 17	**27.93%** 50	**2.79%** 5	179	3.30

#	Other (please specify)	Date
1	Please do not build any unnecessary structures (Ranger station, maintenance shed, resource booths,m etc.)	7/6/2017 2:41 PM
2	Integration and maintenance of multi-purpose trails with Wicklow property -- mountain bike, hiking, equestrian. Making single use trails would limit usefulness. Err on the side of making them multi-purpose.	7/5/2017 10:13 AM
3	on leash trail restrictions;off-leash fenced open space areas.	7/5/2017 9:24 AM
4	trail connections to GGNRA clearly marked near house at top	7/1/2017 9:57 AM
5	Dogs love walking trails too. All dogs are not "fenced, off-leash" lovers. That's what my backyard is for. An open space with trails should just be that. Why does it have to be so structured? I go here for the UNstructured part of my life.	6/30/2017 7:07 PM
6	I want to walk my dog off leash when I visit the park.	6/30/2017 8:23 AM
7	off-leash dog trails	6/29/2017 11:02 AM
8	• cross country multi-use trails connecting beyond the park • Stabilize dam & spillway • stabilize old logging roads	6/28/2017 6:25 PM
9	off-leash dog walking on trails	6/28/2017 12:25 PM
10	I want to maintain all the trails to be accessible to dog walking	6/26/2017 3:33 PM
11	Mountain biking trails (not downhill)	6/26/2017 8:56 AM
12	my primary hope is that we have opportunities for off leash walking with our dogs.	6/26/2017 1:53 AM
13	Cross-country single-track mountain bike trails!	6/25/2017 10:50 PM
14	off leash dog walking	6/25/2017 2:23 PM
15	would like to use a drone in Mirada East	6/25/2017 10:41 AM
16	like to see continued tolerance for off leash dog walking	6/25/2017 9:41 AM
17	habitat restoration	6/25/2017 8:19 AM
18	Trails designated for off leash dog walking	6/25/2017 7:53 AM
19	I walk the trails. I see kids play in the playground. I see people walk their dogs. Keep it a nice place for those activities, keep the community garden, and I'll be satisfied.	6/25/2017 7:19 AM
20	mountain biking on designated trails	6/24/2017 6:34 PM
21	Make off leash legal for well-behaved dogs	6/24/2017 10:55 AM
22	As a dog owner, I'm familiar with the need of a fenced dog area. But personally I don't use them. I and my dogs get exercise by hiking the trails. So it's important to me that the trails are open to dogs.	6/24/2017 9:12 AM
23	Please remove more poison oak along trails & hill near playground	6/23/2017 10:16 PM
24	Additionally, it would be great if there was a mountain bike specific trail (no hikers or equestrians allowed). There are hundreds, maybe even thousands of hiking only trails in the bay area, and very few mountain bike only trails. Additionally, an even dates/ odd dates trade off would be a good compromise.	6/23/2017 4:16 PM
25	Please have off leash dog trails to walk on not fenced area	6/23/2017 3:41 PM
26	Need single-track trails exclusively for walking/hiking with no bicycles or horses.	6/23/2017 2:41 PM
27	I would like to ride with my dog off leash	6/23/2017 1:24 PM
28	Off leash dog trails or at least sections that it is allowed. I have been walking dogs there since before it was a park and clearing trails of trees and limbs all along	6/23/2017 12:40 PM
29	It is VITAL to keep Quarry Park open to dogs and their responsible owners. this is an AWESOME park for hiking and for our dogs to get daily exercise	6/23/2017 12:28 PM

Online Survey Responses

Quarry Park Master Plan Survey, June 2017

30	Please keep the trails open to dogs	6/23/2017 11:48 AM
31	Off leash trails	6/23/2017 11:25 AM
32	Off leash dog walking - if our pet family members are not allowed to run free and get all the exercise they need; then dogs will have major behavioral problems the county will have to deal with.	6/23/2017 11:14 AM
33	cross country mtn bike trails	6/23/2017 8:16 AM
34	trails that allow off leash dog walking	6/22/2017 9:17 PM
35	Invasive plant species should be removed.	6/22/2017 8:14 PM
36	Off-leash dog hiking trail	6/22/2017 6:31 PM
37	I just retired, am not a silicone valley millionare, understand the coast is changning to over time, the residents are all young millionares. This will lead the county to cater to them, rather than people who are not millionares. I understand it is inevetibale over time. Can I ask the local governments to at least consider, (would not expect local government to do anything other than what pays the most), but can San Mateo Co at least think about people who have been on coast for years, can no longer afford, will have to sell and move just to afford to die? I expect San mateo co board of supervisors, and all the unelected career local government buerocrats could care less. That is the way it is. The supervisors and county government is going to follow the money, stay in power, keep raising taxes as much as they can. I worked my entire life, paid taxes, but now I just retired, can no longer afford to live in my own house. I doubt county could give a shit, as there are endless silicone valley rich people to take my place, when I sell and move, just to be able to afford to die. You could make this park a paradise. But instead, you will dick around and spend the money, tax money, that people who work for a livig pay, and nothing will happen for park. The money will never go for the park, it will go to Atherton, or raises for supervisors, or a new chief of police or fire dept. what a shame. This whole site to ask for input is a joke, the county will never listen to people living here, have probably already decided what they are going to impose, and all this is just going through the motions so the county can say they asked for input, then do whatever they want. It is a joke. The people with the most money will decide what happens on the coast, and the county government will kiss there ass. Have you checked with Ocean Colony?	6/22/2017 6:16 PM
38	Habitat restoration, removal of invasive and/or exotic plants	6/22/2017 5:25 PM
39	off leash dog walking areas on some of the trails	6/22/2017 4:09 PM
40	I like it being rural. It should not be humanized. Please leave it natural.	6/22/2017 2:46 PM
41	Off-leash dog walking trails	6/22/2017 1:58 PM
42	unleashed dog walking	6/22/2017 1:29 PM
43	Some off leash walking trails would be a huge benefit to the community at large.	6/22/2017 1:16 PM
44	Off leash trails for dog walkers is VERY important.	6/22/2017 1:09 PM
45	off-leash dog trails!	6/22/2017 1:05 PM
46	off-leash dog walking	6/22/2017 1:05 PM
47	Off leash dog trails	6/22/2017 1:04 PM
48	Designated off leash dog trails/fire roads, in addition to the fenced area	6/22/2017 1:00 PM
49	We need trails for off leash walking of dogs	6/22/2017 12:59 PM
50	off leash dog access at Quarry Park	6/22/2017 12:28 PM
51	NO off leash dog walking, please.	6/22/2017 12:25 PM
52	a pool in community building, off leash dog trails	6/22/2017 12:08 PM
53	dog walking -	6/22/2017 12:06 PM
54	off leash dog walking is very important. Please include flat trails for those of us who cannot hike hills.	6/22/2017 12:04 PM
55	I come here specifically to hike with friends and walk our dogs. Please don't take this away from us!	6/22/2017 11:34 AM
56	poison oak eradication close to trails	6/22/2017 11:26 AM
57	Absolutely need signs at ALL areas where people walk dogs to pack out their poop. Trails are covered with full poop bags just left on the trail side. If they're conscientous enough to put it in the bag, they should complete the process by depositing it into the provided waste cans!	6/22/2017 11:25 AM
58	Pump track!!!!!!	6/22/2017 11:18 AM

Online Survey Responses

	equipment for older children - the recent removal of the spiral slide limited this to a toddler park. In general, no improvements are necessary. There are hundreds if not thousands of miles of trails for all the other activities along the entire coast. Leave this park as it is.	
60	off leash dog walking	6/22/2017 11:08 AM
61	Continued leashed dog access on all trails	6/22/2017 10:45 AM
62	Off leash dog walking	6/22/2017 10:23 AM
63	The park is perfect as is. No improvements needed	6/22/2017 10:23 AM
64	Designated off leash dog walking areas (or even better - Designated time of day for off-leash dog walking)	6/22/2017 10:04 AM
65	Trails that allow off-leash dog walking	6/22/2017 10:02 AM
66	I would really like a pull up bar (for adults) or monkey bars in the playground - similar to what they have in moss beach	6/22/2017 9:10 AM
67	Multi-use trails can be are good. Some of the old roads can be made into trails	6/22/2017 7:35 AM
68	Maintained lawn or turf area for misc sports, running around	6/22/2017 7:11 AM
69	Good loop trails with vistas and opportunity to walk with dog.	6/21/2017 10:46 PM
70	onsite ranger for enforcement (motorized dirtbikes, etc.)	6/21/2017 10:20 PM
71	Leave undeveloped space undeveloped! We don't need more buildings, facilities, parking, etc. Maintain what exists. Let nature be nature!	6/21/2017 9:40 PM
72	Single track mt bike trails,Dogs off leash on all trails during weekday mornings until 1pm	6/21/2017 8:23 PM
73	Formally signing and linking Quarry Park to Rancho Corral (NPS).	6/21/2017 7:15 PM

Online Survey Responses

Quarry Park Master Plan Survey, June 2017

Q5 With regard to educational signage and interpretive programs, are there particular stories, natural systems or history related to Quarry Park/Mirada Surf that interest to you?

Answered: 70 Skipped: 124

#	Responses	Date
1	Leave it natural but groomed. Just like I grew up.	7/7/2017 6:06 PM
2	Origins of quarry park, Hwy 1, area wildlife, and plants, including the trees.	7/7/2017 2:44 PM
3	not needed	7/6/2017 2:41 PM
4	No.	7/5/2017 10:13 AM
5	Quarry material used to build HMB airport and Hwy 1.	7/4/2017 1:53 PM
6	NOPE	6/30/2017 7:07 PM
7	Native habitats, invasive species.	6/29/2017 6:22 PM
8	Natural guides explaining plants animals native to area	6/28/2017 8:43 PM
9	• Mac the stable operator • weeds v. native plants • landslide conditions	6/28/2017 6:25 PM
10	this would not be an effective use of public funds	6/26/2017 6:55 PM
11	No	6/26/2017 3:33 PM
12	history	6/26/2017 1:53 AM
13	The quarry: historically, what were its functions and when? What caused the park to be so heavily forested with Eucs, and how is this forest being managed? What wildlife exists in the park? What aquatic plants, amphibians, or fish can be observed in the wetlands & pond(s) of the park? What am I seeing before me (at viewpoints)? How to recognize poisonous plants in this park (poison oak, sting nettles, certain berries).	6/25/2017 3:12 PM
14	About the eucyluptus trees and the quarry floor. More clear signage/maps on how it is connected to rest of Golden Gate Rec Area	6/25/2017 2:23 PM
15	n/a	6/25/2017 1:21 PM
16	Local wildlife	6/25/2017 10:41 AM
17	Not familiar with particular stories but would like to be educated.	6/24/2017 9:12 AM
18	Local geology, botany and general history	6/23/2017 4:42 PM
19	I'm interested in the history of the area and the geology that formed it, similar to how the devil's slide trail interpretive signage discusses the railroad, as well as the geology of the landscape and information about native animals and plants.	6/23/2017 4:16 PM
20	Would be interesting to know the history of the quarry and its purpose	6/23/2017 2:58 PM
21	Explain the loss of natural features to non-native vegetation and human development.	6/23/2017 2:41 PM
22	area history	6/23/2017 1:24 PM
23	No	6/23/2017 1:23 PM
24	Quarry history. Geological history	6/23/2017 12:40 PM
25	Jay Moriarity Memorial	6/23/2017 12:28 PM
26	quarry history	6/23/2017 11:38 AM
27	No	6/23/2017 11:14 AM
28	Not familiar	6/23/2017 10:28 AM

Online Survey Responses

Quarry Park Master Plan Survey, June 2017

29	I'd like trails designated for off-leash dog walking	6/23/2017 10:10 AM
30	natural systems and history	6/23/2017 5:54 AM
31	wild flowers and other trees/plants	6/22/2017 6:31 PM
32	10, 15, 20 years ago, all sorts of people from every specirum, rich, poor, all types of jobs, lived on coast. Now, gradually, month after month, year after year, the coast is turning into Malibu, or Santa Barbara, and I would guess in another 10 years, only millionaires will be able to afford to live here. Except for illegal immigrants, who will be here to clean houses, cut lawns, do all the jobs the rich people would never consider doing themselves.	6/22/2017 6:16 PM
33	The origins of the park, how it was developed from a quarry to a eucalyptus forest, the flora and fauna. There's a lovely little pond off the Meadow Trail that has California newts that would be a fun educational opportunity for kids.	6/22/2017 6:14 PM
34	History of the quarry, the old stable, planting of the eucalyptus, native plants and animals	6/22/2017 5:25 PM
35	no	6/22/2017 4:09 PM
36	History of Quarry , birds, plants	6/22/2017 3:44 PM
37	Natural systems if you have any signage. Why put signs in the woods?	6/22/2017 2:46 PM
38	Natural History, native history	6/22/2017 1:59 PM
39	Description of flora and fauna and ecosystem	6/22/2017 1:58 PM
40	I don't know enough about the history or natural systems there, so anything would be good.	6/22/2017 1:35 PM
41	no	6/22/2017 1:29 PM
42	No	6/22/2017 1:23 PM
43	Wild life and foliage information	6/22/2017 1:16 PM
44	Historical information	6/22/2017 1:09 PM
45	no	6/22/2017 1:05 PM
46	The migrating whales that have been spotted from the beach and bluff the last couple of years.	6/22/2017 1:04 PM
47	Birds, trees, flowers	6/22/2017 1:00 PM
48	No....	6/22/2017 12:59 PM
49	not really	6/22/2017 11:34 AM
50	Signs identifying plants/flowers very important. Explanation of why the roads in Quarry Park were developed. Also, back to dog poop - a reminder that it can spread disease and to PLEASE deposit the poop bag in the trash. This is a pet peeve. Need Poison Oak pictures posted in the heavy areas of growth. This can really hurt people. Also a notice that their dogs can spread it to them if they aren't washed after walking thru it.	6/22/2017 11:25 AM
51	Surf	6/22/2017 11:23 AM
52	Wildlife and flora like to n devils slide	6/22/2017 10:52 AM
53	All it's full of history especially for kids to understand how lucky they are to live here!	6/22/2017 10:46 AM
54	Ecological history - what the parklands looked like 200-500 years ago	6/22/2017 10:45 AM
55	Environmental awareness and conservation of natural resources, and habitat, is important.	6/22/2017 10:28 AM
56	history of indigenous peoples ... that most of the trees are basically imported weeds ...	6/22/2017 10:20 AM
57	no	6/22/2017 9:55 AM
58	no	6/22/2017 9:47 AM
59	No	6/22/2017 9:10 AM
60	No	6/22/2017 8:07 AM
61	History and old pics are always interesting of the area or view. Who planted the Eucs? Animals and plant description are interesting too.	6/22/2017 7:35 AM
62	Quarry history and maybe El Granada history.	6/22/2017 1:25 AM
63	History of the coast and the El Granada community, native plants, geology of the coast range.	6/21/2017 10:46 PM
64	history, plants, animals	6/21/2017 10:20 PM

Online Survey Responses

Quarry Park Master Plan Survey, June 2017

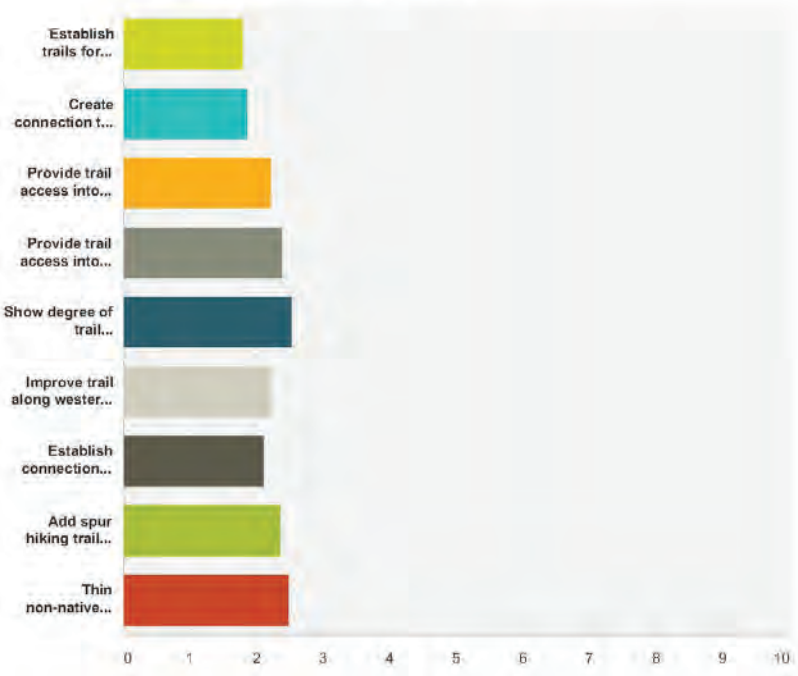
65	Signage is not needed! Please let open space be just that....open space! No developments please!	6/21/2017 9:40 PM
66	How QP Quarried rock helped with the rebuilding of SF post 06 quake. How QP Quarried rock helped with Ocean Shore Railroad construction(if it did)	6/21/2017 8:23 PM
67	History and ecology	6/21/2017 7:00 PM
68	No	6/21/2017 6:23 PM
69	none	6/21/2017 6:16 PM
70	It might be interesting to know why the eucs are here, history of the quarry	6/21/2017 6:08 PM

Online Survey Responses

Quarry Park Master Plan Survey, June 2017

Q6 Trail Improvements: Please tell us how important the following trail improvements are to you. Refer to the map when specific park locations are referenced.

Answered: 192 Skipped: 2



	Very	Somewhat	Neither important nor unimportant	Somewhat unimportant	Not at all important	Total	Weighted Average
Establish trails for designated uses (examples: mountain biking, on-leash dog walking, equestrian)	61.20% 112	20.77% 38	4.92% 9	4.37% 8	8.74% 16	183	1.79
Create connection to Golden Gate National Recreation Area trail system (area A on map)	53.23% 99	26.34% 49	9.14% 17	3.76% 7	7.53% 14	186	1.86
Provide trail access into park from end of El Granada Boulevard (area B on map)	36.07% 66	28.42% 52	21.86% 40	6.01% 11	7.65% 14	183	2.21
Provide trail access into park from end of Dolphine Avenue (area C on map)	28.89% 52	30.56% 55	25.00% 45	6.11% 11	9.44% 17	180	2.37
Show degree of trail difficulty on park signs	22.34% 42	35.64% 67	20.74% 39	10.11% 19	11.17% 21	188	2.52
Improve trail along western edge of park (area D on map)	30.90% 55	37.08% 66	19.10% 34	5.62% 10	7.30% 13	178	2.21
Establish connection between Mirada E. Fire Road to South Ride Trail (area E on map)	34.08% 61	37.43% 67	17.88% 32	4.47% 8	6.15% 11	179	2.11

Online Survey Responses

Quarry Park Master Plan Survey, June 2017

Add spur hiking trail off South Ridge Trail to potential vista point (area F on map)	**26.92%** 49	**37.91%** 69	**18.13%** 33	**7.14%** 13	**9.89%** 18	182	2.35
Thin non-native Eucalyptus tress that may block views	**30.27%** 56	**30.81%** 57	**16.76%** 31	**4.32%** 8	**17.84%** 33	185	2.49

#	Please specify any other trail improvements that are important to you.	Date
1	Most pressing need of entire survey is a PUMP TRACK!!!!	7/6/2017 1:52 PM
2	Can a trail be built parallel to the private residence/private road to connect the north side of south ridge trail to the 932' high point and further to the Deer Creek Trail?	7/5/2017 10:13 AM
3	connections - connections - connections to GGNRA	7/1/2017 9:57 AM
4	Keep it simple. We all get along together fine, bikes, horses, dogs and people.	6/30/2017 8:23 AM
5	Consider adding small segments of trail at steepest segments of fire road to decrease grade and make it easier to climb.	6/29/2017 5:41 PM
6	Abate french broom, remove all euc sprouts, preserve/enhance willow grove wetland at trailhead by Hwy1	6/28/2017 6:25 PM
7	Please don't think Eucalyptus trees - they are the best feature of the park.	6/28/2017 3:02 PM
8	designation for off-leash dog walking	6/28/2017 12:25 PM
9	I think we can all use the trails together	6/26/2017 3:33 PM
10	Clear out poison oak on heavily used trails.	6/26/2017 1:53 AM
11	off leash dog trails	6/25/2017 2:23 PM
12	ALL of this is important because I do not want to see massive development and build up in ANY of these areas.	6/25/2017 1:21 PM
13	cut back poison oak far from trails	6/25/2017 10:41 AM
14	harbor view area should have trees thinned to enhance views.	6/25/2017 9:41 AM
15	keep dirt trails! and please designate off leash area trails for dogs!!	6/25/2017 7:53 AM
16	Clear the eucalyptus debris on the trails. I hate that our local park is full of eucalyptus, instead of native plants. I'd advocate more clearing than just thinning, and reintroduce native trees and plants.	6/25/2017 7:19 AM
17	trails for off-leash dog walking	6/24/2017 6:34 PM
18	I'd like to see all trails open to dogs not only designated trails. Also, I'd like most of the trails to be off leash	6/24/2017 9:12 AM
19	Poison oak removal next to trails	6/23/2017 10:16 PM
20	Off leash areas and trails for walking dogs	6/23/2017 6:58 PM
21	Trail quality is very important to me, we have many fireroads open to mountain bikes but very little single track. Interested in more single track open to bikes.	6/23/2017 4:42 PM
22	I think having online brochures and/or an informational kiosk with trail difficulty and descriptions is adequate, I don't think it's needed on the park signs.	6/23/2017 4:16 PM
23	"De-commission" one of parallel trails close to one another. Convert some of the multi-use trails to single-track walking/hiking trails.	6/23/2017 2:41 PM
24	More singletrack trails for mountain biking and or hiking. If possible direction specific to prevent user conflicts (i.e. uphill only mtb tracks shared with hikers, downhill only mtb tracks that are either: 1. limited to mtb or 2. on an odd/even day system with hikers/dogs)	6/23/2017 1:48 PM
25	It is a nature area that is easily accessible to those who like that. Leave it alone. No government meddling.	6/23/2017 12:40 PM
26	I concur with all of the proposed improvements on the map above :-) !	6/23/2017 12:28 PM
27	dog off leash riding trails	6/23/2017 11:46 AM
28	We want to keep Quarry Park as it is: natural and not over run by trash-leaving visitors	6/23/2017 11:14 AM
29	Keep the trees	6/23/2017 9:27 AM
30	So you're not ok w eucalyptus trees, but you're ok with the lack of control of poison oak?!	6/23/2017 2:04 AM
31	Wide enough to avoid poison oak	6/22/2017 8:16 PM

Online Survey Responses

Quarry Park Master Plan Survey, June 2017

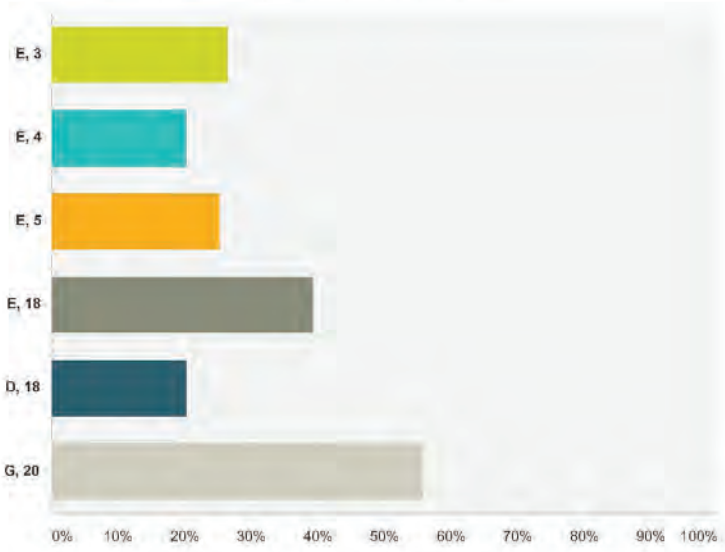
32	Remove Pampas Grass and other non native plants	6/22/2017 8:14 PM
33	Come up with plan to prevent dumping.(garbage, leaves, grass etc) and enforce it. (Sheriff, ranger?	6/22/2017 6:16 PM
34	Remove french broom, jubuia grass to improve line of site along trails	6/22/2017 5:25 PM
35	Off leash dog areas	6/22/2017 4:45 PM
36	Establish off-leash dog walking trails throughout the range	6/22/2017 1:58 PM
37	ability to walk my dog unleashed as do so many other people who use this park area. Bikers tend to dominate any area their using so I would request no shared biking trails/paths	6/22/2017 1:29 PM
38	Designated trails for off leash dog walking separate from bikes hikers horses etc so there's a choice.	6/22/2017 1:16 PM
39	Off-leash dog walking	6/22/2017 1:09 PM
40	off-leash dog trails!	6/22/2017 1:05 PM
41	Trying to get control of the blue gum and cape ivy and get more ecological variety.	6/22/2017 1:04 PM
42	It's very important to keep trails open to off-leash for dogs.	6/22/2017 12:59 PM
43	off leash dog walking access	6/22/2017 12:28 PM
44	Trails designated for off leash dog walking	6/22/2017 12:21 PM
45	Off leash dog trails, all trails should have dog access-do not like to hike alone in the woods without dog	6/22/2017 12:08 PM
46	stop wasting tax dollars - fix HYW 1 traffic !	6/22/2017 12:06 PM
47	some shaded walk areas. Not familiar with whole park.	6/22/2017 12:04 PM
48	off leash dog walking area	6/22/2017 11:26 AM
49	As little as possible. I do not want to have to be afraid of encountering a horse anywhere and really dislike having to walk off a trail to avoid their poop. Keep all the area off leash for dogs as grandfathered in when property was transferred to county. There are hundreds if not thousands of miles of trails along entire coast for absolutely EVERYONE and EVERYTHING including horses, hikers, bikers, etc., except dogs. .	6/22/2017 11:15 AM
50	I'm very happy with the current mixed use trails (mountain biking and dogs together)	6/22/2017 11:08 AM
51	Highest priority should be connection to GGNRA	6/22/2017 10:45 AM
52	It's important to me to keep Quarry Park's trails multi-use - open to dog walking, biking, etc. Designating main trails for just one or a few uses would be mistake. Quarry Park is a park for all and should remain that way.	6/22/2017 10:02 AM
53	clean up the trails blocked by mud slides from last winter	6/22/2017 9:10 AM
54	Walking trail needed on either side of Coronado from Ave Alhambra to hwy 1	6/22/2017 8:07 AM
55	Don't establish anything! Maintain what exists! Don't limit/segregate use! ALL Trails are multi use!	6/21/2017 9:40 PM
56	No hiking only trails anywhere within the park, there are already enough hiker only trails within San Mateo Co Parks lands.	6/21/2017 8:23 PM
57	More mtn bike trails. Cut back vegetation and do trail maintanence on a routine basis. Work with clubs to engage mtn bike community and trails stewardship.	6/21/2017 8:13 PM
58	Less building structures. More trails, please protect the wildlife	6/21/2017 7:00 PM
59	A dirt trail already exists connecting quarry park to GGNRA trials where the letter A is marked on the map	6/21/2017 6:16 PM
60	Remove all equestrian access. Make entire park off leash dog. Stop cutting back the fire roads so wide make single or double track trails. All trails should be bike and hike.	6/21/2017 6:11 PM
61	Cut back the damn poison oak every once in a while please	6/21/2017 6:08 PM

Online Survey Responses

Quarry Park Master Plan Survey, June 2017

Q7 Vista Points: Please indicate your preferred vista point locations referencing the Row numbers and Column letters as shown on the map. Provide additional comments in the box below.

Answered: 79 Skipped: 115



Answer Choices	Responses	
E, 3	26.58%	21
E, 4	20.25%	16
E, 5	25.32%	20
E, 18	39.24%	31
D, 18	20.25%	16
G, 20	55.70%	44
Total Respondents: 79		

#	Other (please specify)	Date
1	J17, F3, G4	7/5/2017 10:13 AM
2	The J side has good views too	6/30/2017 7:07 PM
3	F20	6/29/2017 5:41 PM
4	Sorry, been too long since I was there to remember the places - but there's lots of vista point opportunities there	6/28/2017 6:25 PM
5	D, 22	6/26/2017 6:55 PM

Online Survey Responses

Quarry Park Master Plan Survey, June 2017

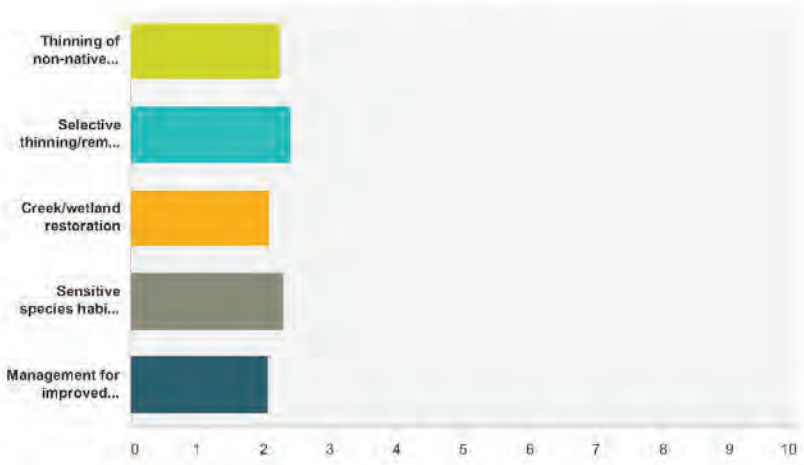
6	K, 12: for a new Vista Point at the end of the proposed spur trail eastward off South Ridge Trail, for views of the State Beaches & the Pacific, all the way SW-ward to the Ritz.	6/25/2017 3:12 PM
7	This is a very poorly done survey! What do you mean by "preferred vista point location"? Are you going to "build" a vista point? What does that entail?	6/25/2017 1:21 PM
8	?	6/25/2017 7:53 AM
9	Any or none, just go daily to hike with my dog	6/24/2017 10:55 AM
10	As an avid hiker and mountain biker, I really enjoy when the vista points require a bit of a journey and are not right next to the parking area or road, such as E3,4,5.	6/23/2017 4:16 PM
11	Get rid of the eucs and the vistas will take care of themselves.	6/23/2017 2:41 PM
12	Not sure	6/23/2017 2:25 PM
13	no preference	6/23/2017 10:24 AM
14	Not sure, any would be nice	6/22/2017 8:16 PM
15	Don't care what vista points, care if park is clean and safew	6/22/2017 6:16 PM
16	Any and all would be nice. Hard to tell what the views would be from this map anyway.	6/22/2017 6:14 PM
17	Don't really care	6/22/2017 5:25 PM
18	Vista points don't really matter to me from this park - I like being in the trees	6/22/2017 1:58 PM
19	none - no parking - traffic jams	6/22/2017 12:06 PM
20	Don't know the Vista points	6/22/2017 12:04 PM
21	Any high up view spot could use a bench. More resting spots are useful for people in less than fit shape.	6/22/2017 11:25 AM
22	The ones there now are good.	6/22/2017 11:15 AM
23	Not really a priority for me	6/22/2017 10:45 AM
24	J, 18	6/22/2017 10:04 AM
25	More water views would be great.	6/22/2017 10:02 AM
26	K-10 is nice. Reward visitors for their effort. There may be better vista points but with all the Eucs they are hidden.	6/22/2017 7:35 AM
27	K, 10 to get view of coast range and down coast	6/21/2017 10:46 PM
28	K,12	6/21/2017 10:20 PM
29	No opinion	6/21/2017 6:23 PM
30	J, 10	6/21/2017 6:11 PM

Online Survey Responses

Quarry Park Master Plan Survey, June 2017

Q8 How important are the following natural resource management activities to you (cost and implementation challenges may impact feasibility).

Answered: 187 Skipped: 7



	Very	Somewhat	Neither important nor unimportant	Somewhat unimportant	Not at all important	Total	Weighted Average
Thinning of non-native Eucalyptus for fuel (fire) management	36.76% 68	33.51% 62	11.89% 22	5.41% 10	12.43% 23	185	2.23
Selective thinning/removal of non-native species and planting of native species for vegetation/habitat management	23.37% 43	40.76% 75	19.57% 36	3.80% 7	12.50% 23	184	2.41
Creek/wetland restoration	39.01% 71	33.52% 61	14.29% 26	5.49% 10	7.69% 14	182	2.09
Sensitive species habitat enhancement	29.28% 53	35.91% 65	19.89% 36	4.97% 9	9.94% 18	181	2.30
Management for improved sediment and drainage	30.43% 56	46.74% 86	13.04% 24	4.89% 9	4.89% 9	184	2.07

#	Other (please specify)	Date
1	please do not waste tax dollars thinning a forest of non native species. The entire hillside is non native trees. Just leave them alone. The thinning you did at the quarry over look caused more erosion and sped up the likely hood of the overlook deck to fall.	7/6/2017 2:41 PM
2	Thin/remove pampas grass aggressively.	7/5/2017 10:13 AM
3	Salvage the dam to save the pond	6/28/2017 6:25 PM
4	Please don't cut down trees, who cares that they are non-native? They look nice.	6/28/2017 3:02 PM
5	Again, how can you ask a question about importance w/out explaining what it entails?	6/25/2017 1:21 PM
6	Way more important than more artificial development in the park outside current established play areas.	6/23/2017 2:41 PM

Online Survey Responses

Quarry Park Master Plan Survey, June 2017

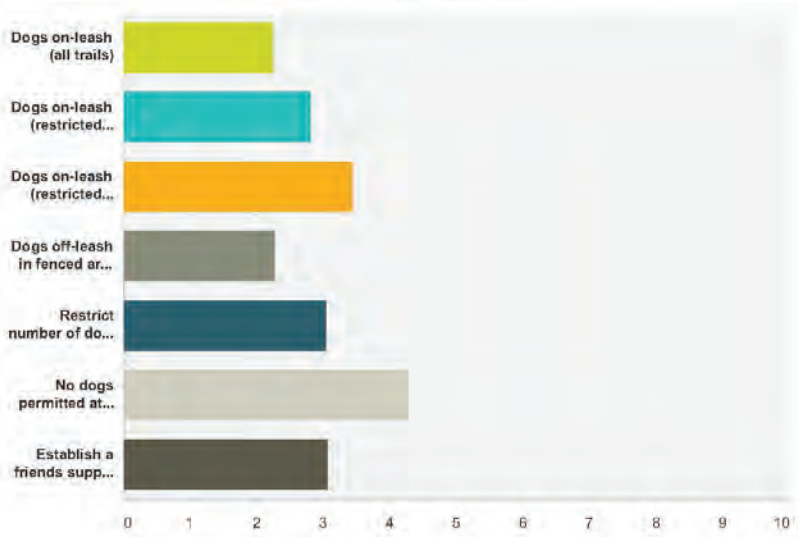
7	Leave it alone.	6/23/2017 12:40 PM
8	Expect you will ban everyone from area (humans) and arrest people to help banana slugs or something	6/22/2017 6:16 PM
9	Why can't you just leave that beautiful park ALONE	6/22/2017 2:46 PM
10	Can't really comment on how important these things are because I don't know how feasible they are in that area, e.g., wetland restoration??	6/22/2017 1:58 PM
11	tax waste	6/22/2017 12:08 PM
12	Dependent upon rainfall, the last one may become critical.	6/22/2017 11:25 AM
13	Going back to native species depends on how far back you want to go. What was here before the Indians - 10,000 years ago? How will you keep non-natives out in future - huge on-going expense. Waste of time and money.	6/22/2017 11:15 AM
14	Very concerned you are conflating fire hazard with non-native trees	6/22/2017 11:03 AM
15	This park is almost all non-native plants. However, it is lovely, green and cool year round. I like to think of it as an English Garden that's gone wild.	6/22/2017 10:04 AM
16	I support habitat restoration, but not at the expense of recreational opportunities and access, including dog walking.	6/22/2017 10:02 AM
17	remove poison oak	6/22/2017 9:10 AM
18	manage native vegetation to bring in birds	6/21/2017 10:46 PM
19	There is nothing natural about this land. Eucalyptus are invasive, it has been quarried, cultivated, grazed etc. Reduce fire risk, improve/maintain trails and drainage.	6/21/2017 9:40 PM
20	Pampas grass,French Broom removed throughout park please.	6/21/2017 8:23 PM

Online Survey Responses

Quarry Park Master Plan Survey, June 2017

Q9 San Mateo County Parks is developing a dog management policy for all of its parks. Please indicate how important the following aspects of dog access are to you at Quarry Park and Mirada Surf.

Answered: 186 Skipped: 8



	Very	Somewhat	Neither important or unimportant	Somewhat unimportant	Not at all important	Total	Weighted Average
Dogs on-leash (all trails)	51.65% 94	11.54% 21	13.19% 24	7.69% 14	15.93% 29	182	2.25
Dogs on-leash (restricted trails)	29.41% 50	22.94% 39	15.29% 26	1.76% 3	30.59% 52	170	2.81
Dogs on-leash (restricted hours)	19.64% 33	13.10% 22	14.88% 25	7.14% 12	45.24% 76	168	3.45
Dogs off-leash in fenced area, dogs separated by small/large size (Quarry Park only)	43.89% 79	21.67% 39	13.33% 24	4.44% 8	16.67% 30	180	2.28
Restrict number of dogs per visitor	18.99% 34	23.46% 42	19.55% 35	9.50% 17	28.49% 51	179	3.05
No dogs permitted at Quarry Park/Mirada Surf	8.52% 15	3.98% 7	9.66% 17	6.82% 12	71.02% 125	176	4.28
Establish a friends support group of dog owners/walkers	16.37% 28	19.88% 34	30.41% 52	7.02% 12	26.32% 45	171	3.07

#	Other (please specify)	Date
1	A dog on a leash should be allowed at all times. Restricted trails/times just leads to confusion.	6/30/2017 7:07 PM
2	Allow dogs to be walked off leash.	6/30/2017 8:23 AM

Online Survey Responses

Quarry Park Master Plan Survey, June 2017

3	I don't have a dog, but I don't mind dogs or their owners in our parks.	6/28/2017 3:02 PM
4	Dogs OFF-leash on trails	6/28/2017 12:25 PM
5	8 out of 10 people have their dogs off leash in this park. Please provide off leash trails, not just a rectangular box with wood chips. Some dogs need room to run and if their owner is unable to run then we need resources.	6/26/2017 6:55 PM
6	San Mateo County Parks are the most dog unfriendly parks in the state.	6/26/2017 3:33 PM
7	Again I would like to advocate off leash dog trails.	6/26/2017 1:53 AM
8	off leash trails	6/25/2017 2:23 PM
9	These issues are AL important in that they are being considered, not that I want to see a particular element established.	6/25/2017 1:21 PM
10	Limit dog access to reduce impact on fauna.	6/25/2017 8:19 AM
11	dogs desperately need off leash trails and I notice there is no provision for this needed inclusion	6/25/2017 7:53 AM
12	Let dog walkers walk their dogs. I don't have dogs, and I'm fine with well-trained dogs with good recall being off lead. In the enclosed park dogs should be on leash in case there are kids who are scared of dogs. I support having an enclosed dog park. I want dogs to keep running around and chasing balls at Mirada Surf.	6/25/2017 7:19 AM
13	Dogs off-leash walking on designated trails	6/24/2017 6:34 PM
14	Dogs off leash all trails	6/24/2017 10:55 AM
15	I disagree with limiting dog walking in any form.	6/24/2017 9:12 AM
16	Keep Quarry Park dog friendly please!! :)	6/24/2017 9:06 AM
17	We need recreational areas for our dogs to enjoy the outdoors and to be able to run and roam. There are already too many restrictions and rules regarding dogs in San Mateo County.	6/23/2017 6:58 PM
18	I support dogs off leash	6/23/2017 4:42 PM
19	As a mountain biker, it would be great if there were no dogs allowed on some of the mountain bike trails, as sometimes dogs get scared of bikes, even when appropriately slowing down and saying hello to the owner.	6/23/2017 4:16 PM
20	please create off leash dog trails- we have had access to quarry park for walking our dogs for the d10 yrs we lived here	6/23/2017 3:41 PM
21	MUST be able to take dogs to Quarry Park	6/23/2017 2:58 PM
22	ALL on-leash dog areas in parks have an off-leash dog problem. The problem is less with active enforcement, but all parks in San Mateo County that allow dogs are very weak on enforcement.	6/23/2017 2:41 PM
23	off leash under voice controll on some trails	6/23/2017 1:24 PM
24	Put in a game camera and see that 80% of visitors have dogs.	6/23/2017 12:40 PM
25	re: "no dogs " at Quarry...DOGS should continue to be allowed at Quarry Park. ., responsible owners should pick up dog waste and keep their dogs under voice control if off leash.. on leash in parking lot ..ok..until they are on the trail	6/23/2017 12:28 PM
26	Please keep all the trails open to dogs	6/23/2017 11:48 AM
27	dogs off leash is very important to me. and allowed on trails on leash.	6/23/2017 11:46 AM
28	very important; dogs off-leash on specific trails (or hours)	6/23/2017 11:38 AM
29	Not sure of meaning of first three choices	6/23/2017 10:28 AM
30	Given how few county parks are open to dogs I am not in favor of any restrictions at Quarry Park	6/22/2017 9:17 PM
31	Only if they self police poop pick up and keeping dogs on leash	6/22/2017 8:16 PM
32	portion of trail allows dogs off-leash for hiking (e.g. Pulgas Ridge)	6/22/2017 6:31 PM
33	I believe dogs should be allowed off leash, and if there are incidents, prosecute lazy dog owners.	6/22/2017 6:16 PM
34	I really don't like dog parks	6/22/2017 5:25 PM
35	This is THE dog park! Please Keep it!!	6/22/2017 3:12 PM
36	We already have our own dog groups. All aspects are very important as clearly you discriminate against certain species. This human superiority is becoming so disgusting.	6/22/2017 2:46 PM
37	Ideally, I would like all trails to be off-leash.	6/22/2017 1:58 PM

Online Survey Responses

Quarry Park Master Plan Survey, June 2017

38	why do you guys have to ruin a good thing -- all of the people who use the park and bring their dogs are respectful and clean.	6/22/2017 1:29 PM
39	The majority of dog owners are responsible and all dogs should be welcome with on AND off leash trail options	6/22/2017 1:16 PM
40	Off-leash trails are very important	6/22/2017 1:09 PM
41	dog owners need access to space also.	6/22/2017 1:05 PM
42	Dogs off-leash most everywhere	6/22/2017 1:05 PM
43	Very important that there be off leash trails. Any further restrictions on dogs would be extremely negative. The community has a large number of dogs and dog owners don't want to go places without their dog. We stopped going to state parks when we got our dog 12 years ago. The more exposure and off leash experience a dog gets, the more harmonious and at ease they are. People walking around tense and nervous with a tense and nervous dog on leash is not a good thing.	6/22/2017 1:04 PM
44	I've lived here for 9 years in El Granada, and I think it's critical for dogs to have trails available to them for off-leash.	6/22/2017 12:59 PM
45	Dogs should have restricted hours to allow for off-leash trail walking. Dogs need more than a fenced area to run about. A dog park is not enough. Quarry Park has been our haven for decades and it is not fair to take that away from us!! The majority of people there are walking dogs!	6/22/2017 12:42 PM
46	Off leash dog trails/fire road access	6/22/2017 12:28 PM
47	OFF leash dog trails!	6/22/2017 12:08 PM
48	no commercial dog walking companies on trails !	6/22/2017 12:06 PM
49	off leash dog walking trails. if restricted, please have some flat trails accessible.	6/22/2017 12:04 PM
50	I am a dog owner and lover but I hope that people that come to any park can be made to understand how important it is to clean up after them always.	6/22/2017 11:26 AM
51	Dogs NEED space to run free for awhile and chase balls. Their normal spots for this crucial exercise is being taken away all over the Bay Area. This area has a huge population of dog lovers who enjoy getting out and exercising with their pups. Quarry Park has traditionally been off leash (although not legally) forever. We must preserve at least some space, preferably large, for off leash activities.	6/22/2017 11:25 AM
52	Keep all dogs off leash as grandfathered in when property given to county. Stop discriminating against dog owners. We are probably the majority on the coast and deserve some acknowledgement. There are hundreds if not thousands of miles of trail that EVERYONE, even horses, except dog owners with their dogs can enjoy.	6/22/2017 11:15 AM
53	Who not offer some off-leash trails? Why does your survery omit that when you are very aware of the support for it and the problems engulfing GGNRA for refusing to offer some?	6/22/2017 11:03 AM
54	You must maintain current levels of dog access - leashed access to all trails.	6/22/2017 10:45 AM
55	What is a friends support group?	6/22/2017 10:25 AM
56	Dogs should be permitted off leash everywhere in the park	6/22/2017 10:23 AM
57	9 out of 10 regular visitors to Quarry Park walk dogs there. This is the MOST IMPORTANT recreational activity to preserve at this park. It is ideal, since it is mostly non native plants, and less environmentally sensitive than other areas that need tighter restrictions on dogs - such as plover nesting areas, or red-legged frog water lands.	6/22/2017 10:04 AM
58	At the community meeting, folks said they are interested in having off-leash dog walking on trails. I'm disappointed that SMC Parks did not include this in the list of options above. Quarry Park is the perfect place to have some off-leash dog trails.	6/22/2017 10:02 AM
59	How are you supposed to answer the "No dogs permitted...) if you DISagree with that policy? Dogs SHOULD be allowed, so is it VERY IMPORTANT or NOT AT ALL important? (I put not at all important that No Dogs Permitted, because I think they should be.)	6/22/2017 9:54 AM
60	I have never seen horse up there, but they should definitely have a separate trail from mountain bikes. One of my dogs got badly spooked by a mountain bike that came barreling down and took off, ran all the way home. If that happens with a horse, someone could get seriously injured.	6/22/2017 9:53 AM
61	I don't have a dog	6/22/2017 9:10 AM
62	I want to bring my dog to the park with our family anytime, any day	6/22/2017 8:07 AM
63	A well trained dog on trails off leash is fine. The picking up of dog poop is most important -and that does not mean leaving your little bags on the side of the road.	6/22/2017 7:35 AM

Online Survey Responses

Quarry Park Master Plan Survey, June 2017

64	Dogs off4leash on certain trails.	6/21/2017 10:46 PM
65	Please do not limit access to dog owners! No segregation!	6/21/2017 9:40 PM
66	Dogs off leash on weekdays on all trails from sunup until 1pm.	6/21/2017 8:23 PM
67	It's not the dogs..It's always the handlers	6/21/2017 7:39 PM
68	Dog off leash on all trails all times	6/21/2017 6:11 PM

Online Survey Responses

Quarry Park Master Plan Survey, June 2017

Q10 Given that there are limited resources with which to make improvements, please rank the following areas in order of importance to you (1=most important....3=least important)

Answered: 176 Skipped: 18

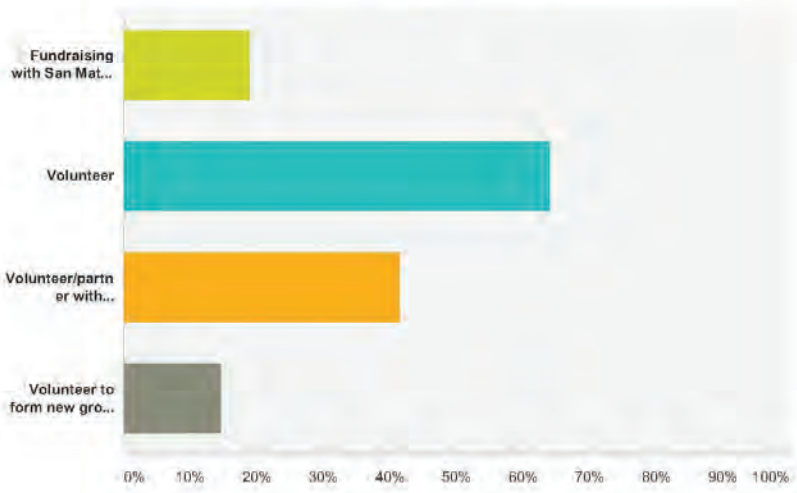
	1	2	3	Total	Score
Park improvements/additions (see Q:4)	23.17% 38	36.59% 60	40.24% 66	164	1.83
Trail improvements (Q:5)	55.36% 93	32.14% 54	12.50% 21	168	2.43
Natural resource management	21.51% 37	30.81% 53	47.67% 82	172	1.74

Online Survey Responses

Quarry Park Master Plan Survey, June 2017

Q11 Please tell us how you would like to be involved in the future of Quarry Park/Mirada Surf. Check all that apply.

Answered: 89 Skipped: 105



Answer Choices	Responses	
Fundraising with San Mateo County Parks Foundation	19.10%	17
Volunteer	64.04%	57
Volunteer/partner with existing group	41.57%	37
Volunteer to form new group with special focus	14.61%	13
Total Respondents: 89		

#	Other (please specify)	Date
1	already volunteering at Pescadero Park	7/7/2017 3:05 PM
2	Participate in bike trails and track. Local liaison.	7/6/2017 2:41 PM
3	Volunteer to maintain pump track	7/6/2017 1:52 PM
4	I'd volunteer with an IMBA national bike patrol team if one is formed.	7/5/2017 10:13 AM
5	Depends on what SM county parks does with Quarry Park/Mirada Surf	6/26/2017 3:33 PM
6	coastside dog	6/26/2017 1:53 AM
7	Because I serve on the GCSD Parks & rec Advisory Committee, I would be interested in being a liaison for it & County Parks	6/25/2017 3:12 PM
8	Involved in restricting development as much as possible.	6/25/2017 1:21 PM
9	I'll volunteer if you keep the dog policy as is - allow dog access to all trails	6/24/2017 9:12 AM
10	Support initiatives that allow dogs to enjoy nature	6/23/2017 6:58 PM
11	Volunteer with trail building/improvement groups to benefit mountain bikers, hikers, and equestrians	6/23/2017 5:02 PM

Online Survey Responses

Quarry Park Master Plan Survey, June 2017

12	I only volunteer in parks that are positively managed for natural features and never in parks where more artificial development is being pushed.	6/23/2017 2:41 PM
13	Email updates	6/23/2017 2:25 PM
14	I think there is a large enough contingent of mountain bikers on the coastside (and potentially in the greater peninsula area) that would be willing to donate time and money if QP were a viable resource for them.	6/23/2017 1:48 PM
15	I have cleared branches and downed trees after storms from the trails for years.	6/23/2017 12:40 PM
16	Dog owners for unleashed walks. Why are we so discriminated against and harrassed by San Mateo County?	6/23/2017 11:14 AM
17	would volunteer for specific projects, but am totally skeptical if county government is involved	6/22/2017 6:16 PM
18	I am so disappointed in the parks. I used to be an avid volunteer until recently	6/22/2017 2:46 PM
19	Off leash dog group	6/22/2017 1:59 PM
20	Work with Coastside dog groups to ensure dog owners have a say!	6/22/2017 12:42 PM
21	I work with an existing group supporting off-leash dogs.	6/22/2017 11:15 AM
22	Having directional mountain bike specific trails would eleminate conflicts between user groups. Hikers can design trails that are preferable to foot travel and cyclists could design trails that are preferable for bicycle riding. It's important to get both groups involved in trail design, building and maintenance.	6/21/2017 8:24 PM

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COMMUNITY MEETING 2

QUARRY PARK
MASTER PLAN

Agenda for Meeting #2

GATES +ASSOCIATES LANDSCAPE ARCHITECTURE · LAND PLANNING · URBAN DESIGN

WORKING AGENDA

Quarry Park Master Plan
Community Meeting #2

Tuesday July 25, 2017
7:00-9:00 pm
El Granada Elementary School
Multipurpose Room

Time Frame	Topic	Presenter	Materials
15 minutes	**Introduction / Welcome** • Team	County Staff	Sign-in sheet Name tags
30 minutes	**Presentation** • Background • Project Update • Next Steps	County Staff / Gates	Powerpoint
40 minutes	**Station Break Out** 1. Draft Trails Map 2. Entry Flat Programming Alternatives 3. Draft Technical Studies Maps	Station Leaders	Boards
20 minutes	**Station Summary** 1. 5 mins per station	Station Leaders	Boards
10 minutes	Next Steps	Gates	

Workshop Photographs From Meeting #2

Presentation Slides From Meeting #2

COMMUNITY MEETING #2

July 25, 2017

INTRODUCTION

THE MASTER PLAN TEAM

San Mateo County Parks

- Gates + Associates
  (Park & Recreation Planning/Lanscape Architecture)
- WRA Environmental Consultants
  (Biological Resources Assessment)
- Pacific Watershed Associates
  (Erosion Inventory and Assessment)

Presentation Slides From Meeting #2

MEETING OVERVIEW

TODAY'S AGENDA

1. Background Recap
2. Project Update
3. Table Groups and Summaries
4. Questions/Feedback
5. Next Steps

QUARRY PARK
MASTER PLAN

INTRODUCTION

SCOPE OF MASTER PLAN DOCUMENT

Existing Conditions Assessment
- » Biological Assessment
- » Sediment Source Reduction Plan
- » Existing Uses
- » ADA accessibility

Community Outreach Process/Input

Preferred Plan
- » Park Uses and Amenities
- » Vehicle and Trail Access and Travel
- » Infrastructure
- » Signage and Interpretive Opportunities

Management Guidelines

Partnerships

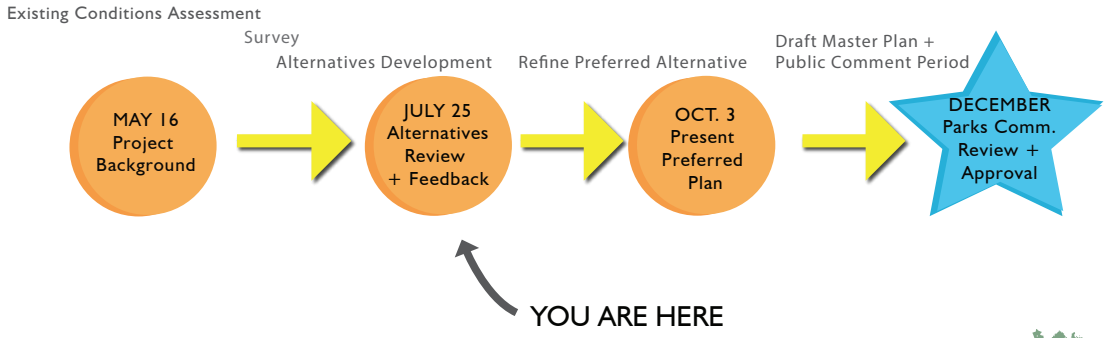
Implementation and Phasing

QUARRY PARK
MASTER PLAN

Presentation Slides From Meeting #2

INTRODUCTION

PROJECT SCHEDULE



Check web site for updates on survey
parks.smcgov.org/quarry-park

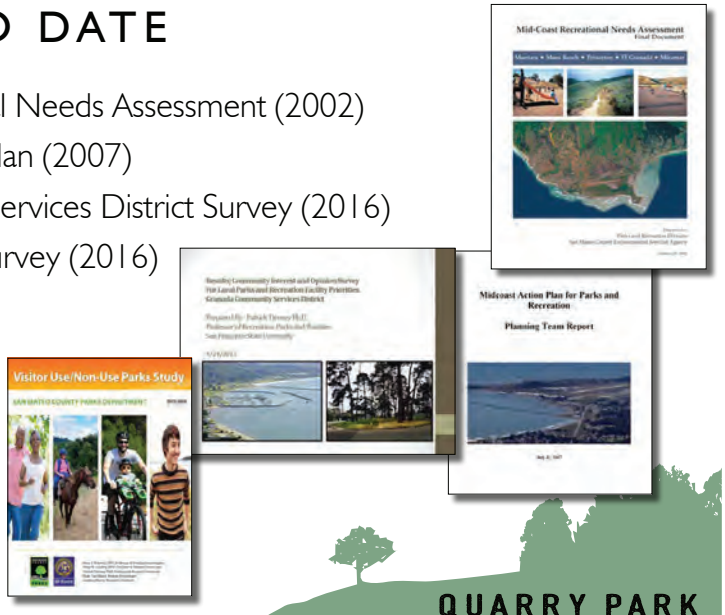
QUARRY PARK
MASTER PLAN

BACKGROUND

EFFORTS TO DATE

Mid-Coast Recreational Needs Assessment (2002)
Midcoast Park Action Plan (2007)
Granada Community Services District Survey (2016)
County Parks Visitor Survey (2016)

Consistent Priorities
- Hiking
- Dog Walking
- Cycling
- Swimming
- Picnic
- Playgrounds



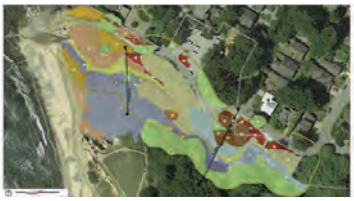
QUARRY PARK
MASTER PLAN

Presentation Slides From Meeting #2

BACKGROUND

RECENT IMPROVEMENTS

- Surfer's Beach Coastal Trail Improvements
- Mirada Surf Coastal Trail
- San Vicente Creek Restoration
- Moss Beach Park
- Clipper Ridge Playground
- Quarry Park Playground



San Vicente Creek Restoration

Surfer's Beach

Moss Beach Playground

Mirada Surf Phase III

QUARRY PARK
MASTER PLAN

BACKGROUND

PARALLEL TRAIL

QUARRY PARK
MASTER PLAN

Presentation Slides From Meeting #2

BACKGROUND

DOGS IN PARKS

» Dog management committee currently developing policy recommendations, which are to be presented to Parks Commission in December 2017

» Upcoming meetings:
August 21, 2017 at 2:30 pm
San Mateo County Parks
455 County Center, 4th Floor, Redwood City

San Mateo County Parks Dog Committee web page:
parks@smcgov.org/dogs-at-SMC-parks

QUARRY PARK
MASTER PLAN

PROJECT UPDATE

EFFORTS SINCE MAY

» Meeting #1 Summary

» Online Survey Results

» Technical Studies Analysis

» Draft Trail Plan

» Program Alternatives for Quarry Entry Flat

QUARRY PARK
MASTER PLAN

Presentation Slides From Meeting #2

PROJECT UPDATE

COMMUNITY MEETING #1

» Project Scope and Background

» Breakout Stations
- Trails Network
- Existing and Potential Uses
- Technical Studies

» Feedback helped inform survey questions
- desire for designated trails for mountain biking
- dogs access a priority
- concerns about drainage/erosion
- concerns about fire
- desire for pump track
- concerns about native vs. invasive vegetation

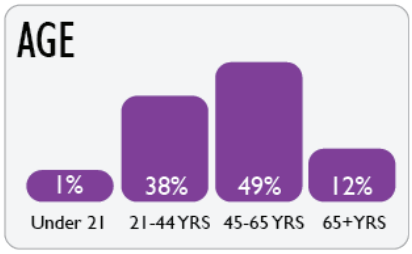
QUARRY PARK
MASTER PLAN

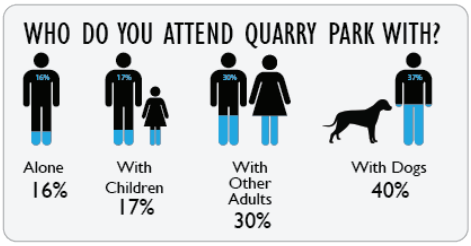
PROJECT UPDATE

ONLINE SURVEY RESULTS

TOTAL # OF ONLINE SURVEY PARTICIPANTS: 235

OPENED JUNE 12, 2017
RESPONSE COLLECTED FOR 37 DAYS



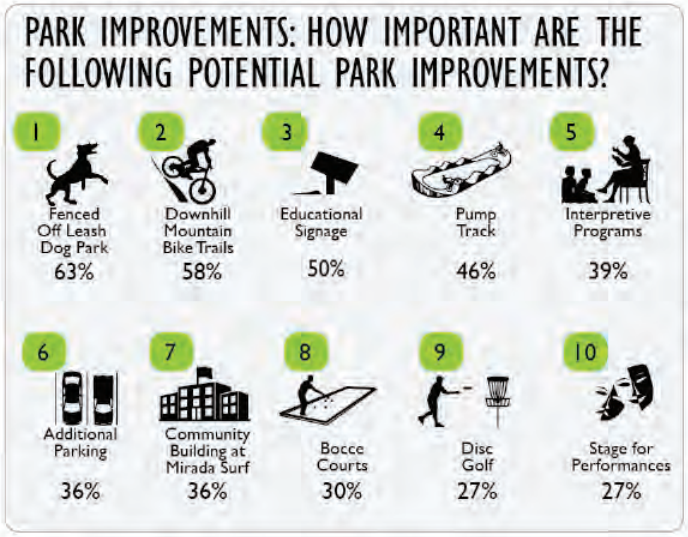


QUARRY PARK
MASTER PLAN

Presentation Slides From Meeting #2

PROJECT UPDATE

ONLINE SURVEY RESULTS

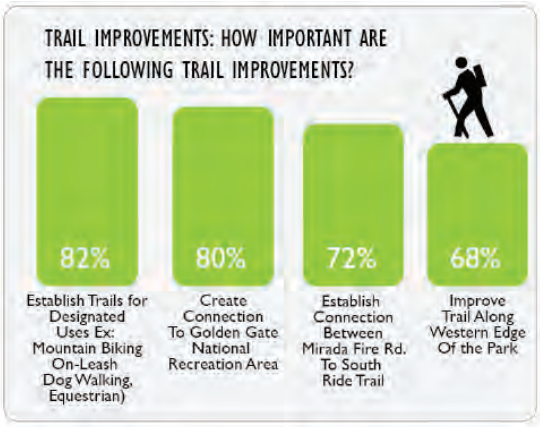


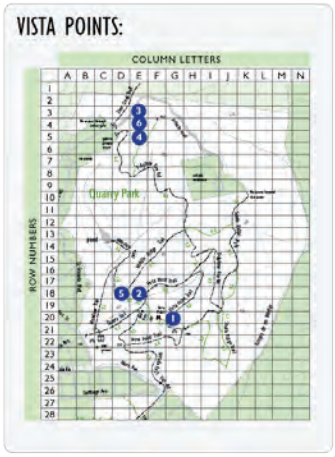
» E-mails received requesting pickleball

QUARRY PARK
MASTER PLAN

PROJECT UPDATE

ONLINE SURVEY RESULTS



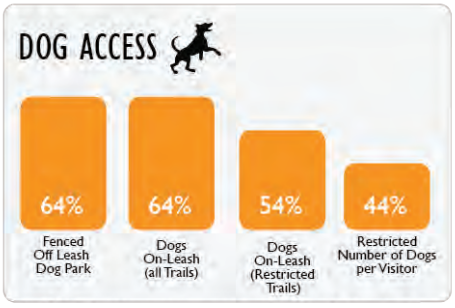


QUARRY PARK
MASTER PLAN

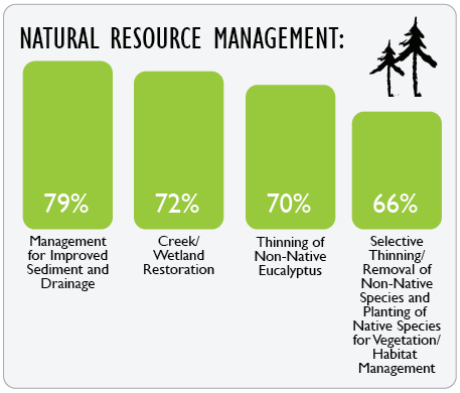
Presentation Slides From Meeting #2

PROJECT UPDATE

ONLINE SURVEY RESULTS



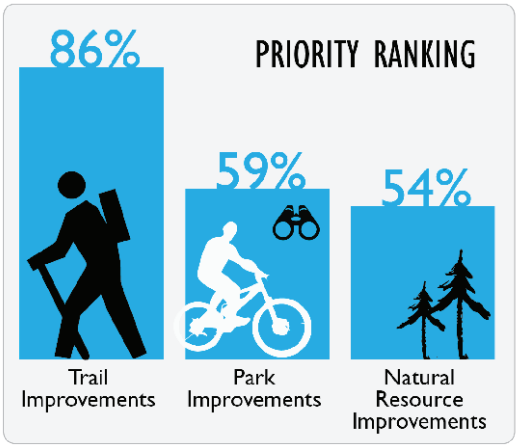
*25% of the comments requested off leash dog trails



QUARRY PARK
MASTER PLAN

PROJECT UPDATE

ONLINE SURVEY RESULTS



QUARRY PARK
MASTER PLAN

Presentation Slides From Meeting #2

PROJECT UPDATE

SEDIMENT SOURCE ASSESSMENT

Quarry Park Overlook

Run-off into residential areas

» Overlook closed for safety due to erosion
- Master Plan to propose new location

» Decision made to retain existing pond for:
- Drainage functions
- Program opportunities (rest area, educational signage)

» Team working to identify priority areas for drainage and roads/trails to maintain/improve. Considerations:
- Public health and safety
- Biological sensitivity and ecological function
- Accessibility
- Preferred road/trail network and park uses
- Aesthetics
- Costs

QUARRY PARK
MASTER PLAN

PROJECT UPDATE

BIOLOGICAL ASSESSMENT

Woodland Strawberry

Northern Coastal Scrub

» Restoration possibilities extremely limited due to size of site, extent of invasive species and very limited budgets.

» Best potential is to preserve/enhance/expand northern coastal scrub areas on edges of site

» Team working to identify potential enhancement opportunities to synergize with other repairs or improvements.

QUARRY PARK
MASTER PLAN

Presentation Slides From Meeting #2

PROJECT UPDATE

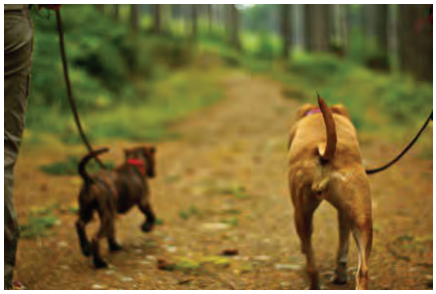
DOG WASTE MANAGEMENT

» Cleaning up your dog's waste is critical for the environment

» Dog waste is NOT part of the natural ecosystem

» Contains bacteria and nitrogen that enters waterways and is harmful to animals, fisheries, creeks and streams

» Committee expected to present dog management recommendations to County Parks Commission in December 2017



QUARRY PARK
MASTER PLAN

PROJECT UPDATE

FIRE MANAGEMENT

» A key consideration in developing the final roads/trails network and prioritizing recommendations

» Maintenance of existing fire buffers on north and south sides of the park

» Master plan to identify fire management goals and priorities for when funds become available.

QUARRY PARK
MASTER PLAN

Presentation Slides From Meeting #2

DRAFT TRAILS NETWORK

Considerations

» Importance for emergency vehicle access, fire management, maintenance

» Impacts on sediment/drainage

» Impacts on natural resources

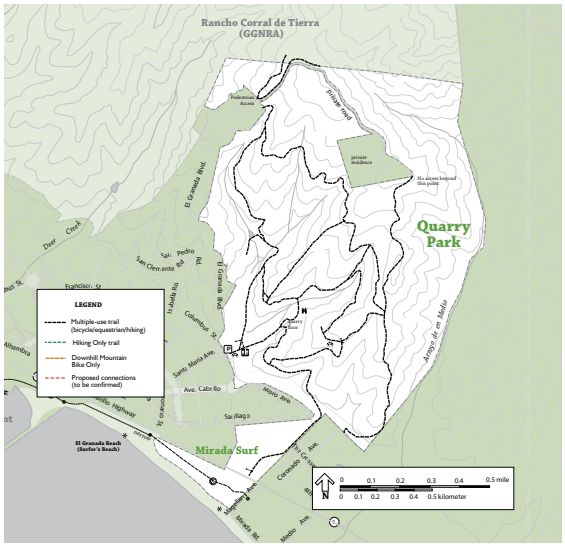
» Recreation value

» Creation of loops and connections

QUARRY PARK
MASTER PLAN

DRAFT TRAILS NETWORK

MULTIPLE USE TRAILS



» No change in multiple use trails network from current map anticipated at this time

» Repairs and drainage improvements needed and will be recommended and prioritized

» Revision to County ordinance regarding bicycles to be recommended

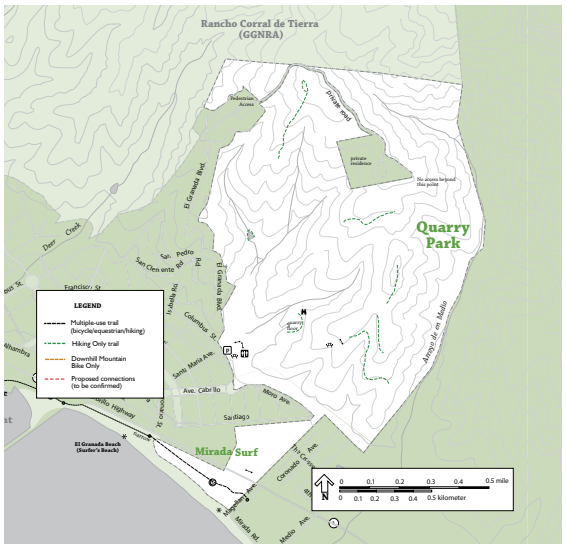
» Signage to be recommended

QUARRY PARK
MASTER PLAN

Presentation Slides From Meeting #2

DRAFT TRAILS NETWORK

HIKING ONLY TRAILS



» Bicycles not permitted

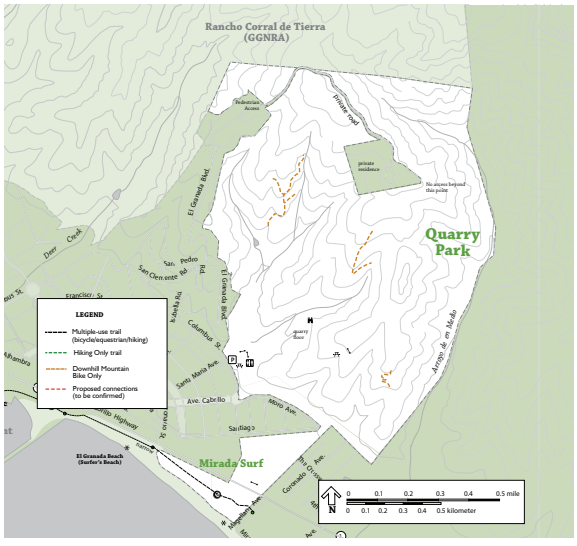
» Signage to be recommended

» Additional opportunities may be identified as studies progress

QUARRY PARK
MASTER PLAN

DRAFT TRAILS NETWORK

MOUNTAIN BIKE ONLY TRAILS



» Potential downhill mountain bike trails identified

» Revision to County ordinance to be recommended

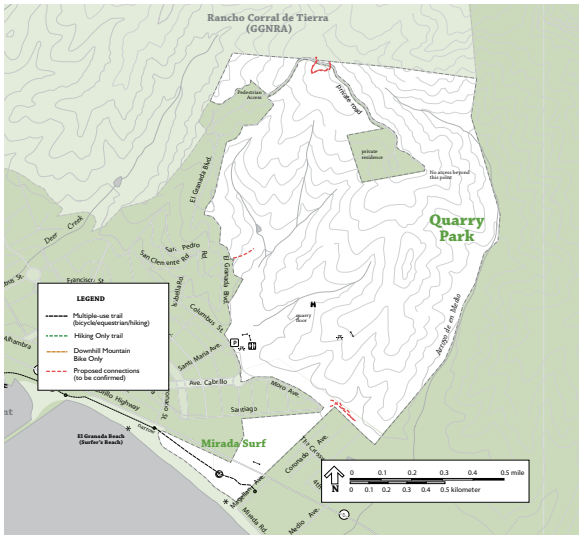
» Signage to be recommended (identification, safety)

QUARRY PARK
MASTER PLAN

Presentation Slides From Meeting #2

DRAFT TRAILS NETWORK

CONNECTIONS



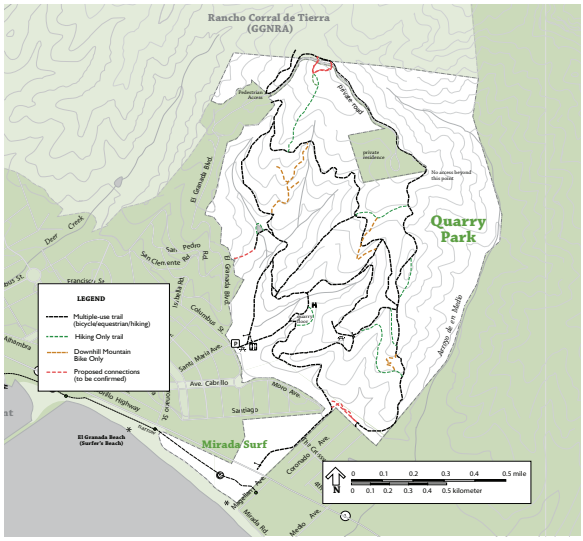
» Recommended connections to GGNRA (needed easements to be explored)

» Connection between South Ridge Trail and Mirada Surf East to creat loop

QUARRY PARK
MASTER PLAN

DRAFT TRAILS NETWORK

ALL

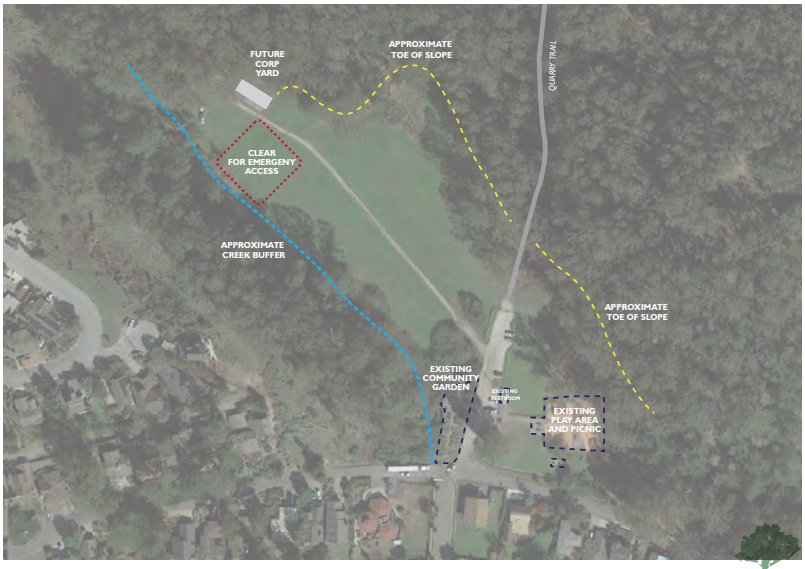


» Team continuing to review trail network based on data from technical studies

QUARRY PARK
MASTER PLAN

Presentation Slides From Meeting #2

POTENTIAL NEW USES



EXISTING CONDITIONS

QUARRY PARK
MASTER PLAN

POTENTIAL NEW USES

Fenced Off-Leash Dog Park

» Small: +/- 0.5 acre

» Large: +/- 1 acre

Pump Track

» +/- 7,000 sf

Bocce

» 23' x 100' each

QUARRY PARK
MASTER PLAN

Presentation Slides From Meeting #2

POTENTIAL NEW USES

Pickleball

» 40' x 64' each

Disk Golf

» min. 0.5 acre per hole

» +/- 2 acres shown here

Additional Parking

» 10 spots shown

YOU CAN HELP

Partnerships needed to make new uses possible:

» design input

» funding

» maintenance and stewardship

Friends of...

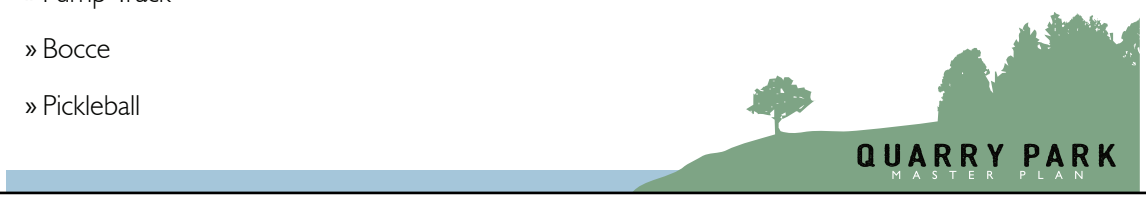
Possible "Friends of" opportunities:

» Dog facilities

» Pump Track

» Bocce

» Pickleball



Presentation Slides From Meeting #2

INPUT STATIONS

DRAFT TRAILS MAP

QUARRY POTENTIAL USES

DRAFT TECHNICAL STUDIES

QUARRY PARK
MASTER PLAN

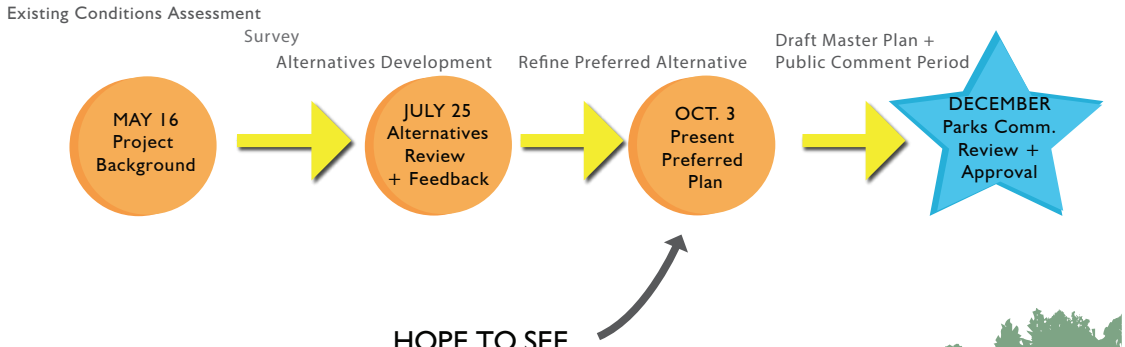
INPUT STATIONS

STATION SUMMARIES

QUARRY PARK
MASTER PLAN

Presentation Slides From Meeting #2

NEXT STEPS



QUARRY PARK MASTER PLAN

DOG COMMITTEE

» Dog management committee currently developing policy recommendations

» Recommendations to Parks Commission expected December 2017

» Upcoming meetings:
- August 21

San Mateo County Parks Dog Committee web page:

parks@smcgov.org/dogs-at-SMC-parks

QUARRY PARK MASTER PLAN

Presentation Slides From Meeting #2

FIRE RESOURCES

» **FIRE SAFE San Mateo County**
Dedicated to maintaining quality of life by protecting property and the environment in the wildland/urban interface zones through public/private partnerships, education and fuel reduction

»Meetings every other month. See web page.

Annual BBQ: August 9, 11:30 am - 1:30 pm
Jasper Ridge Preserve

FIRE SAFE San Mateo web page:
firesafesanmateo.org

Page from 'Living with Fire'

QUARRY PARK
MASTER PLAN

THANK YOU

parks.smcgov.org/quarry-park

QUARRY PARK
MASTER PLAN

Group Activity From Meeting #2

9

PRIORITY MATRIX

	PARK ACTIVITY	VERY IMPORTANT	SOME WHAT IMPORTANT	NOT IMPORTANT
Fenced Off Leash Dog Park		Don't build it in a key open area. Design it into space on sides/back.		
Pump Track		Need it!		
Additional Parking				
Bocce Courts		Need Horse shoes + Bean Bag toss, cheaper + more popular.		
Disc Golf		Needs to be designed around the open field. Can't obstruct crucial open field area.		
Pickleball		Make tennis court + draw the Pickleball lines onto it		
Other	*We need an open area. Kids running, soccer, football. Can't risk chopping up area with features for open field.	Stage area for plays, events, speakers. Cross fit work out area. Mountain bike only trail. Running track. Track + field.		Running open areas with objects that could be a injury hazard.

How many people participated in the matrix above? ______

TABLE 2

^

-7w

PRIORITY MATRIX

	PARK ACTIVITY	VERY IMPORTANT	SOME WHAT IMPORTANT	NOT IMPORTANT
Fenced Off Leash Dog Park		X		
Pump Track		important but X	location needs attention - Mirada Surf?	more
Additional Parking		/		
Bocce Courts			X	
Disc Golf				X
Pickleball				NO HARD SCAPE!! X
Other	Wetlands restoration + interpretive signage Horse Accessible Park Area			

How many people participated in the matrix above? 7

Group Activity From Meeting #2

PRIORITY MATRIX

	PARK ACTIVITY	VERY IMPORTANT	SOME WHAT IMPORTANT	NOT IMPORTANT
Fenced Off Leash Dog Park				
Pump Track		MIRADA SURF WEST		
Additional Parking				
Bocce Courts		QUARRY FLOOR AS POSSIBILITY		
Disc Golf				
Pickleball				
Other				

How many people participated in the matrix above? ______

PRIORITY MATRIX

4

TABLE #1

	PARK ACTIVITY	VERY IMPORTANT	SOME WHAT IMPORTANT	NOT IMPORTANT
~~Fenced~~ Off Leash Dog Park		✓ yes on the hiking trails. Rec areas should be protected from dogs		
Pump Track		top of the meadow on or the Right going east [illegible]		
Additional Parking		east of Mirada Surf off Hwy 1 - good for hikers		~~[illegible]~~
Bocce Courts		yes. near the playground (close to parking)		
Disc Golf				
Pickleball		yes near the playground (close to parking)		
Other				

needs more space so put in another park

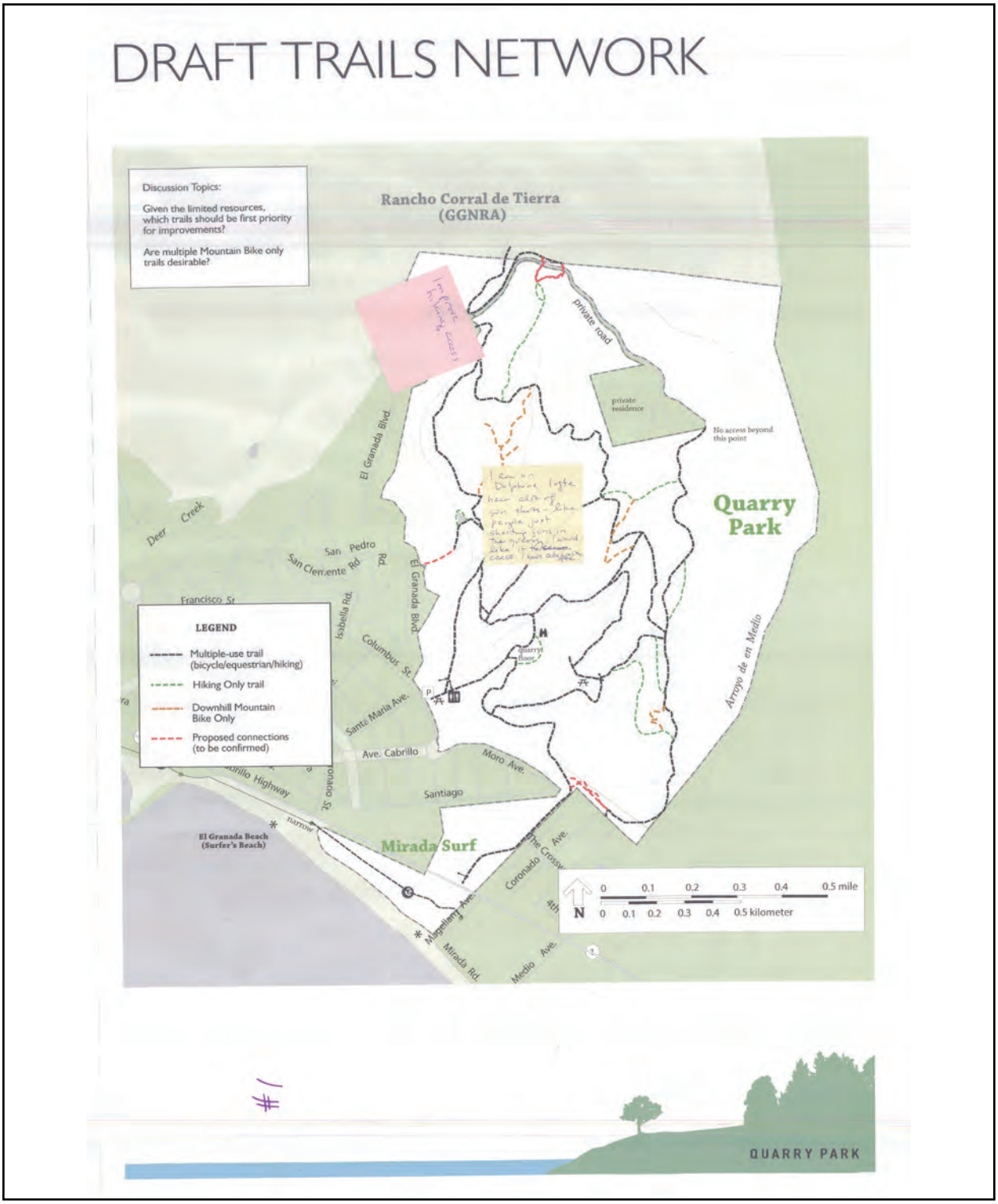
How many people participated in the matrix above? ______

Group Activity From Meeting #2

PRIORITY MATRIX

	PARK ACTIVITY	VERY IMPORTANT	SOME WHAT IMPORTANT	NOT IMPORTANT	RANKING
Fenced Off Leash Dog Park		15			2
Pump Track		20			1
Additional Parking		11			3
Bocce Courts		5	7		5
Disc Golf		8			4
Pickleball		12		7	6
Other	Horse shoes Stage Area Horse Access Signage/Wetland Restoration	8 8 7 7			

Group Activity From Meeting #2



Group Activity From Meeting #2

Group Activity From Meeting #2

Group Activity From Meeting #2

Group Activity From Meeting #2

Group Activity From Meeting #2

Group Activity From Meeting #2

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COMMUNITY MEETING 3

QUARRY PARK
MASTER PLAN

Input Station Boards From Meeting #3

Input Station Boards From Meeting #3


POTENTIAL
FENCED OFF
LEASH DOG
AREA

Subject: Re: Support for proposed new disc golf course in Half Moon Bay.

Mr Herzberg--

My family and I live across the street from the Golden Gate Park Disc Golf Course here in San Francisco. I am quite familiar with how much of a boon it's been to Golden Gate Park, because I see many people playing disc golf there every day. I see families, young people and their friends, seniors, all kinds of people. I play disc golf myself, and from my experience it's a inexpensive and very enjoyable way to spend a couple hours.

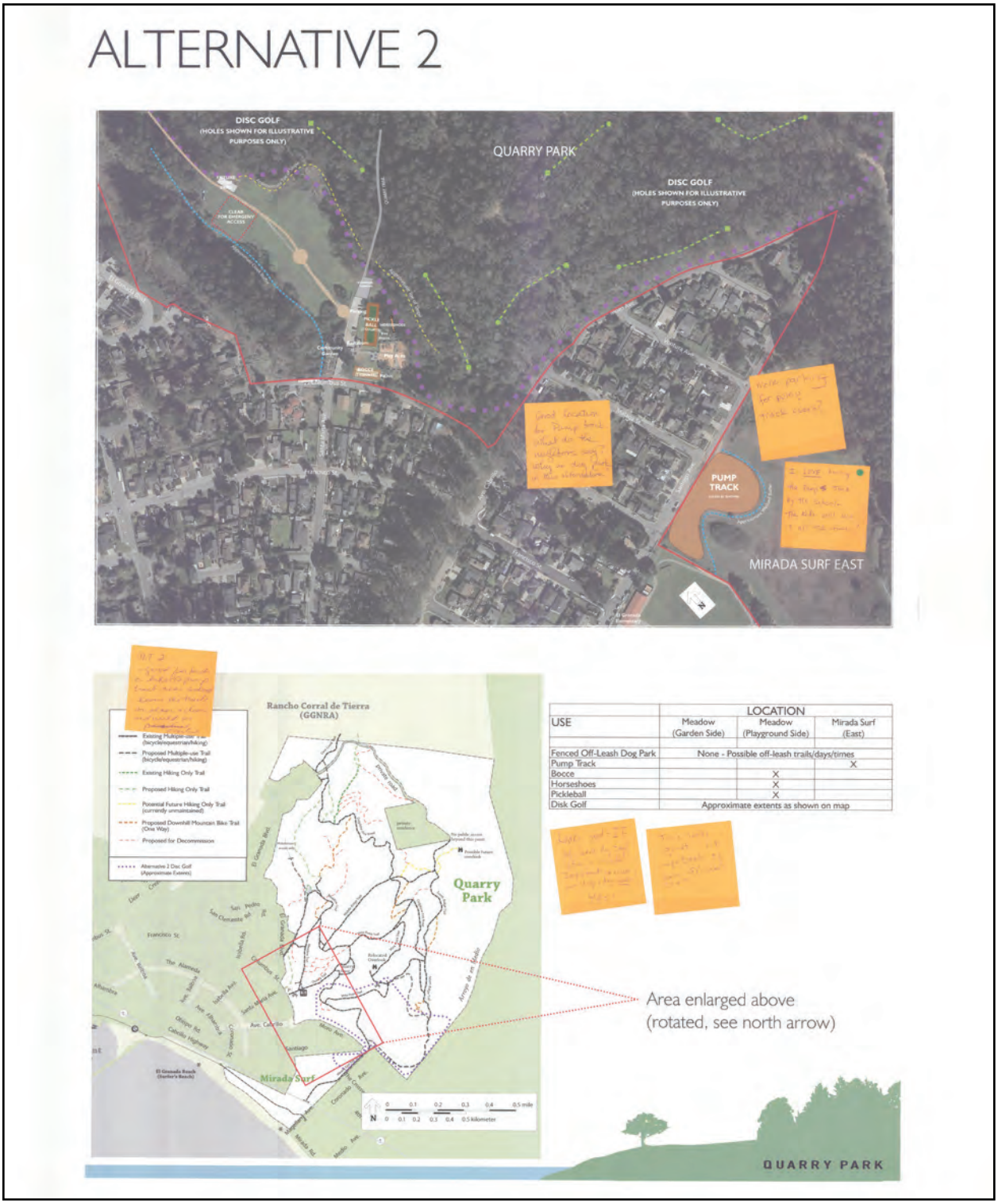
Disc golf is much less intrusive to the natural surroundings than is traditional golf. There's no need for irrigation or heavy landscaping.

I hope that this project moves forward -- I know I would enjoy visiting the course and spending time down in Half Moon Bay. Thank you very much for your consideration.

Dear Carla,
My name is Nicole Skerry and we live in El Granada. My family (2 legged and 4 legged) and I frequent Quarry Park and Mirada Surf on a regular basis.
We would vote for option 1 because it includes the dog parks... which are extremely needed on the coast. However, please plan so that these two dog parks (hopefully one for big dogs and one for small dogs) are at least an acre or so in size so that there are plenty of space to accommodate more than just a handful of dogs at a time.
Thank you for your time and consideration,
Nicole Skerry
114 Del Monte Road
El Granada

P.S.
The so called dog park at Smiths Field in Half Moon Bay is more like a "prison yard" than a dog "park".

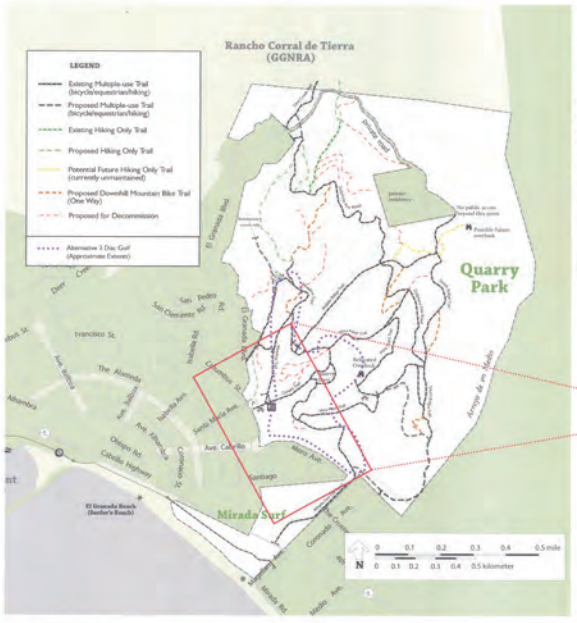
Input Station Boards From Meeting #3



USE	LOCATION		
	Meadow (Garden Side)	Meadow (Playground Side)	Mirada Surf (East)
Fenced Off-Leash Dog Park	None - Possible off-leash trails/days/times		
Pump Track			X
Bocce		X	
Horseshoes		X	
Pickleball		X	
Disk Golf	Approximate extents as shown on map		

Input Station Boards From Meeting #3

ALTERNATIVE 3



USE	LOCATION		
	Meadow (Garden Side)	Meadow (Playground Side)	Mirada Surf (East)
Fenced Off-Leash Dog Park	None - Possible off-leash trails/days/times		
Pump Track	X		
Bocce		X	
Horseshoes		X	
Pickleball		X	
Disk Golf	Approximate extents as shown on map		

Area enlarged above
(rotated, see north arrow)

Input Station Boards From Meeting #3

WHICH DO YOU PREFER?

Place one dot (only 1 dot per person, please) beside your preferred alternative. Feel free to add written comments.

ALTERNATIVE 1

DOTS | COMMENTS

ALTERNATIVE 2

DOTS | COMMENTS

ALTERNATIVE 3

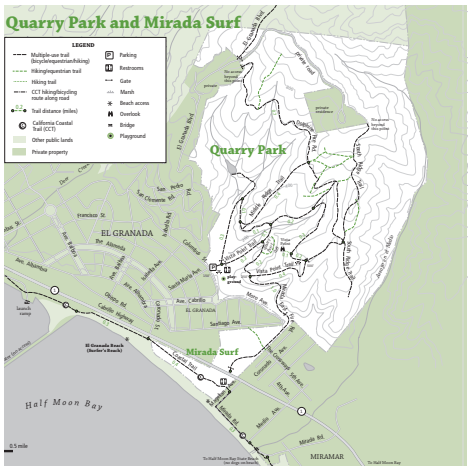
DOTS | COMMENTS

QUARRY PARK

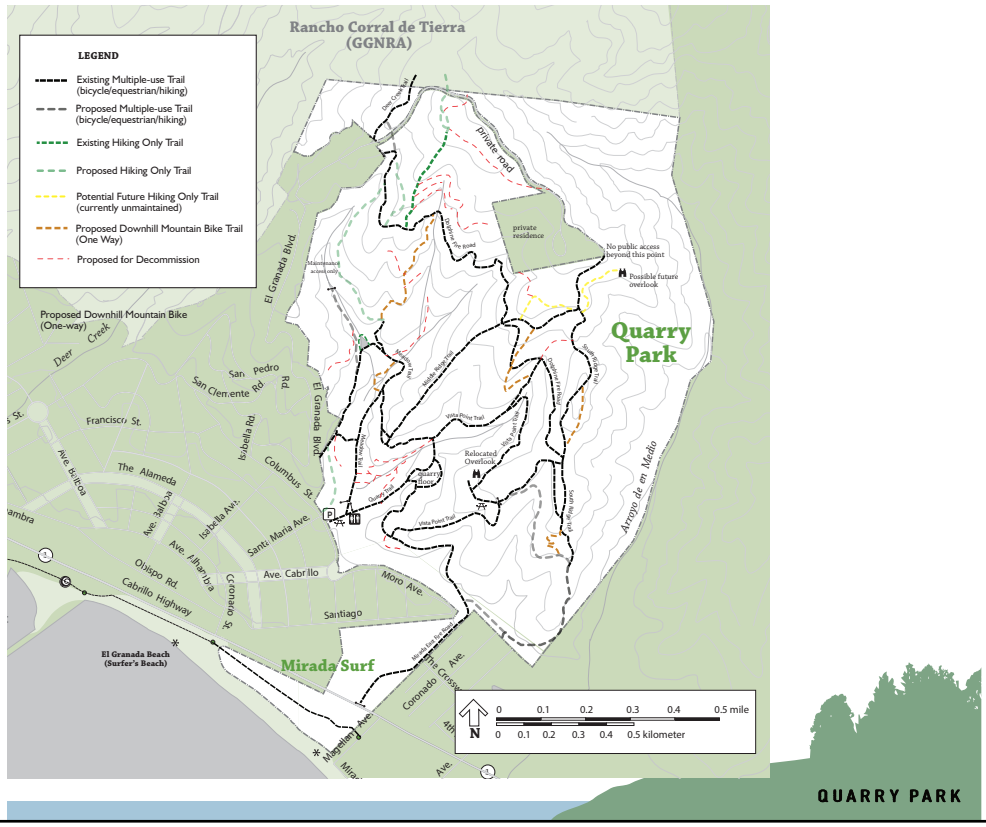
Input Station Boards From Meeting #3

TRAILS MAP

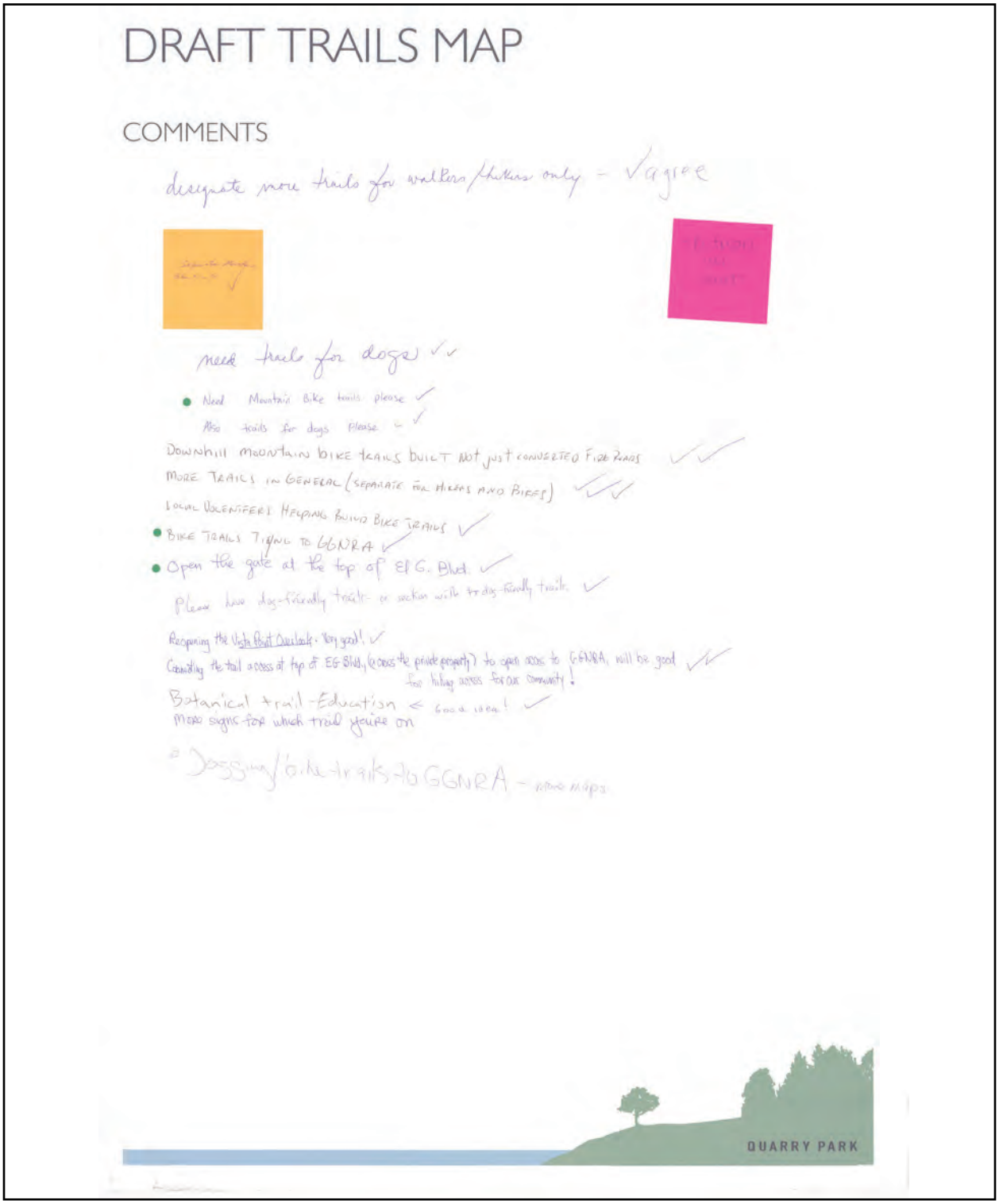
EXISTING



PROPOSED DRAFT

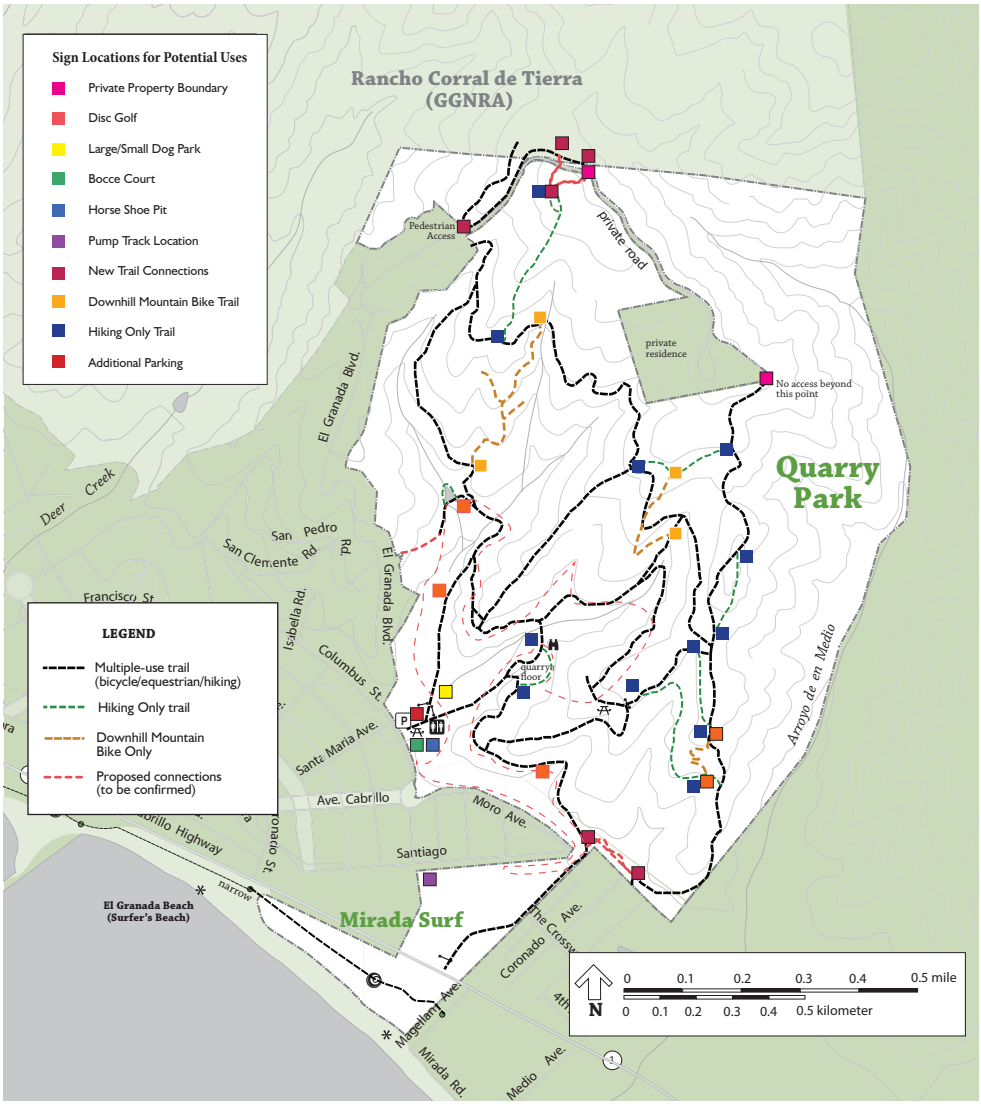


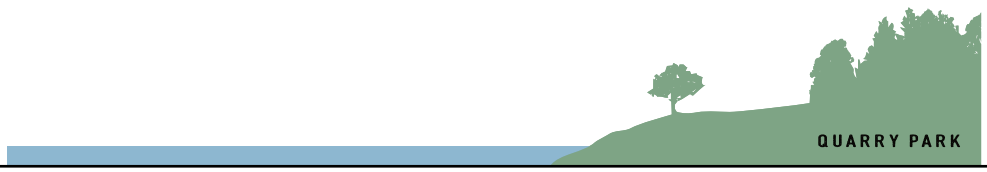
Input Station Boards From Meeting #3



Input Station Boards From Meeting #3

Signage Location Plan for Potential Uses





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COMMUNITY MEETING 4

QUARRY PARK
MASTER PLAN

Images from Meeting #4

Presentation Slides From Meeting #4

QUARRY PARK
MASTER PLAN

COMMUNITY MEETING #4

October 3, 2017

INTRODUCTION

THE MASTER PLAN TEAM

San Mateo County Parks

- Gates + Associates
  (Park & Recreation Planning/Lanscape Architecture)
- WRA Environmental Consultants
  (Biological Resources Assessment)
- Pacific Watershed Associates
  (Erosion Inventory and Assessment)

QUARRY PARK
MASTER PLAN

Presentation Slides From Meeting #4

MEETING OVERVIEW

TODAY'S AGENDA

1. Background Recap
2. Project Update
3. Table Discussions
4. Table Sharing/Summary
5. Focus Groups Discussion
6. Next Steps

QUARRY PARK
MASTER PLAN

INTRODUCTION

SCOPE OF MASTER PLAN DOCUMENT

Existing Conditions Assessment
- » Biological Assessment
- » Sediment Source Reduction Plan
- » Existing Uses
- » ADA accessibility

Community Outreach Process/Input

Preferred Plan
- » Park Uses and Amenities
- » Vehicle and Trail Access and Travel
- » Infrastructure
- » Signage and Interpretive Opportunities

Management Guidelines

Partnerships

Implementation and Phasing

QUARRY PARK
MASTER PLAN

Presentation Slides From Meeting #4

INTRODUCTION

PROJECT SCHEDULE

Check web site for updates on survey
parks.smcgov.org/quarry-park

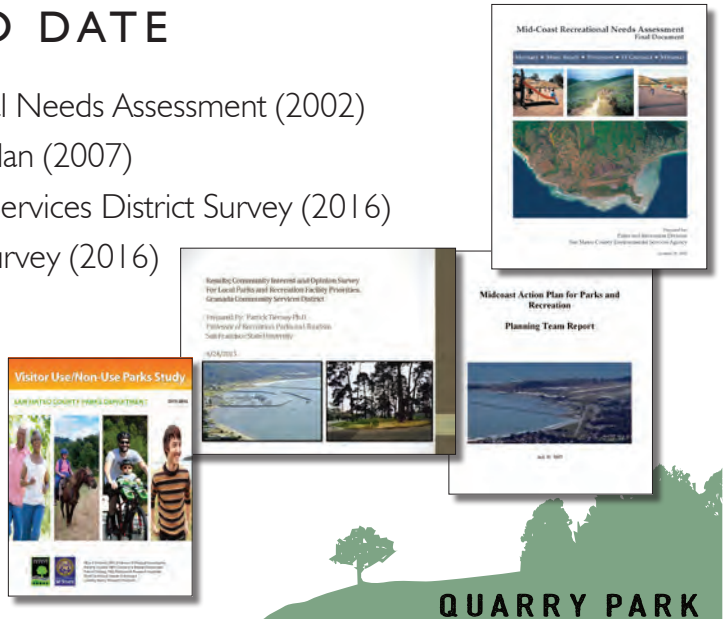
QUARRY PARK
MASTER PLAN

BACKGROUND

EFFORTS TO DATE

Mid-Coast Recreational Needs Assessment (2002)
Midcoast Park Action Plan (2007)
Granada Community Services District Survey (2016)
County Parks Visitor Survey (2016)

Consistent Priorities
- Hiking
- Dog Walking
- Cycling
- Swimming
- Picnic
- Playgrounds



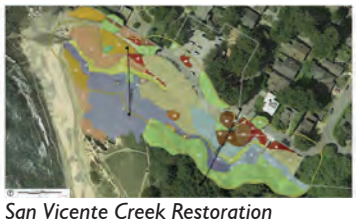
QUARRY PARK
MASTER PLAN

Presentation Slides From Meeting #4

BACKGROUND

RECENT IMPROVEMENTS

- » Surfer's Beach Coastal Trail Improvements
- » Mirada Surf Coastal Trail
- » San Vicente Creek Restoration
- » Moss Beach Park
- » Clipper Ridge Playground
- » Quarry Park Playground



San Vicente Creek Restoration

Surfer's Beach

Moss Beach Playground

Mirada Surf Phase III

QUARRY PARK
MASTER PLAN

BACKGROUND

PARALLEL TRAIL

QUARRY PARK
MASTER PLAN

Presentation Slides From Meeting #4

PROJECT UPDATE

EFFORTS SINCE MAY

» 3 Community Meetings (one on-site)

» Online Survey Results

» Technical Studies Analysis

» Draft Trail Plan

» Alternatives for Entry Area

QUARRY PARK
MASTER PLAN

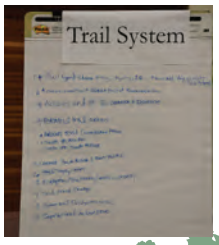
PROJECT UPDATE

COMMUNITY MEETING #1

» Project Scope and Background

» Breakout Stations
- Trails Network
- Existing and Potential Uses
- Technical Studies

» Feedback helped inform survey questions
- desire for designated trails for mountain biking
- dogs access a priority
- concerns about drainage/erosion
- concerns about fire
- desire for pump track
- concerns about native vs. invasive vegetation



QUARRY PARK
MASTER PLAN

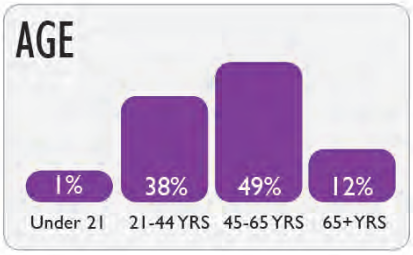
Presentation Slides From Meeting #4

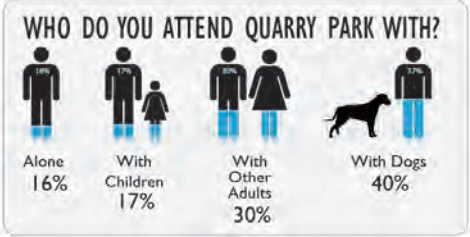
PROJECT UPDATE

ONLINE SURVEY RESULTS

TOTAL # OF ONLINE SURVEY PARTICIPANTS: 235

OPENED JUNE 12, 2017
RESPONSE COLLECTED FOR 37 DAYS

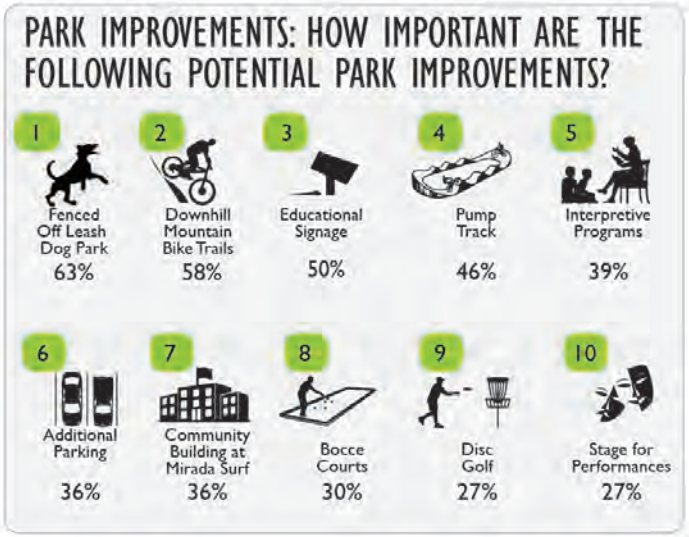




QUARRY PARK
MASTER PLAN

PROJECT UPDATE

ONLINE SURVEY RESULTS



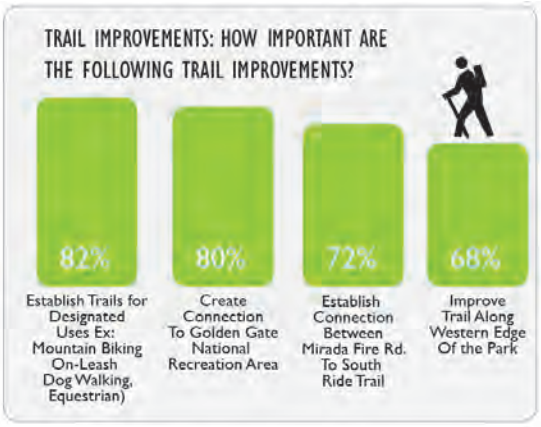
» E-mails received requesting pickleball

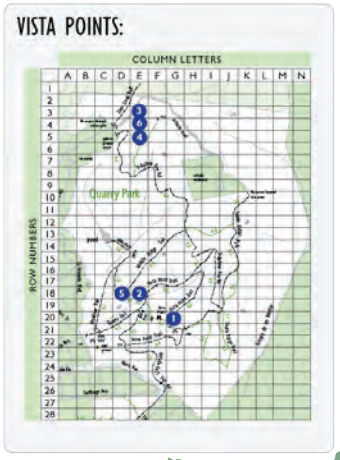
QUARRY PARK
MASTER PLAN

Presentation Slides From Meeting #4

PROJECT UPDATE

ONLINE SURVEY RESULTS

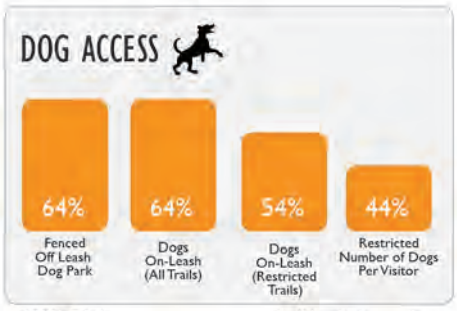




QUARRY PARK
MASTER PLAN

PROJECT UPDATE

ONLINE SURVEY RESULTS



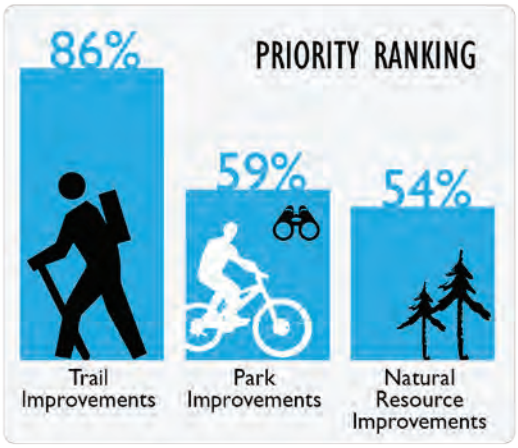
*25% Of the comments requested off leash dog trails

QUARRY PARK
MASTER PLAN

Presentation Slides From Meeting #4

PROJECT UPDATE

ONLINE SURVEY RESULTS



QUARRY PARK
MASTER PLAN

PROJECT UPDATE

COMMUNITY MEETING #2

PRIORITY MATRIX

	PARK ACTIVITY	VERY IMPORTANT	SOME WHAT IMPORTANT	NOT IMPORTANT	RANKING
Fenced Off Leash Dog Park		15			2
Pump Track		20			1
Additional Parking		11			3
Bocce Courts		5	7		5
Disc Golf		8			4
Pickleball		12		7	6
Other	Horse shoes Stage Area Horse Access Signage/Wetland Restoration	8 8 7 7			

» Review Draft Trail Map

» Explore Program Options for Entry Area

QUARRY PARK
MASTER PLAN

Presentation Slides From Meeting #4

PROJECT UPDATE

COMMUNITY MEETING #3

» On-site Review of Trail Plan

» Discussed Alternatives for Entry Area

QUARRY PARK
MASTER PLAN

PROJECT UPDATE

SEDIMENT SOURCE ASSESSMENT

Quarry Park Overlook

Run-off into residential areas

» Overlook closed for safety due to erosion
- Master Plan to proposes new location

» Decision made to retain existing pond for:
- Drainage functions
- Program opportunities (rest area, educational signage)

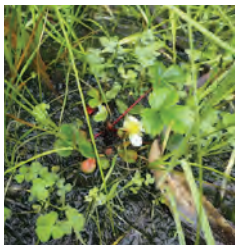
» Team identifies priority areas for drainage and roads/trails to maintain/improve. Considerations:
- Public health and safety
- Biological sensitivity and ecological function
- Accessibility
- Preferred road/trail network and park uses
- Aesthetics
- Costs

QUARRY PARK
MASTER PLAN

Presentation Slides From Meeting #4

PROJECT UPDATE

BIOLOGICAL ASSESSMENT



Woodland Strawberry

Northern Coastal Scrub

» Restoration possibilities extremely limited due to size of site, extent of invasive species and very limited budgets.

» Best potential is to preserve/enhance/expand northern coastal scrub areas on edges of site

» Team has identified potential enhancement opportunities to synergize with other repairs or improvements.

QUARRY PARK
MASTER PLAN

PROJECT UPDATE

FIRE MANAGEMENT

» A key consideration in developing the roads/trails network and prioritizing recommendations

» Maintenance of existing fire buffers on north and south sides of the park

» Master plan to identify fire management goals and priorities for when funds become available.

QUARRY PARK
MASTER PLAN

Presentation Slides From Meeting #4

DRAFT TRAILS NETWORK

Considerations

» Importance for emergency vehicle access, fire management, maintenance

» Impacts on sediment/drainage

» Impacts on natural resources

» Recreation value

» Creation of loops and connections

QUARRY PARK
MASTER PLAN

DRAFT TRAILS NETWORK

MULTIPLE USE TRAILS

» Improve multi-use trail networks

» Decommission non-essential problematic trails

» Provide networks for maintenance, fire management and safety

» Provide educational, information and interpretive trail signage system

» Relocate look out

» Continue use of Quarry Floor for events

QUARRY PARK
MASTER PLAN

Presentation Slides From Meeting #4

DRAFT TRAILS NETWORK

HIKING ONLY TRAILS

- Bicycles not permitted
- Signage

QUARRY PARK
MASTER PLAN

DRAFT TRAILS NETWORK

MOUNTAIN BIKE ONLY TRAILS

- Potential downhill mountain bike trails identified
- Revision to County ordinance to be recommended
- Signage to be recommended (identification, safety)

QUARRY PARK
MASTER PLAN

Presentation Slides From Meeting #4

DRAFT TRAILS NETWORK

CONNECTIONS

» Recommended connections to GGNRA (needed easements to be explored)

» Connection between South Ridge Trail and Mirada Surf East to create loop

» Access from end of El Granada Blvd.

» Connect Mirada East Road & South Ridge Trail

QUARRY PARK
MASTER PLAN

POTENTIAL NEW USES

PROS

» Exercise and socialize dogs

» Social activity for owners, creates "dog owner" community

» Dog activity contained, dog waste contained

» Serves community need

» Reduces conflicts on trails

CONS

» High maintenance commitment

» Significant construction costs

» Waste Management

» Reduces flexible space in meadow area

» Increased traffic

1: FENCED OFF-LEASH DOG AREA

QUARRY PARK
MASTER PLAN

Presentation Slides From Meeting #4

POTENTIAL NEW USES

PROS

- Attracts youth outdoors for active exercise
- Serves community need
- Social activity
- Builds skills
- Build Stewardship - volunteer involvement for maintenance & management

CONS

- Ongoing maintenance costs
- Noise and dust
- Construction disruption to import soil
- Significant construction costs
- Users age, continual volunteer recruitment
- Liability issue

2: PUMP TRACK

QUARRY PARK
MASTER PLAN

POTENTIAL NEW USES

PROS

- Low impact, small physical footprint
- Social activity
- Family and age friendly
- Compatible with adjacent uses
- Retains flexible use space

CONS

- Ongoing maintenance
- Limited number of users at one time
- Moderate construction costs

3: BOCCE BALL

QUARRY PARK
MASTER PLAN

Presentation Slides From Meeting #4

POTENTIAL NEW USES

PROS

- Active use, small groups
- Age friendly
- Increasing in popularity
- Serves community need
- Social activity
- Promotes fitness

CONS

- Requires paved court surface and fencing
- Takes up flexible space in meadow
- High construction costs

4: PICKLE BALL

QUARRY PARK
MASTER PLAN

POTENTIAL NEW USES

PROS

- Low impact: small physical footprints (paths, pads & baskets), low noise
- Less intense active recreation, does not interfere with trails
- Social activity
- Family and age friendly
- Low maintenance
- Stewardship: volunteers for maintenance and management
- Varied terrain & obstacles preferred

CONS

- Retrieval of discs that miss the targets
- Tournaments may attract high number of people

5: DISC GOLF

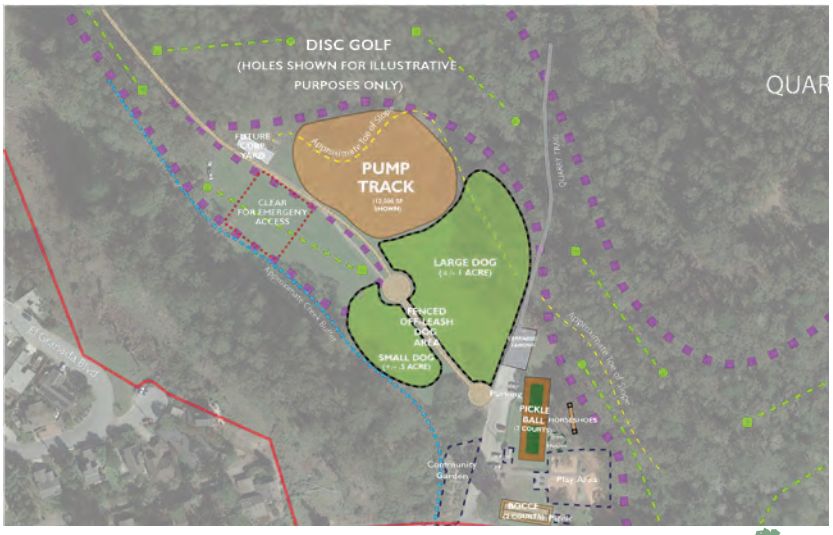
QUARRY PARK
MASTER PLAN

Presentation Slides From Meeting #4

ALTERNATIVE 1

QUARRY PARK
MASTER PLAN

ALTERNATIVE 1



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Presentation Slides From Meeting #4

ALTERNATIVE 2

QUARRY PARK
MASTER PLAN

ALTERNATIVE 2

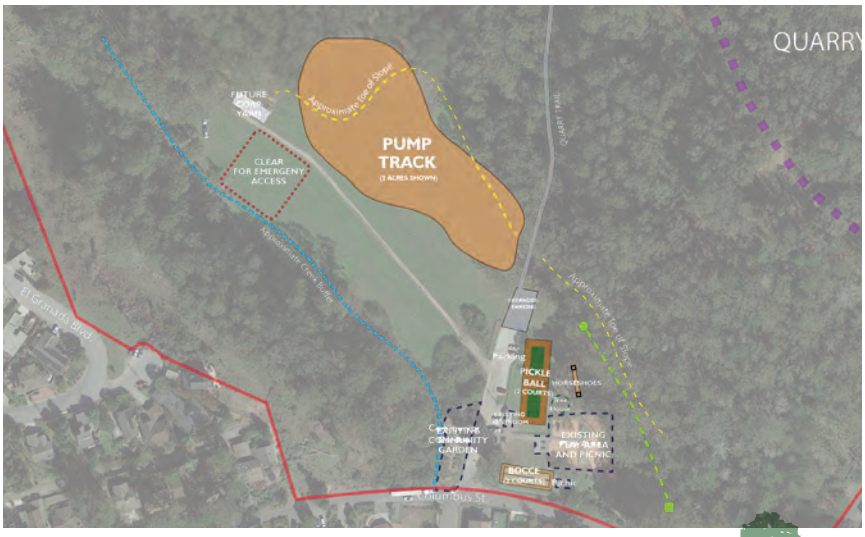
QUARRY PARK
MASTER PLAN

Presentation Slides From Meeting #4

ALTERNATIVE 3

QUARRY PARK
MASTER PLAN

ALTERNATIVE 3



QUARRY PARK
MASTER PLAN

Presentation Slides From Meeting #4

TABLE STATIONS

»REFINE DESIGN CRITERIA

»IDENTIFY PREFERRED ALTERNATIVE

»SHARE IDEAS

QUARRY PARK
MASTER PLAN

DESIGN CRITERIA

QUARRY PARK
MASTER PLAN

DESIGN CRITERIA

Meets Criteria:
1 = Not at all
2 = Somewhat
3 = Very Well

	Level of Impact (On a scale of 1-5 1 = low, 5 = high)	Alt. 1	Alt. 2	Alt. 3
Criteria Weight				
Preserves natural feel of park				
Creates a social center				
Appeals to a broader range of users (multigenerational)				
Provides family friendly ambiance				
Protects sensitive habitat				
Retains open meadow/flexible use space				
Compatible with adjacent park uses				
Promotes outdoor education; connection to nature				
Promotes physical activity				
Attractive to youth – gets kids outside				
Serves community need (lacking elsewhere)				
Accommodate dog use				
Minimize maintenance costs				
Encourages volunteers / stewardship				
Minimize noise impacts				
Minimize vehicle traffic				
Low construction costs/impact				
Minimize impact on neighbors				
Supports trail use				
Other:				

QUARRY PARK
MASTER PLAN

Presentation Slides From Meeting #4

ALTERNATIVES

ALTERNATIVE	PROS	CONS

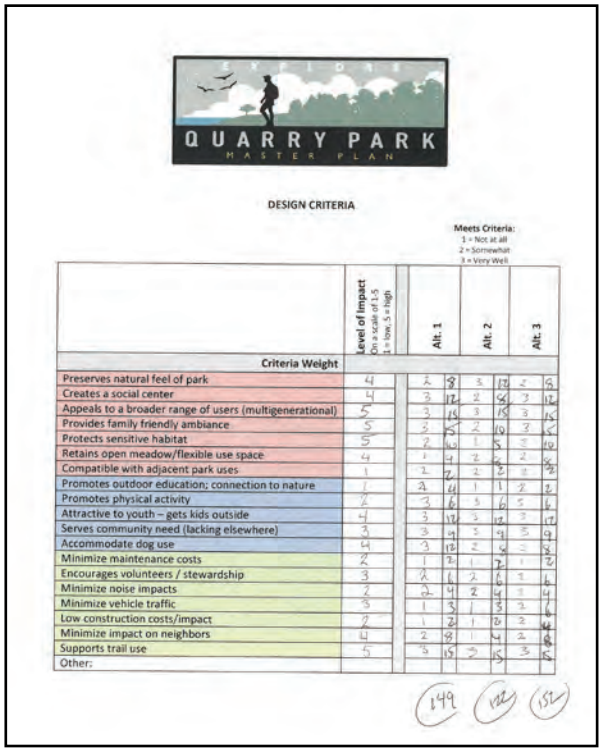
QUARRY PARK
MASTER PLAN

THANK YOU

parks.smcgov.org/quarry-park

QUARRY PARK
MASTER PLAN

Input Boards From Meeting #4



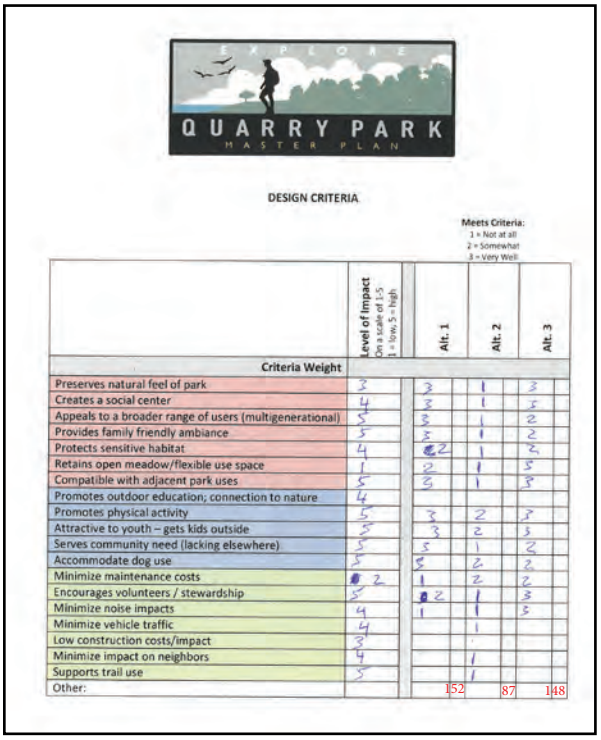
EXPLORE
QUARRY PARK
MASTER PLAN

DESIGN CRITERIA

Meets Criteria:
1 = Not at all
2 = Somewhat
3 = Very Well

Criteria Weight	Level of Impact On a scale of 1-5 1 = low, 5 = high	Alt. 1	Alt. 2	Alt. 3
Preserves natural feel of park	4	2 8	3 12	2 8
Creates a social center	4	3 12	2 8	3 12
Appeals to a broader range of users (multigenerational)	5	3 15	3 15	3 15
Provides family friendly ambiance	5	3 15	2 10	3 15
Protects sensitive habitat	5	2 10	1 5	2 10
Retains open meadow/flexible use space	4	1 4	2 8	2 8
Compatible with adjacent park uses	1	2 2	2 2	2 2
Promotes outdoor education; connection to nature	1	2 2	4 4	1 1
Promotes physical activity	2	3 6	3 6	2 4
Attractive to youth – gets kids outside	4	3 12	3 12	3 12
Serves community need (lacking elsewhere)	3	3 9	3 9	3 9
Accommodate dog use	4	3 12	2 8	2 8
Minimize maintenance costs	2	1 2	1 2	1 2
Encourages volunteers / stewardship	3	2 6	2 6	2 6
Minimize noise impacts	2	2 4	2 4	2 4
Minimize vehicle traffic	3	1 3	1 3	2 6
Low construction costs/impact	2	1 2	1 2	2 4
Minimize impact on neighbors	4	2 8	1 4	2 8
Supports trail use	5	3 15	3 15	3 15
Other:				

149 122 132

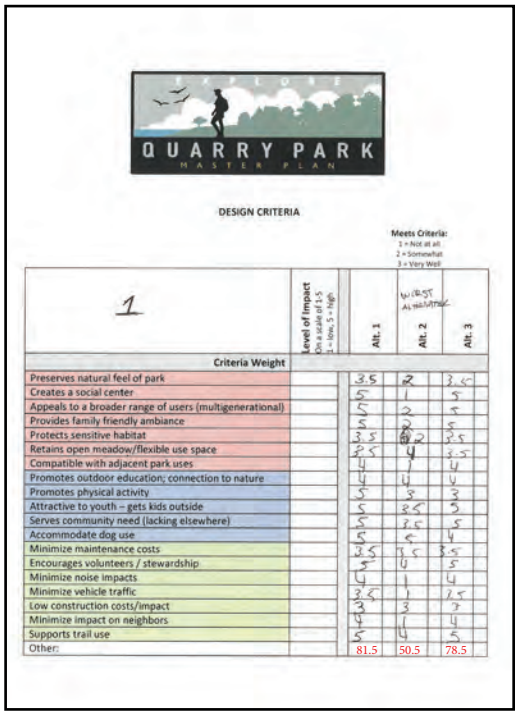


EXPLORE
QUARRY PARK
MASTER PLAN

DESIGN CRITERIA

Meets Criteria:
1 = Not at all
2 = Somewhat
3 = Very Well

Criteria Weight	Level of Impact On a scale of 1-5 1 = low, 5 = high	Alt. 1	Alt. 2	Alt. 3
Preserves natural feel of park	3	3	1	3
Creates a social center	4	3	1	1
Appeals to a broader range of users (multigenerational)	5	3	1	2
Provides family friendly ambiance	5	3	1	2
Protects sensitive habitat	4	2	1	2
Retains open meadow/flexible use space	1	2	1	3
Compatible with adjacent park uses	5	3	1	3
Promotes outdoor education; connection to nature	4			
Promotes physical activity	5	3	2	3
Attractive to youth – gets kids outside	5	3	2	3
Serves community need (lacking elsewhere)	5	3	1	2
Accommodate dog use	5	3	2	2
Minimize maintenance costs	2	1	2	2
Encourages volunteers / stewardship	5	2	1	3
Minimize noise impacts	4	1	1	3
Minimize vehicle traffic	4		1	
Low construction costs/impact	3			
Minimize impact on neighbors	4		1	
Supports trail use	5		1	
Other:		152	87	148



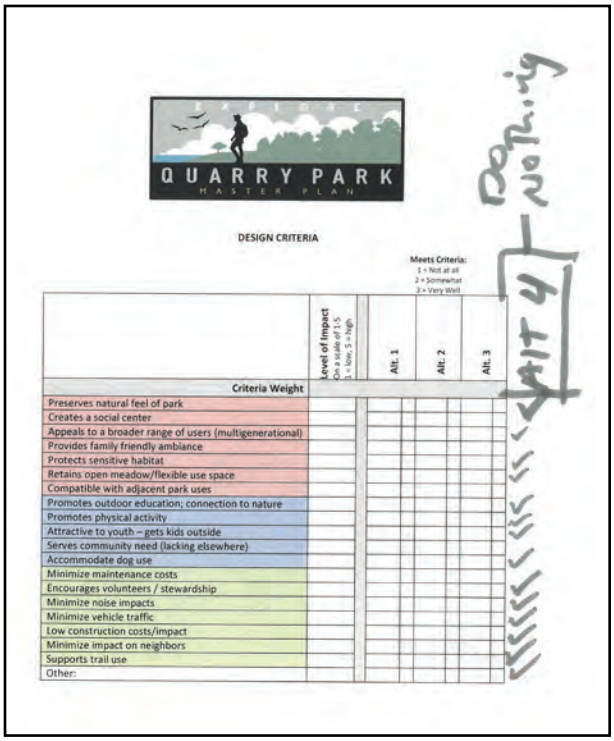
EXPLORE
QUARRY PARK
MASTER PLAN

DESIGN CRITERIA

Meets Criteria:
1 = Not at all
2 = Somewhat
3 = Very Well

1

Criteria Weight	Level of Impact On a scale of 1-5 1 = low, 5 = high	Alt. 1	Alt. 2	Alt. 3
Preserves natural feel of park		3.5	2	3.5
Creates a social center		5	1	5
Appeals to a broader range of users (multigenerational)		5	2	5
Provides family friendly ambiance		5	2	5
Protects sensitive habitat		3.5	2	3.5
Retains open meadow/flexible use space		3.5	4	3.5
Compatible with adjacent park uses		4	4	4
Promotes outdoor education; connection to nature		4	4	4
Promotes physical activity		5	3	3
Attractive to youth – gets kids outside		5	3.5	3
Serves community need (lacking elsewhere)		5	3.5	5
Accommodate dog use		5	4	4
Minimize maintenance costs		3.5	3.5	3.5
Encourages volunteers / stewardship		5	4	5
Minimize noise impacts		4	1	4
Minimize vehicle traffic		3.5	1	1.5
Low construction costs/impact		3	3	3
Minimize impact on neighbors		4	1	4
Supports trail use		5	4	5
Other:		81.5	50.5	78.5



EXPLORE
QUARRY PARK
MASTER PLAN

DESIGN CRITERIA

Meets Criteria:
1 = Not at all
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3 = Very Well

Criteria Weight	Level of Impact On a scale of 1-5 1 = low, 5 = high	Alt. 1	Alt. 2	Alt. 3
Preserves natural feel of park				
Creates a social center				
Appeals to a broader range of users (multigenerational)				
Provides family friendly ambiance				
Protects sensitive habitat				
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Promotes outdoor education; connection to nature				
Promotes physical activity				
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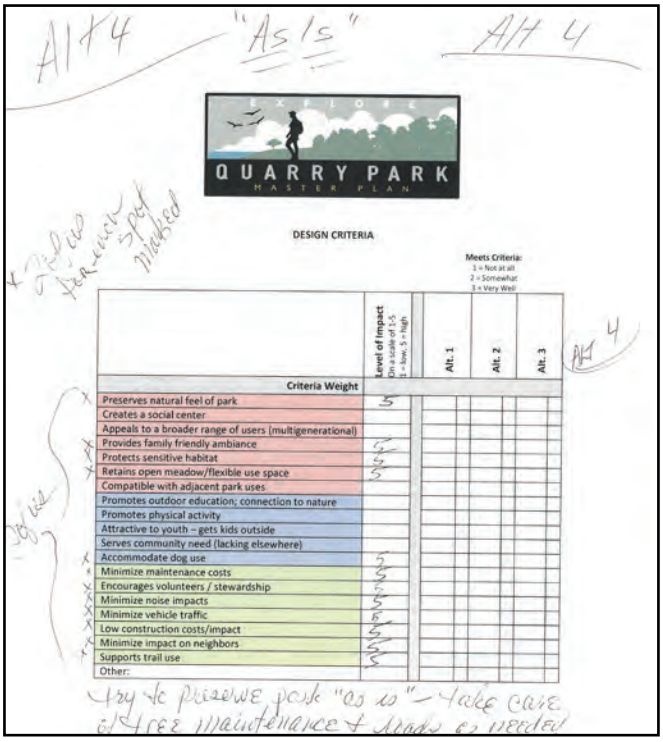
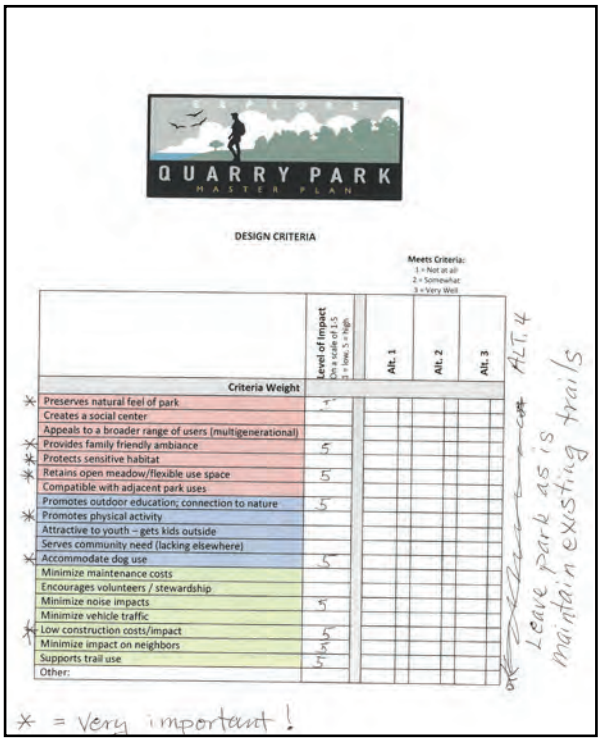
Accommodate dog use				
Minimize maintenance costs				
Encourages volunteers / stewardship				
Minimize noise impacts				
Minimize vehicle traffic				
Low construction costs/impact				
Minimize impact on neighbors				
Supports trail use				
Other:				

Input Boards From Meeting #4





Group Presentation Notes From Meeting #4

TABLE 1

ALT #1 - GOLF NOT MAX. → EXTEND DOWN AROUND BEND

LIKES: | AREA LOCATION - FAMILIES
· BATHROOM, ETC.

· ADD CHILDREN RECREATION IN SMALL % OF LAND IN AREA

TABLE 2

- NO ALT. #2 !

ALT #1

- REVISE LAYOUT OF
PUMP TRACK + DOG GOOD
↓
MOVE BACK TOWARD POND AREA

- DISC GOLF - POISON OAK IS A CONCERN (maintanance!)

- KEEP + IMPROVED PLAY AREA
- climbing area. zip line, higher tree house

Group Presentation Notes From Meeting #4

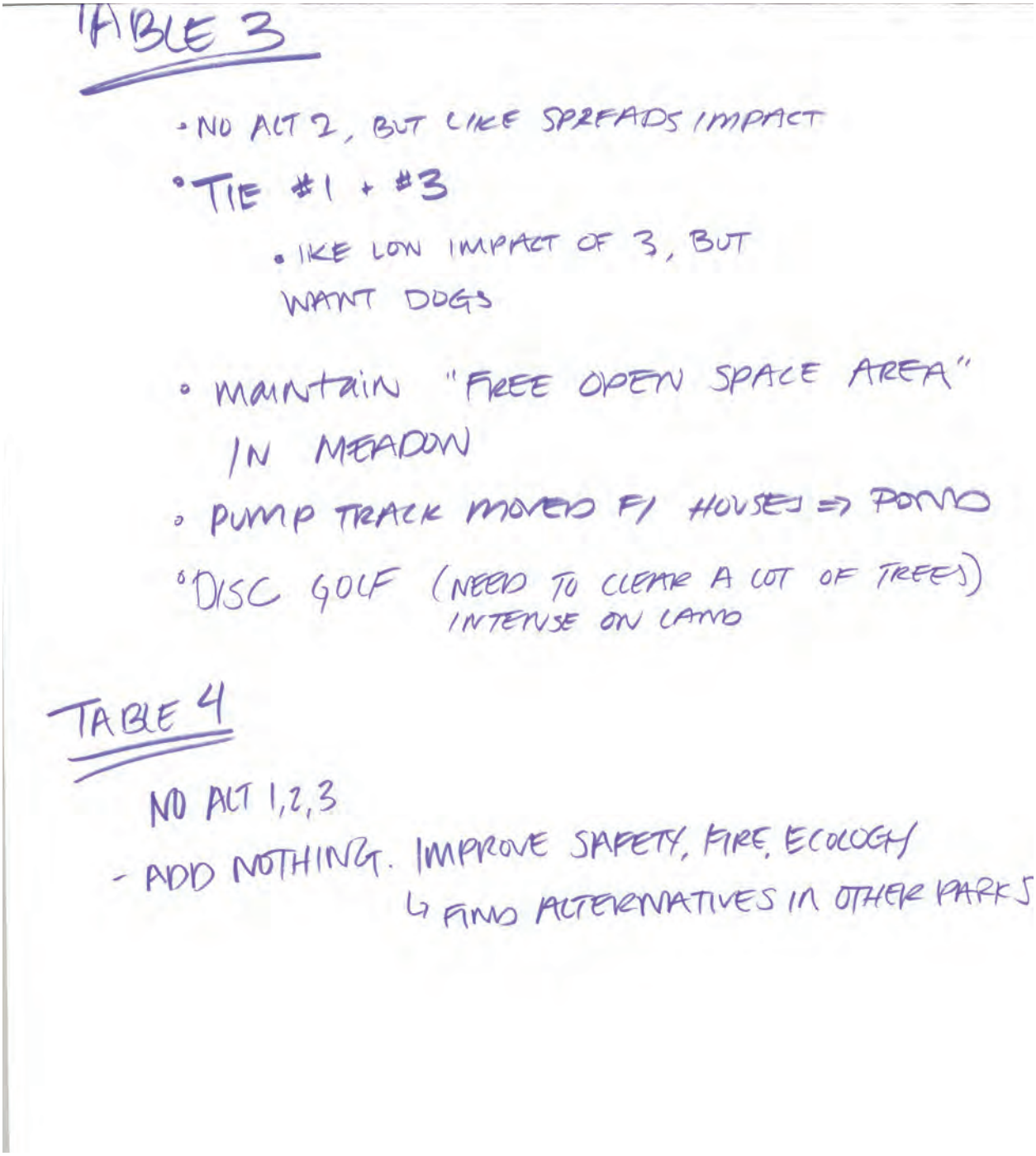


TABLE 3

- NO ALT 2, BUT LIKE SPREADS IMPACT
- TIE #1 + #3
  - IKE LOW IMPACT OF 3, BUT WANT DOGS
- MAINTAIN "FREE OPEN SPACE AREA" IN MEADOW
- PUMP TRACK MOVED F/ HOUSES ⇒ PONDO
- DISC GOLF (NEED TO CLEAR A LOT OF TREES) INTENSE ON LAND

TABLE 4

NO ALT 1,2,3

- ADD NOTHING. IMPROVE SAFETY, FIRE, ECOLOGY
  ↳ FIND ALTERNATIVES IN OTHER PARKS

Group Presentation Notes From Meeting #4

TABLE 5

- LIKE ALT #1 o ALL PEOPLE TOGETHER

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COMMUNITY MEETING 5

QUARRY PARK
MASTER PLAN

Presentation Slides From Meeting #5

COMMUNITY MEETING #5

April 24, 2018

INTRODUCTION

THE MASTER PLAN TEAM

San Mateo County Parks

- Gates + Associates
  (Park & Recreation Planning/Landscape Architecture)
- WRA Environmental Consultants
  (Biological Resources Assessment)
- Pacific Watershed Associates
  (Erosion Inventory and Assessment)

QUARRY PARK
MASTER PLAN

Presentation Slides From Meeting #5

MEETING OVERVIEW

TODAY'S AGENDA

1. Project Update
2. General Questions & Comments
3. Break-Out Review and Comments on Preliminary Recommendations
4. Next Steps - Comments will be recorded and considered for incorporation into the Draft Master Plan. Comments will be provided to San Mateo County Parks and Recreation Committee at their review of the Plan.

QUARRY PARK
MASTER PLAN

PROJECT UPDATE

SCOPE OF MASTER PLAN DOCUMENT

Existing Conditions Assessment
- Biological Assessment
- Sediment Source Reduction Plan
- Existing Uses

Community Outreach Process/Input

Preferred Plan
- Park Uses and Amenities
- Trail Plan
- Signage and Interpretive Opportunities
- Resource Management Plan
- Park Management Plan

Implementation and Phasing

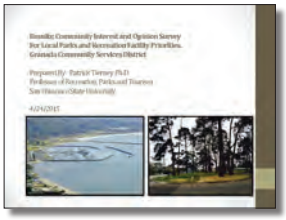
QUARRY PARK
MASTER PLAN

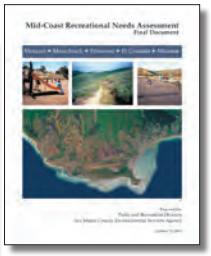
Presentation Slides From Meeting #5

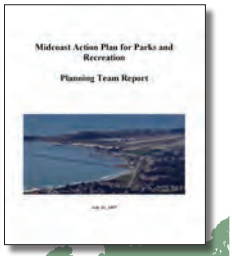
PROJECT UPDATE

EFFORTS TO DATE

Mid-Coast Recreational Needs Assessment (2002)
Midcoast Park Action Plan (2007)
Granada Community Services District Survey (2016)
County Parks Visitor Survey (2016)







Consistent Priorities

- Hiking
- Dog Walking
- Biking
- Picnic
- Playgrounds

QUARRY PARK
MASTER PLAN

PROJECT UPDATE

PARALLEL TRAIL

Parallel Trail will be in Caltrans R.O.W., managed by County

QUARRY PARK
MASTER PLAN

Presentation Slides From Meeting #5

PROJECT UPDATE

COMMUNITY MEETING #1:
What Recreational Features Do We Want?

COMMUNITY MEETING #2:
What Features are Our Priorities?

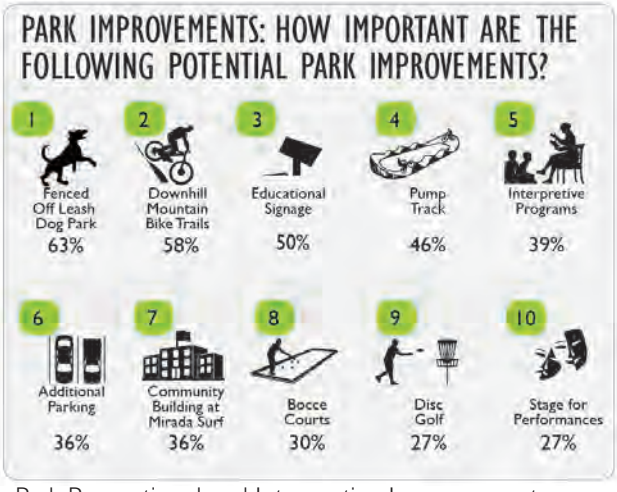
PRIORITY MATRIX

	PARK ACTIVITY	VERY IMPORTANT	SOME WHAT IMPORTANT	NOT IMPORTANT	RANKING
Fenced Off Leash Dog Park		15			2
Pump Track		20			1
Additional Parking		11			3
Bocce Courts		5	7		5
Disc Golf		8			4
Pickleball		12		7	6
Other	Horse shoes Stage Area Horse Access Signage/Wetland Restoration	8 8 7 7			

QUARRY PARK
MASTER PLAN

PROJECT UPDATE

ONLINE SURVEY RESULTS



TOTAL # OF ONLINE SURVEY PARTICIPANTS: 235

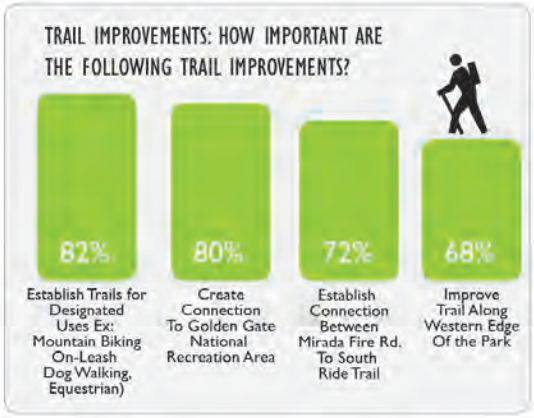
Park Recreational and Interpretive Improvements

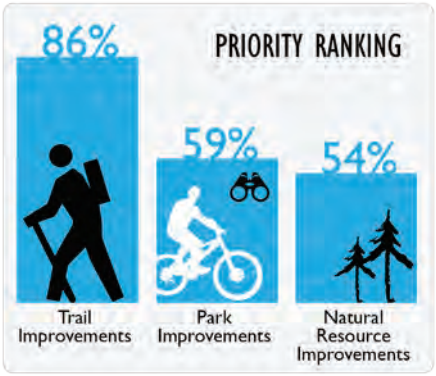
QUARRY PARK
MASTER PLAN

Presentation Slides From Meeting #5

PROJECT UPDATE

ONLINE SURVEY RESULTS





QUARRY PARK
MASTER PLAN

PROJECT UPDATE

COMMUNITY MEETING #3:
On Site Review

COMMUNITY MEETING #4:
Preferred Alternative

QUARRY PARK
MASTER PLAN

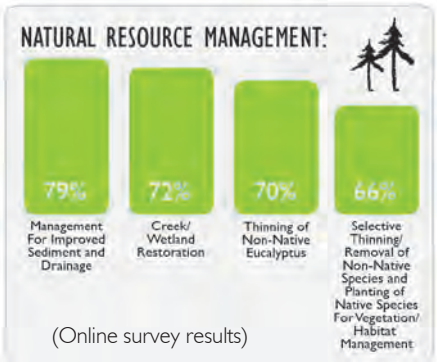
Presentation Slides From Meeting #5

RECOMMENDATIONS

NATURAL RESOURCE MANAGEMENT

Quarry Park Overlook

Pond



» Relocate Overlook

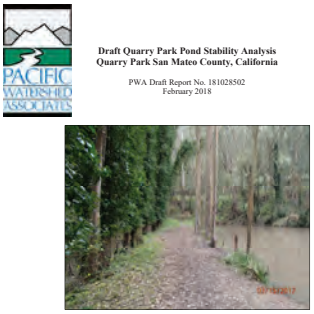
» Retain existing dam and pond, per PWA Study

- Drainage functions
- Program opportunities (rest area, educational signage)

QUARRY PARK
MASTER PLAN

RECOMMENDATIONS

DAM AND POND



Draft Quarry Park Pond Stability Analysis
Quarry Park San Mateo County, California

PWA Draft Report No. 181028502
February 2018

Prepared for:
Gail Donaldson, Associate Principal
Gates & Associates
2671 Crow Canyon Road, San Ramon, CA 94583

Sam Herzberg, Senior Planner
San Mateo County Parks Department
455 County Center, Redwood City, CA 94063

Prepared by:
Brad Job, California Registered Civil Engineer #C55699
Tara Zuroweste, Senior Geologist, PG # 8418
Clay Allison, Project Geologist
Danny Hagans, Principal Earth Scientist
Pacific Watershed Associates Inc.
P.O. Box 2070, Petaluma, CA 94953
bradj@pacificwatershed.com / (707) 773-1385

» Dam and pond assessment completed

» Dam is stable and pond can be retained

- Inspect and maintain pond drains
- Install culvert spillway and emergency spillway
- Remove large trees growing on the embankment (keep stumps)
- Inspect features annually

QUARRY PARK
MASTER PLAN

Presentation Slides From Meeting #5

RECOMMENDATIONS

NATURAL RESOURCE MANAGEMENT

Erosion repair example

Stream restoration example

Area of concern example - bluff erosion

» Priorities

- Repair culverts and other erosion causing features
- Restore stream
- Specific areas of concern

QUARRY PARK
MASTER PLAN

RECOMMENDATIONS

NATURAL RESOURCE MANAGEMENT: AREAS OF CONCERN

- Protect high quality habitat
- Transition a gallery forest
- Shaded fuel breaks along roads

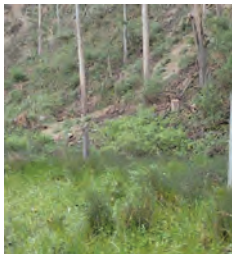
QUARRY PARK
MASTER PLAN

Presentation Slides From Meeting #5

RECOMMENDATIONS

HABITAT MANAGEMENT

Northern Coastal Scrub



Potential seasonal wetland

» Preserve/enhance/expand northern coastal scrub areas on edges of site

» Pursue enhancement opportunities that synergize with other repairs or improvements

- Example: Stream restoration where erosion repair needed
- Example: Remove invasives when transitioning to gallery forest

QUARRY PARK
MASTER PLAN

RECOMMENDATIONS

HABITAT MANAGEMENT

California Mouse

Burrowing Owl

Long-Tailed Weasel

San Francisco Dusky Footed Wood Rat

» Preserve and protect species found in the park

QUARRY PARK
MASTER PLAN

Presentation Slides From Meeting #5

RECOMMENDATIONS

FIRE MANAGEMENT

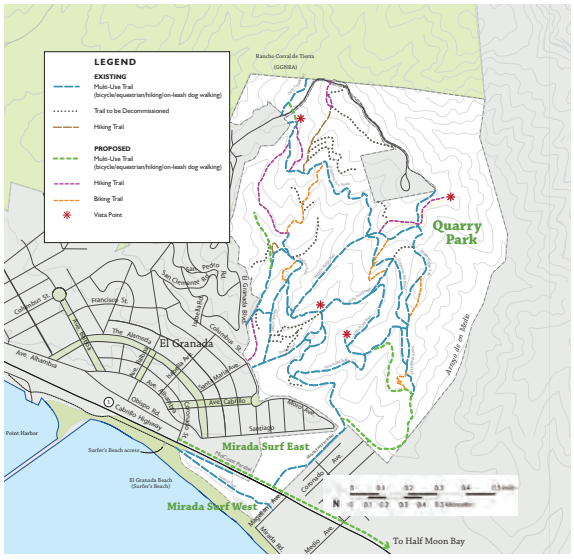
» Thin eucalyptus to reduce fire risk, create shaded breaks along trails

» Maintain existing fire buffers on north and south sides of the park

QUARRY PARK
MASTER PLAN

RECOMMENDATIONS: TRAILS

INTEGRATED TRAIL SYSTEM



» Provide networks for maintenance, fire management and safety

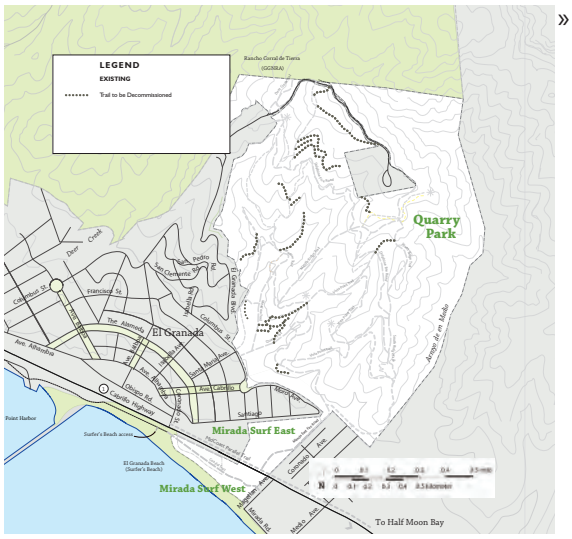
» Provide informative trail signage system

QUARRY PARK
MASTER PLAN

Presentation Slides From Meeting #5

RECOMMENDATIONS: TRAILS

DECOMMISSION TRAILS



» Decommission non-essential problem trails

QUARRY PARK
MASTER PLAN

RECOMMENDATIONS: TRAILS

MULTI-USE TRAILS

» Provide networks for maintenance, fire management and safety

» Designate on leash trails

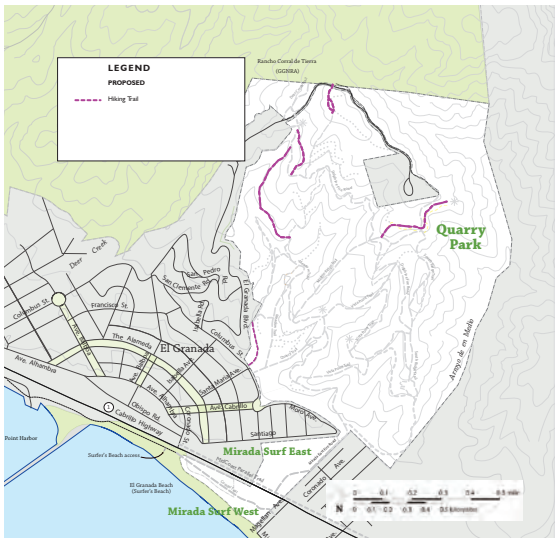
- New dog management policies were approved by the San Mateo County Parks and Recreation Commission
- New County ordinance is being developed
- Quarry Park grandfathers in limited dog access

QUARRY PARK
MASTER PLAN

Presentation Slides From Meeting #5

RECOMMENDATIONS: TRAILS

HIKING ONLY TRAILS

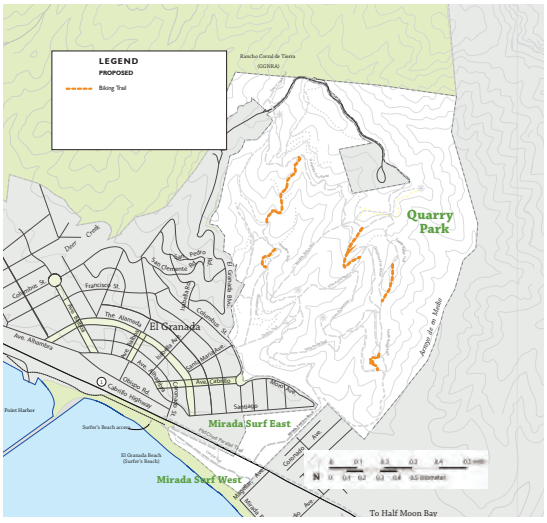


» Future signage will designate trail use

QUARRY PARK
MASTER PLAN

RECOMMENDATIONS: TRAILS

MOUNTAIN BIKE ONLY TRAILS



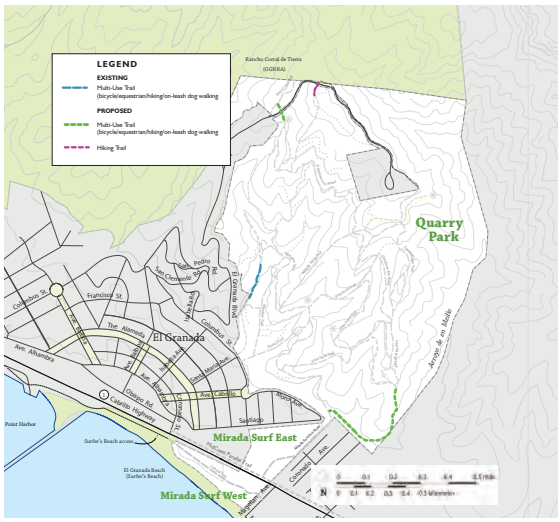
» Restricted use, clear signage
» Limited to existing established trails

QUARRY PARK
MASTER PLAN

Presentation Slides From Meeting #5

RECOMMENDATIONS: TRAILS

CONNECTIONS



» Recommended connections to GGNRA

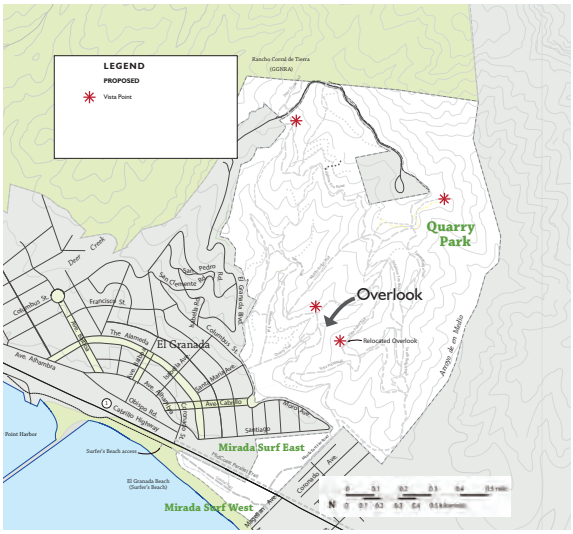
» Connection between South Ridge Trail and Mirada Surf East to create loop

» Access from end of El Granada Blvd.

QUARRY PARK
MASTER PLAN

RECOMMENDATIONS: TRAILS

VISTA POINTS



» Move existing overlook for safety reasons

- Could be enhanced for future weddings and special events

» Create new vista points with benches and signage

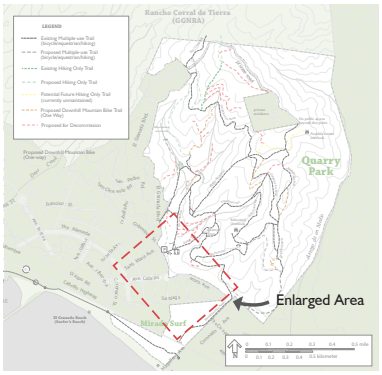
» Open up views to the ocean where possible

QUARRY PARK
MASTER PLAN

Presentation Slides From Meeting #5

PREFERRED PLAN

ENTRY AREA



Key Map

QUARRY PARK
MASTER PLAN

PREFERRED PLAN

EXPANDED PLAY AND PICNIC AREAS

- Reservable picnic area
- More play structures
- More space

QUARRY PARK
MASTER PLAN

Presentation Slides From Meeting #5

PREFERRED PLAN

COMMUNITY GARDEN

» Formalize community garden process

» Consider additional garden location

QUARRY PARK
MASTER PLAN

RECOMMENDATIONS

QUARRY FLOOR

» Create amphitheater / reservable event space

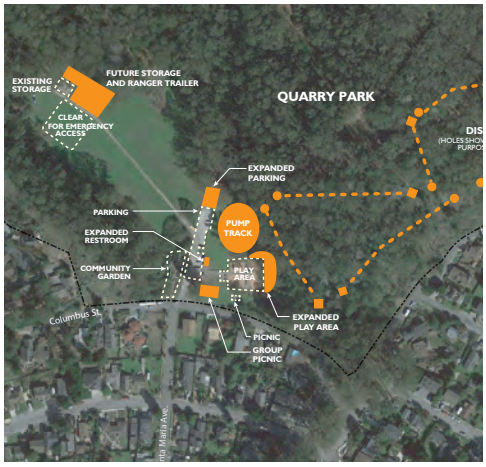
- Use fallen eucalyptus and/or other material for seating

QUARRY PARK
MASTER PLAN

Presentation Slides From Meeting #5

PREFERRED PLAN

PUMP TRACK



» Explore partnership with Granada Community Services District

QUARRY PARK
MASTER PLAN

PREFERRED PLAN

DISC GOLF

» Further evaluation needed

» Explore partnership opportunities

QUARRY PARK
MASTER PLAN

Presentation Slides From Meeting #5

PREFERRED PLAN

INFRASTRUCTURE

Existing storage pad: expand for additional park storage and administration

Address drainage to the street

QUARRY PARK
MASTER PLAN

PROJECT UPDATE

PROJECT SCHEDULE

MAY 16 — Project Background

→ **JULY 25** — Alternatives Review & Feedback

→ **SEPT. 23** — Onsite Trail & Alternatives Review

→ **OCT. 3** — Present Preferred Plan

→ **APRIL 24** — Community Workshop #5

ON-LINE SURVEY
JUNE 12, 2017 - JULY 18, 2017

JUNE 15 — Draft Master Plan available for Public Review

→ **AUG. 2** — Presentation to County Parks & Recreation Commission

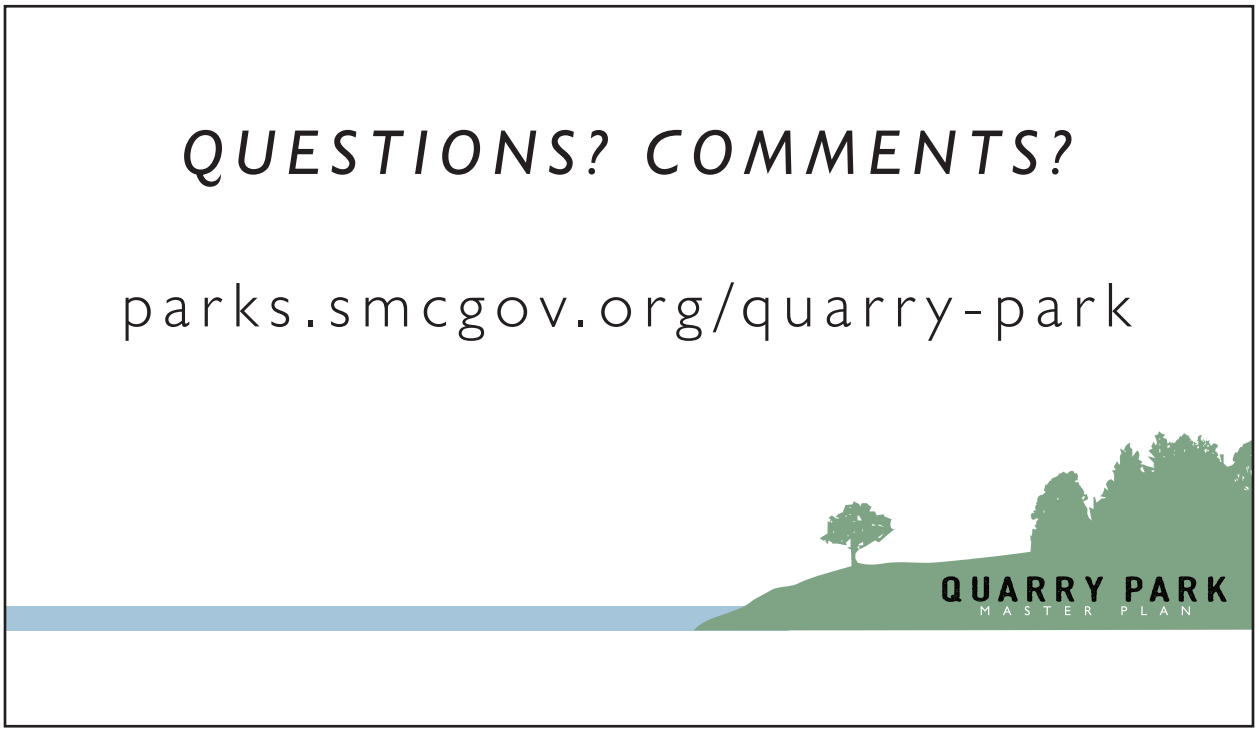
Location:
San Mateo County
Board of Supervisors Chambers
400 County Center
Redwood City, CA
4:00PM - 6:00PM

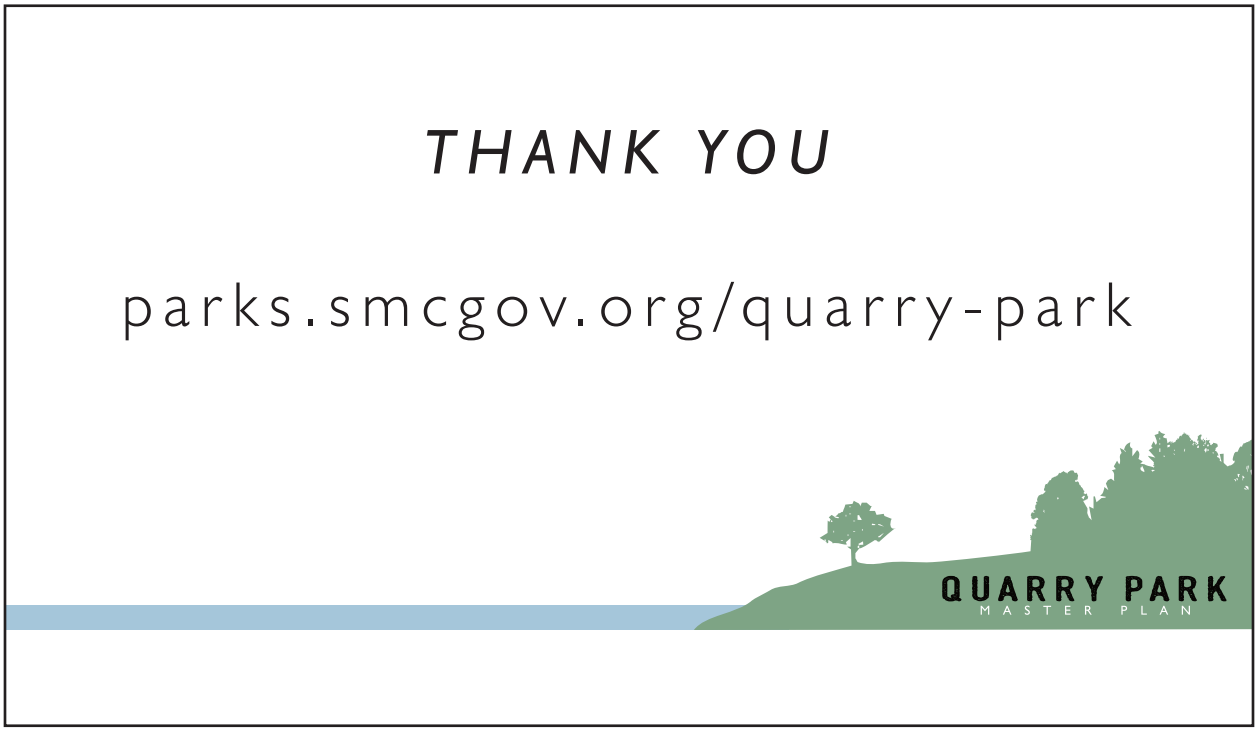
Draft Master Plan will be posted to County Park web page

Check web site for updates
parks.smcgov.org/quarry-park

QUARRY PARK
MASTER PLAN

Presentation Slides From Meeting #5





Input Boards From Meeting #5

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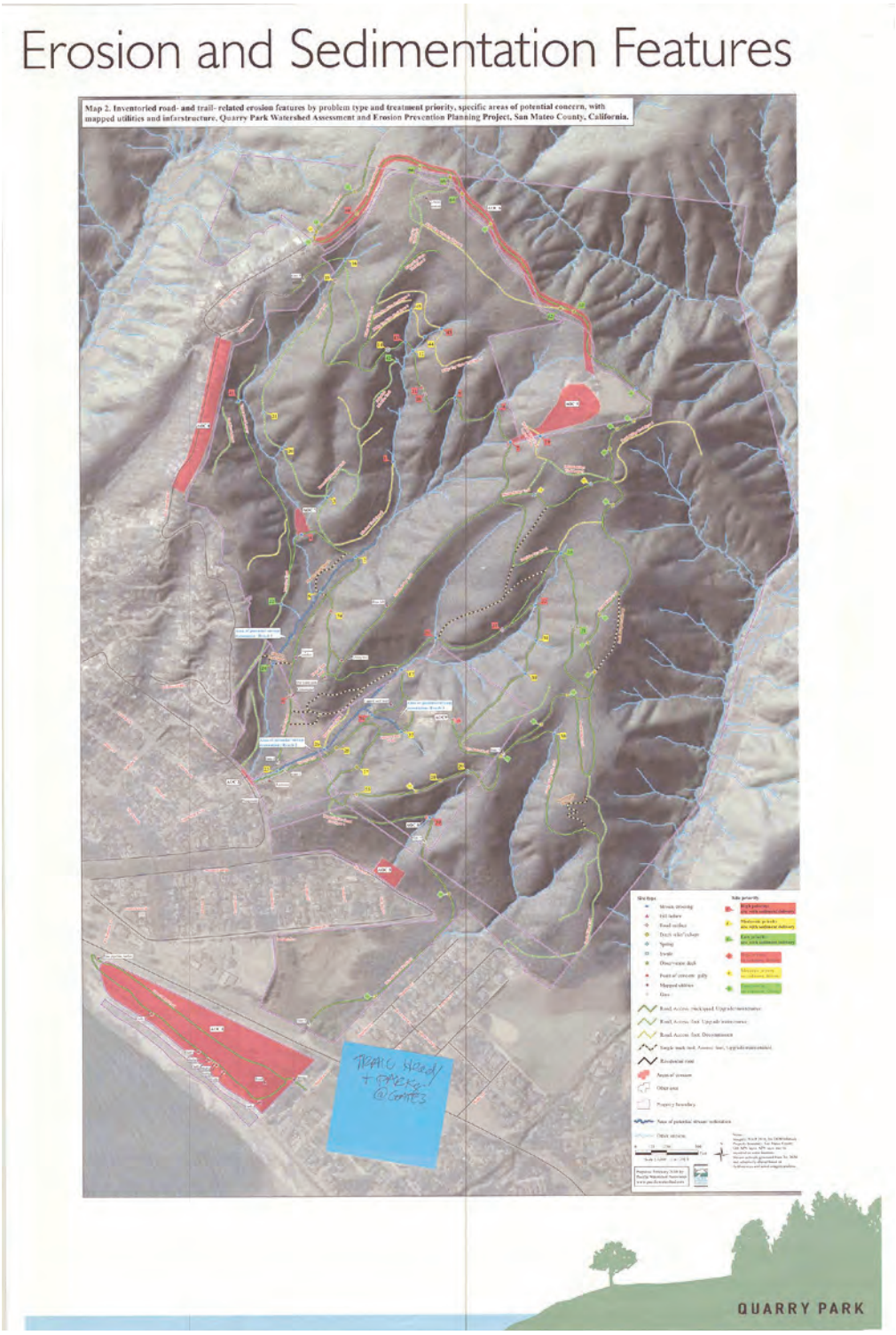


Input Boards From Meeting #5

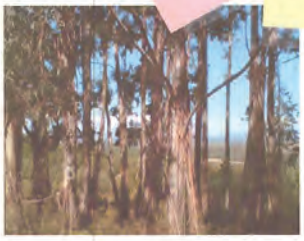
Resource and Fire Managment - Recommendations

HABITAT PROTECTION AND MANAGEMENT

- Protect and maintain high quality habitat such as northern coastal scrub and coastal prairie.
- Prioritize potential enhancement opportunities that synergize with other repairs or improvements.
- Engage in stream restoration.
- In restoration areas, chip and mulch removed eucalyptus trees on site to suppress non-native seed growth.
- Retain dam and pond.

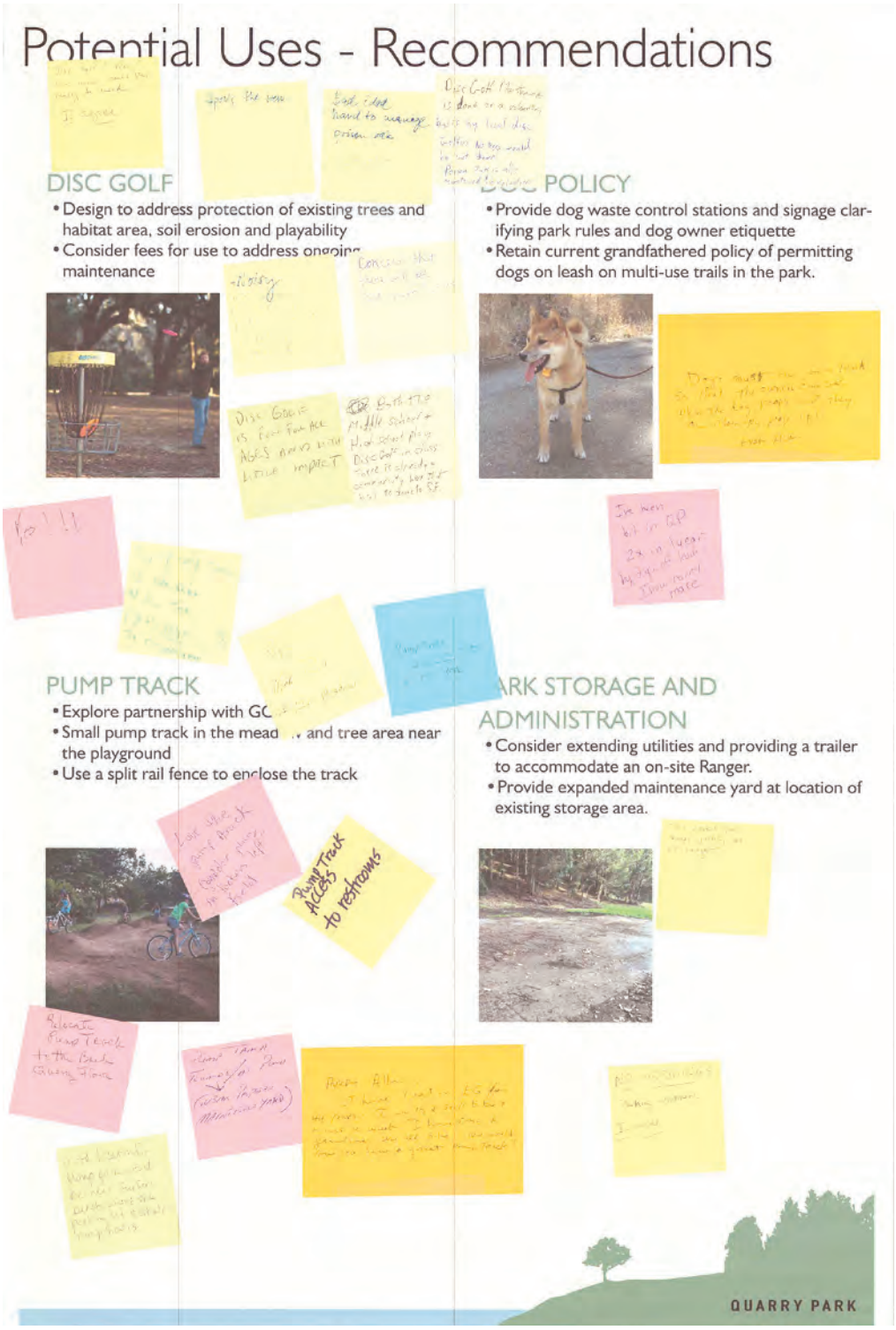
FIRE MANAGEMENT

- Create shaded fuel breaks along the roads by thinning smaller trees and ladder fuels.
- Thin trees to create a more open canopy and to reduce potential for tree to tree fire transmission.
- Protect habitat areas such as northern coastal scrub and coastal prairie, which are less prone to fire.

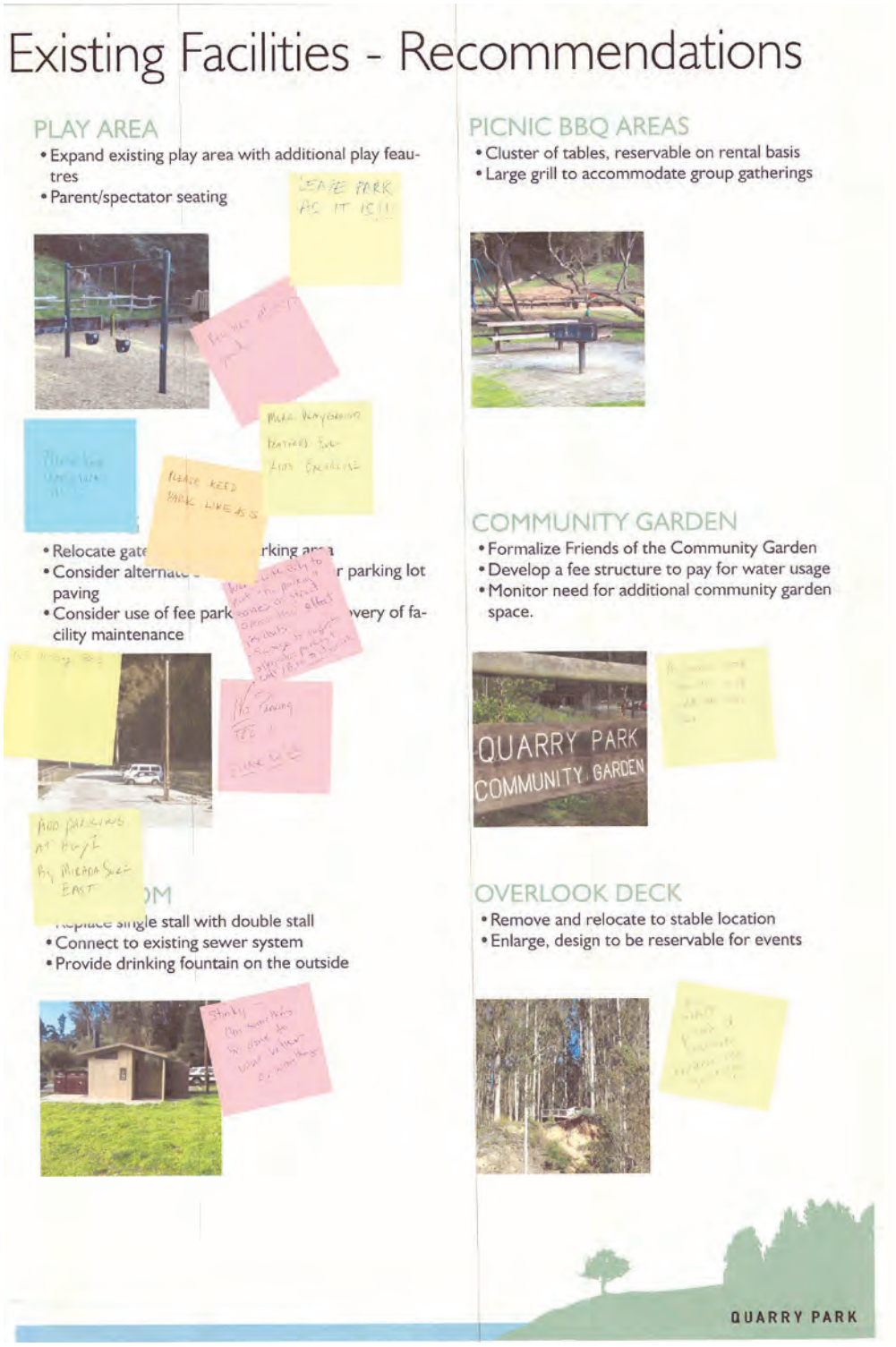


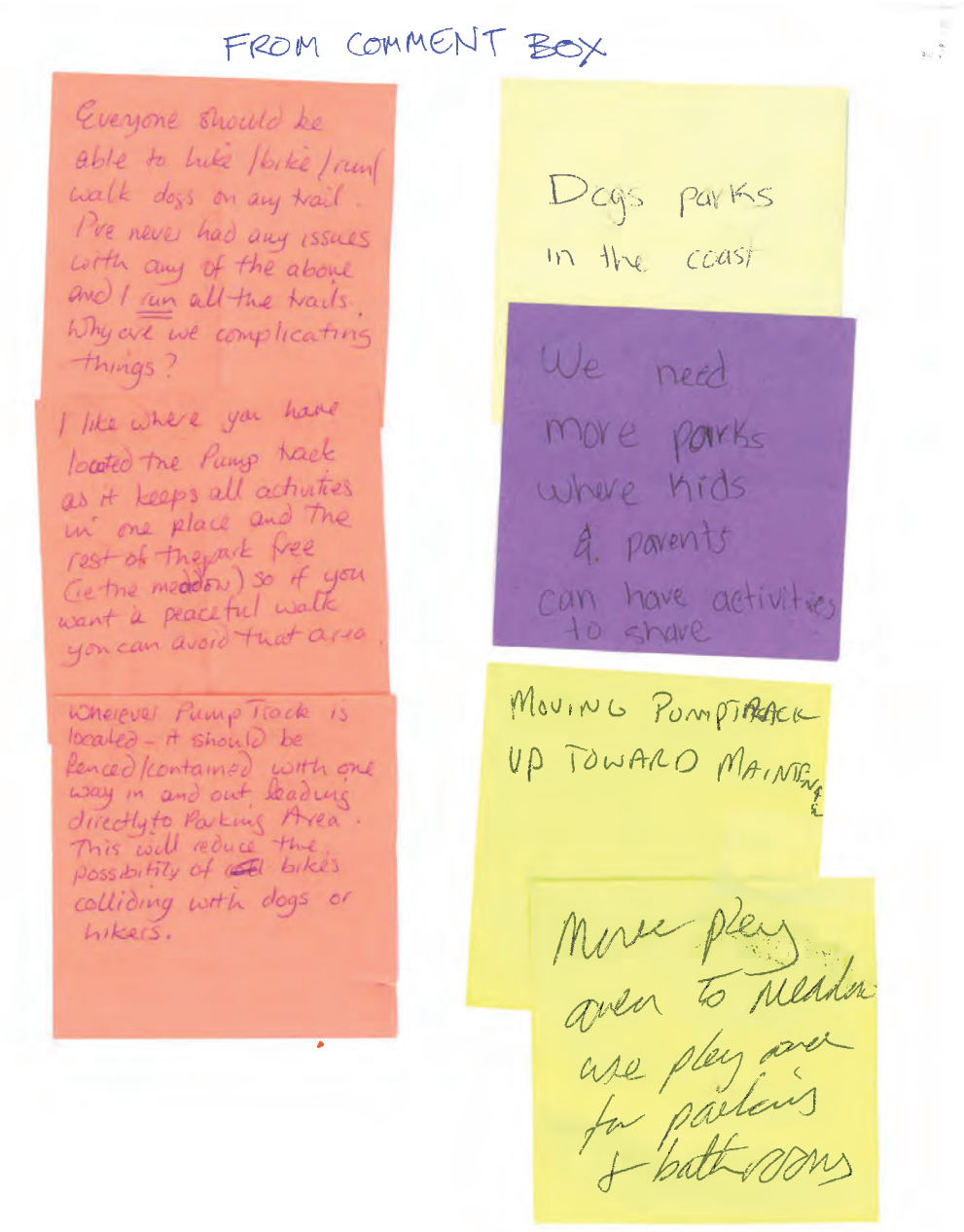
QUARRY PARK

Input Boards From Meeting #5

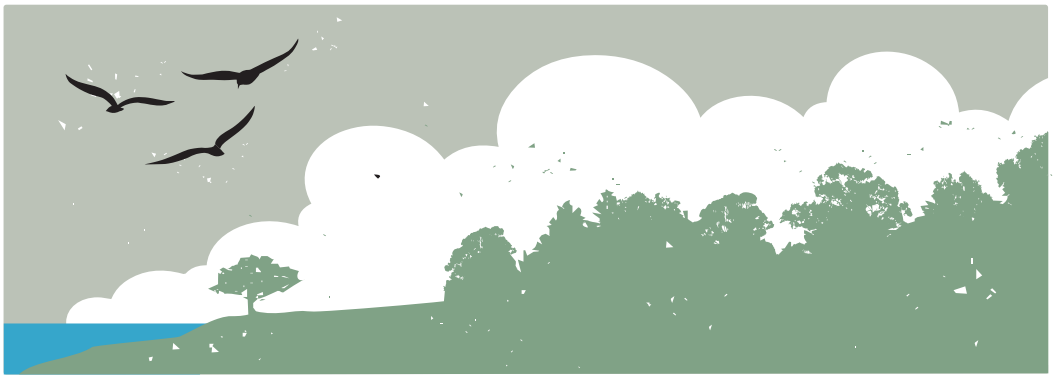


Input Boards From Meeting #5




FROM COMMENT BOX
Everyone should be able to hike / bike / run / walk dogs on any trail. I've never had any issues with any of the above and I run all the trails. Why are we complicating things?
I like where you have located the Pump track as it keeps all activities in one place and the rest of the park free (ie the meadow) so if you want a peaceful walk you can avoid that area.
Wherever Pump Track is located - it should be fenced / contained with one way in and out leading directly to Parking Area. This will reduce the possibility of bikes colliding with dogs or hikers.
Dogs parks in the coast
We need more parks where kids & parents can have activities to share
MOVING PUMPTRACK UP TOWARD MAIN
More play area to Meadow use play area for parking + bathrooms

APPENDIX E.1 ONLINE SURVEY



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Quarry Park Master Plan Survey, June 2017

Q1 Please the provide the zip code of your residence.

Answered: 194 Skipped: 0

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5	94037	7/7/2017 1:55 PM
6	94018	7/6/2017 2:41 PM
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8	94041	7/5/2017 1:30 PM
9	94019	7/5/2017 10:13 AM
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Quarry Park Master Plan Survey, June 2017

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Quarry Park Master Plan Survey, June 2017

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Quarry Park Master Plan Survey, June 2017

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Quarry Park Master Plan Survey, June 2017

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164	95030	6/22/2017 9:21 AM
165	94018	6/22/2017 9:10 AM
166	94018	6/22/2017 8:38 AM
167	94044	6/22/2017 8:28 AM
168	94018	6/22/2017 8:07 AM
169	94018	6/22/2017 7:35 AM
170	94018	6/22/2017 7:11 AM
171	94018	6/22/2017 1:25 AM
172	94019	6/21/2017 11:59 PM
173	94040	6/21/2017 10:46 PM
174	94018	6/21/2017 10:20 PM
175	94019	6/21/2017 9:40 PM
176	94044	6/21/2017 8:26 PM
177	94019	6/21/2017 8:24 PM
178	94044	6/21/2017 8:23 PM
179	94061	6/21/2017 8:13 PM
180	94002	6/21/2017 8:02 PM
181	94019	6/21/2017 7:39 PM
182	94018	6/21/2017 7:15 PM
183	94018	6/21/2017 7:07 PM
184	94019	6/21/2017 7:00 PM
185	94018	6/21/2017 6:58 PM
186	94018	6/21/2017 6:23 PM
187	94019	6/21/2017 6:16 PM
188	94018	6/21/2017 6:11 PM
189	94018	6/21/2017 6:08 PM
190	94018	6/21/2017 6:08 PM
191	94019	6/21/2017 6:08 PM
192	94044	6/21/2017 6:04 PM
193	94019	6/21/2017 6:04 PM
194	94062	6/21/2017 6:02 PM

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Q2 Please indicate your age from the options below.

Answered: 190 Skipped: 4

Answer Choices	Responses	
Under 21 years	1.05%	2
21 - 44 years	37.37%	71
45 - 65 years	50.00%	95
65+ years	11.58%	22
Total		190

Quarry Park Master Plan Survey, June 2017

Q3 When you visit Quarry Park or Mirada Surf, are you typically ...

Answered: 194 Skipped: 0

Answer Choices	Responses	
alone	**17.01%**	33
with children	**15.98%**	31
with other adults	**27.32%**	53
Other (please describe)	**39.69%**	77
Total		**194**

#	Other (please describe)	Date
1	All of the above	7/7/2017 6:06 PM
2	And my dogs	7/3/2017 4:35 PM
3	With my dogs and sometimes other adults	6/30/2017 7:07 PM
4	all of the above	6/30/2017 8:53 AM
5	alone or with a friend, but always with my dog (and possibly theirs)	6/28/2017 12:25 PM
6	Walking my dogs	6/26/2017 6:55 PM
7	I am with my dogs	6/26/2017 3:33 PM
8	with my dog	6/26/2017 1:53 AM
9	with dog	6/25/2017 2:23 PM
10	with my dog	6/25/2017 1:21 PM
11	dog walker	6/25/2017 9:41 AM
12	with a dog	6/25/2017 7:53 AM

Quarry Park Master Plan Survey, June 2017

13	with my dogs	6/24/2017 6:34 PM
14	with dog	6/24/2017 10:55 AM
15	Dogs	6/24/2017 9:39 AM
16	Walking/hiking with my dog	6/24/2017 9:12 AM
17	With children and my dog	6/23/2017 10:57 PM
18	with my dogs	6/23/2017 3:41 PM
19	all three in pretty equal amounts.	6/23/2017 1:48 PM
20	I ride my bike and walk with my dog and friends	6/23/2017 1:24 PM
21	With my dogs.	6/23/2017 12:40 PM
22	with friends, family an our dogs	6/23/2017 12:28 PM
23	With my dogs	6/23/2017 11:48 AM
24	with dogs	6/23/2017 11:46 AM
25	I	6/23/2017 11:44 AM
26	with other adults and dogs	6/23/2017 11:38 AM
27	With my dog!	6/23/2017 11:14 AM
28	Walking family dog with children	6/23/2017 10:48 AM
29	I like to bike or walk with wife, child, dogs	6/23/2017 10:28 AM
30	with my dog	6/23/2017 10:24 AM
31	Dogs and adults	6/23/2017 9:27 AM
32	W/Dogs	6/23/2017 2:04 AM
33	adults + dog	6/22/2017 6:31 PM
34	With my dog and (sometimes) other adults with their dogs.	6/22/2017 6:14 PM
35	Walking my dogs, sometimes with other adults	6/22/2017 5:25 PM
36	with a dog.	6/22/2017 4:45 PM
37	With dog and other adult	6/22/2017 3:44 PM
38	With my neighbor and our dogs	6/22/2017 2:46 PM
39	Dog	6/22/2017 2:17 PM
40	With dogs	6/22/2017 1:59 PM
41	Walking my dogs	6/22/2017 1:58 PM
42	with my dogs	6/22/2017 1:42 PM
43	my dog and many times with a friend who brings their dog.	6/22/2017 1:29 PM
44	With my dog	6/22/2017 1:16 PM
45	With dogs	6/22/2017 1:09 PM
46	with dogs and family	6/22/2017 1:05 PM
47	walking dog	6/22/2017 1:05 PM
48	With our dog	6/22/2017 1:04 PM
49	With others and our dogs	6/22/2017 1:00 PM
50	Alone and with my dog	6/22/2017 12:59 PM
51	with my dogs	6/22/2017 12:42 PM
52	I am with my dog	6/22/2017 12:28 PM
53	walk dog, prefer off leash	6/22/2017 12:08 PM

Quarry Park Master Plan Survey, June 2017

54	all of the above + my dogs	6/22/2017 12:06 PM
55	with my dog	6/22/2017 12:04 PM
56	dogs	6/22/2017 11:26 AM
57	With my two dachshunds	6/22/2017 11:25 AM
58	with friend and dogs, one each	6/22/2017 11:15 AM
59	with my dog	6/22/2017 11:08 AM
60	dog	6/22/2017 11:03 AM
61	Kids and adults	6/22/2017 10:46 AM
62	Other adults, children, and dogs	6/22/2017 10:45 AM
63	With dogs and adults	6/22/2017 10:28 AM
64	With my dog	6/22/2017 10:23 AM
65	Alone, with my dogs	6/22/2017 10:04 AM
66	With my two dogs and husband.	6/22/2017 10:02 AM
67	with dogs	6/22/2017 9:55 AM
68	with dogs	6/22/2017 9:53 AM
69	walking the dog	6/22/2017 9:47 AM
70	all of the above	6/22/2017 9:10 AM
71	50:50 alone or with other adults	6/22/2017 7:35 AM
72	with our dog.	6/21/2017 10:46 PM
73	Alone, but often with others, hiking, biking, dog walking	6/21/2017 9:40 PM
74	w dogs	6/21/2017 8:23 PM
75	All the above	6/21/2017 7:39 PM
76	I visit with children and also for personal hiking and biking	6/21/2017 7:00 PM
77	I go with my son and wife or I bike alone in the hills.	6/21/2017 6:08 PM

Quarry Park Master Plan Survey, June 2017

Q4 Park Improvements: How important are the following potential park improvements?

Answered: 190 Skipped: 4

	Very	Somewhat	Neither important nor unimportant	Somewhat unimportant	Not important	Not familiar with this	Total
Pump track	**30.05%** 55	**15.85%** 29	**13.11%** 24	**1.09%** 2	**13.66%** 25	**26.23%** 48	183
Stage for performances	**5.52%** 10	**18.23%** 33	**21.55%** 39	**8.29%** 15	**43.09%** 78	**3.31%** 6	181
Downhill mountain bike trails	**39.78%** 72	**18.23%** 33	**15.47%** 28	**3.31%** 6	**22.65%** 41	**0.55%** 1	181
Fenced, off-leash dog area	**46.96%** 85	**17.13%** 31	**13.26%** 24	**4.42%** 8	**17.68%** 32	**0.55%** 1	181
Disc golf	**7.78%** 14	**16.67%** 30	**18.89%** 34	**13.33%** 24	**40.56%** 73	**2.78%** 5	180
Bocce	**8.33%** 15	**22.22%** 40	**22.22%** 40	**11.11%** 20	**33.89%** 61	**2.22%** 4	180
Community building (at Mirada Surf East)	**6.25%** 11	**25.57%** 45	**24.43%** 43	**8.52%** 15	**30.11%** 53	**5.11%** 9	176

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Additional parking	**13.89%** 25	**31.11%** 56	**18.89%** 34	**10.56%** 19	**24.44%** 44	**1.11%** 2	180	3.04
Educational signage	**13.59%** 25	**35.33%** 65	**19.02%** 35	**8.70%** 16	**22.28%** 41	**1.09%** 2	184	2.94
Interpretive programs	**7.82%** 14	**27.93%** 50	**24.02%** 43	**9.50%** 17	**27.93%** 50	**2.79%** 5	179	3.30

#	Other (please specify)	Date
1	Please do not build any unnecessary structures (Ranger station, maintenance shed, resource booths,m etc.)	7/6/2017 2:41 PM
2	Integration and maintenance of multi-purpose trails with Wicklow property -- mountain bike, hiking, equestrian. Making single use trails would limit usefulness. Err on the side of making them multi-purpose.	7/5/2017 10:13 AM
3	on leash trail restrictions;off-leash fenced open space areas.	7/5/2017 9:24 AM
4	trail connections to GGNRA clearly marked near house at top	7/1/2017 9:57 AM
5	Dogs love walking trails too. All dogs are not "fenced, off-leash" lovers. That's what my backyard is for. An open space with trails should just be that. Why does it have to be so structured? I go here for the UNstructured part of my life.	6/30/2017 7:07 PM
6	I want to walk my dog off leash when I visit the park.	6/30/2017 8:23 AM
7	off-leash dog trails	6/29/2017 11:02 AM
8	• cross country multi-use trails connecting beyond the park • Stabilize dam & spillway • stabilize old logging roads	6/28/2017 6:25 PM
9	off-leash dog walking on trails	6/28/2017 12:25 PM
10	I want to maintain all the trails to be accessible to dog walking	6/26/2017 3:33 PM
11	Mountain biking trails (not downhill)	6/26/2017 8:56 AM
12	my primary hope is that we have opportunities for off leash walking with our dogs.	6/26/2017 1:53 AM
13	Cross-country single-track mountain bike trails!	6/25/2017 10:50 PM
14	off leash dog walking	6/25/2017 2:23 PM
15	would like to use a drone in Mirada East	6/25/2017 10:41 AM
16	like to see continued tolerance for off leash dog walking	6/25/2017 9:41 AM
17	habitat restoration	6/25/2017 8:19 AM
18	Trails designated for off leash dog walking	6/25/2017 7:53 AM
19	I walk the trails. I see kids play in the playground. I see people walk their dogs. Keep it a nice place for those activities, keep the community garden, and I'll be satisfied.	6/25/2017 7:19 AM
20	mountain biking on designated trails	6/24/2017 6:34 PM
21	Make off leash legal for well-behaved dogs	6/24/2017 10:55 AM
22	As a dog owner, I'm familiar with the need of a fenced dog area. But personally I don't use them. I and my dogs get exercise by hiking the trails. So it's important to me that the trails are open to dogs.	6/24/2017 9:12 AM
23	Please remove more poison oak along trails & hill near playground	6/23/2017 10:16 PM
24	Additionally, it would be great if there was a mountain bike specific trail (no hikers or equestrians allowed). There are hundreds, maybe even thousands of hiking only trails in the bay area, and very few mountain bike only trails. Additionally, an even dates/ odd dates trade off would be a good compromise.	6/23/2017 4:16 PM
25	Please have off leash dog trails to walk on not fenced area	6/23/2017 3:41 PM
26	Need single-track trails exclusively for walking/hiking with no bicycles or horses.	6/23/2017 2:41 PM
27	I would like to ride with my dog off leash	6/23/2017 1:24 PM
28	Off leash dog trails or at least sections that it is allowed. I have been walking dogs there since before it was a park and clearing trails of trees and limbs all along	6/23/2017 12:40 PM
29	It is VITAL to keep Quarry Park open to dogs and their responsible owners. this is an AWESOME park for hiking and for our dogs to get daily exercise	6/23/2017 12:28 PM

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30	Please keep the trails open to dogs	6/23/2017 11:48 AM
31	Off leash trails	6/23/2017 11:25 AM
32	Off leash dog walking - if our pet family members are not allowed to run free and get all the exercise they need; then dogs will have major behavioral problems the county will have to deal with.	6/23/2017 11:14 AM
33	cross country mtn bike trails	6/23/2017 8:16 AM
34	trails that allow off leash dog walking	6/22/2017 9:17 PM
35	Invasive plant species should be removed.	6/22/2017 8:14 PM
36	Off-leash dog hiking trail	6/22/2017 6:31 PM
37	I just retired, am not a silicone valley millionare, understand the coast is changning to over time, the residents are all young millionares. This will lead the county to cater to them, rather than people who are not millionares. I understand it is inevetibale over time. Can I ask the local governments to at least consider, (would not expect local government to do anything other than what pays the most), but can San Mateo Co at least think about people who have been on coast for years, can no longer afford, will have to sell and move just to afford to die? I expect San mateo co board of supervisors, and all the unelected career local government buerocrats could care less. That is the way it is. The supervisors and county government is going to follow the money, stay in power, keep raising taxes as much as they can. I worked my entire life, paid taxes, but now I just retired, can no longer afford to live in my own house. I doubt county could give a shit, as there are endless silicone valley rich people to take my place, when I sell and move, just to be able to afford to die. You could make this park a paradise. But instead, you will dick around and spend the money, tax money, that people who work for a livig pay, and nothing will happen for park. The money will never go for the park, it will go to Atherton, or raises for supervisors, or a new chief of police or fire dept. what a shame. This whole site to ask for input is a joke, the county will never listen to people living here, have probably already decided what they are going to impose, and all this is just going through the motions so the county can say they asked for input, then do whatever they want. It is a joke. The people with the most money will decide what happens on the coast, and the county government will kiss there ass. Have you checked with Ocean Colony?	6/22/2017 6:16 PM
38	Habitat restoration, removal of invasive and/or exotic plants	6/22/2017 5:25 PM
39	off leash dog walking areas on some of the trails	6/22/2017 4:09 PM
40	I like it being rural. It should not be humanized. Please leave it natural.	6/22/2017 2:46 PM
41	Off-leash dog walking trails	6/22/2017 1:58 PM
42	unleashed dog walking	6/22/2017 1:29 PM
43	Some off leash walking trails would be a huge benefit to the community at large.	6/22/2017 1:16 PM
44	Off leash trails for dog walkers is VERY important.	6/22/2017 1:09 PM
45	off-leash dog trails!	6/22/2017 1:05 PM
46	off-leash dog walking	6/22/2017 1:05 PM
47	Off leash dog trails	6/22/2017 1:04 PM
48	Designated off leash dog trails/fire roads, in addition to the fenced area	6/22/2017 1:00 PM
49	We need trails for off leash walking of dogs	6/22/2017 12:59 PM
50	off leash dog access at Quarry Park	6/22/2017 12:28 PM
51	NO off leash dog walking, please.	6/22/2017 12:25 PM
52	a pool in community building, off leash dog trails	6/22/2017 12:08 PM
53	dog walking -	6/22/2017 12:06 PM
54	off leash dog walking is very important. Please include flat trails for those of us who cannot hike hills.	6/22/2017 12:04 PM
55	I come here specifically to hike with friends and walk our dogs. Please don't take this away from us!	6/22/2017 11:34 AM
56	poison oak eradication close to trails	6/22/2017 11:26 AM
57	Absolutely need signs at ALL areas where people walk dogs to pack out their poop. Trails are covered with full poop bags just left on the trail side. If they're conscientous enough to put it in the bag, they should complete the process by depositing it into the provided waste cans!	6/22/2017 11:25 AM
58	Pump track!!!!!!	6/22/2017 11:18 AM

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59	eep entire area off-leash for dogs as grandfathered in when property was transferred to county. Put in playground equipment for older children - the recent removal of the spiral slide limited this to a toddler park. In general, no improvements are necessary. There are hundreds if not thousands of miles of trails for all the other activities along the entire coast. Leave this park as it is.	6/22/2017 11:15 AM
60	off leash dog walking	6/22/2017 11:08 AM
61	Continued leashed dog access on all trails	6/22/2017 10:45 AM
62	Off leash dog walking	6/22/2017 10:23 AM
63	The park is perfect as is. No improvements needed	6/22/2017 10:23 AM
64	Designated off leash dog walking areas (or even better - Designated time of day for off-leash dog walking)	6/22/2017 10:04 AM
65	Trails that allow off-leash dog walking	6/22/2017 10:02 AM
66	I would really like a pull up bar (for adults) or monkey bars in the playground - similar to what they have in moss beach	6/22/2017 9:10 AM
67	Multi-use trails can be are good. Some of the old roads can be made into trails	6/22/2017 7:35 AM
68	Maintained lawn or turf area for misc sports, running around	6/22/2017 7:11 AM
69	Good loop trails with vistas and opportunity to walk with dog.	6/21/2017 10:46 PM
70	onsite ranger for enforcement (motorized dirtbikes, etc.)	6/21/2017 10:20 PM
71	Leave undeveloped space undeveloped! We don't need more buildings, facilities, parking, etc. Maintain what exists. Let nature be nature!	6/21/2017 9:40 PM
72	Single track mt bike trails,Dogs off leash on all trails during weekday mornings until 1pm	6/21/2017 8:23 PM
73	Formally signing and linking Quarry Park to Rancho Corral (NPS).	6/21/2017 7:15 PM

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Q5 With regard to educational signage and interpretive programs, are there particular stories, natural systems or history related to Quarry Park/Mirada Surf that interest to you?

Answered: 70 Skipped: 124

#	Responses	Date
1	Leave it natural but groomed. Just like I grew up.	7/7/2017 6:06 PM
2	Origins of quarry park, Hwy 1, area wildlife, and plants, including the trees.	7/7/2017 2:44 PM
3	not needed	7/6/2017 2:41 PM
4	No.	7/5/2017 10:13 AM
5	Quarry material used to build HMB airport and Hwy 1.	7/4/2017 1:53 PM
6	NOPE	6/30/2017 7:07 PM
7	Native habitats, invasive species.	6/29/2017 6:22 PM
8	Natural guides explaining plants animals native to area	6/28/2017 8:43 PM
9	• Mac the stable operator • weeds v. native plants • landslide conditions	6/28/2017 6:25 PM
10	this would not be an effective use of public funds	6/26/2017 6:55 PM
11	No	6/26/2017 3:33 PM
12	history	6/26/2017 1:53 AM
13	The quarry: historically, what were its functions and when? What caused the park to be so heavily forested with Eucs, and how is this forest being managed? What wildlife exists in the park? What aquatic plants, amphibians, or fish can be observed in the wetlands & pond(s) of the park? What am I seeing before me (at viewpoints)? How to recognize poisonous plants in this park (poison oak, sting nettles, certain berries).	6/25/2017 3:12 PM
14	About the eucyluptus trees and the quarry floor. More clear signage/maps on how it is connected to rest of Golden Gate Rec Area	6/25/2017 2:23 PM
15	n/a	6/25/2017 1:21 PM
16	Local wildlife	6/25/2017 10:41 AM
17	Not familiar with particular stories but would like to be educated.	6/24/2017 9:12 AM
18	Local geology, botany and general history	6/23/2017 4:42 PM
19	I'm interested in the history of the area and the geology that formed it, similar to how the devil's slide trail interpretive signage discusses the railroad, as well as the geology of the landscape and information about native animals and plants.	6/23/2017 4:16 PM
20	Would be interesting to know the history of the quarry and its purpose	6/23/2017 2:58 PM
21	Explain the loss of natural features to non-native vegetation and human development.	6/23/2017 2:41 PM
22	area history	6/23/2017 1:24 PM
23	No	6/23/2017 1:23 PM
24	Quarry history. Geological history	6/23/2017 12:40 PM
25	Jay Moriarity Memorial	6/23/2017 12:28 PM
26	quarry history	6/23/2017 11:38 AM
27	No	6/23/2017 11:14 AM
28	Not familiar	6/23/2017 10:28 AM

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29	I'd like trails designated for off-leash dog walking	6/23/2017 10:10 AM
30	natural systems and history	6/23/2017 5:54 AM
31	wild flowers and other trees/plants	6/22/2017 6:31 PM
32	10, 15, 20 years ago, all sorts of people from every spectrum, rich, poor, all types of jobs, lived on coast. Now, gradually, month after month, year after year, the coast is turning into Malibu, or Santa Barbara, and I would guess in another 10 years, only millionaires will be able to afford to live here. Except for illegal immigrants, who will be here to clean houses, cut lawns, do all the jobs the rich people would never consider doing themselves.	6/22/2017 6:16 PM
33	The origins of the park, how it was developed from a quarry to a eucalyptus forest, the flora and fauna. There's a lovely little pond off the Meadow Trail that has California newts that would be a fun educational opportunity for kids.	6/22/2017 6:14 PM
34	History of the quarry, the old stable, planting of the eucalyptus, native plants and animals	6/22/2017 5:25 PM
35	no	6/22/2017 4:09 PM
36	History of Quarry , birds, plants	6/22/2017 3:44 PM
37	Natural systems if you have any signage. Why put signs in the woods?	6/22/2017 2:46 PM
38	Natural History, native history	6/22/2017 1:59 PM
39	Description of flora and fauna and ecosystem	6/22/2017 1:58 PM
40	I don't know enough about the history or natural systems there, so anything would be good.	6/22/2017 1:35 PM
41	no	6/22/2017 1:29 PM
42	No	6/22/2017 1:23 PM
43	Wild life and foliage information	6/22/2017 1:16 PM
44	Historical information	6/22/2017 1:09 PM
45	no	6/22/2017 1:05 PM
46	The migrating whales that have been spotted from the beach and bluff the last couple of years.	6/22/2017 1:04 PM
47	Birds, trees, flowers	6/22/2017 1:00 PM
48	No...	6/22/2017 12:59 PM
49	not really	6/22/2017 11:34 AM
50	Signs identifying plants/flowers very important. Explanation of why the roads in Quarry Park were developed. Also, back to dog poop - a reminder that it can spread disease and to PLEASE deposit the poop bag in the trash. This is a pet peeve. Need Poison Oak pictures posted in the heavy areas of growth. This can really hurt people. Also a notice that their dogs can spread it to them if they aren't washed after walking thru it.	6/22/2017 11:25 AM
51	Surf	6/22/2017 11:23 AM
52	Wildlife and flora like to n devils slide	6/22/2017 10:52 AM
53	All it's full of history especially for kids to understand how lucky they are to live here!	6/22/2017 10:46 AM
54	Ecological history - what the parklands looked like 200-500 years ago	6/22/2017 10:45 AM
55	Environmental awareness and conservation of natural resources, and habitat, is important.	6/22/2017 10:28 AM
56	history of indigenous peoples ... that most of the trees are basically imported weeds ...	6/22/2017 10:20 AM
57	no	6/22/2017 9:55 AM
58	no	6/22/2017 9:47 AM
59	No	6/22/2017 9:10 AM
60	No	6/22/2017 8:07 AM
61	History and old pics are always interesting of the area or view. Who planted the Eucs? Animals and plant description are interesting too.	6/22/2017 7:35 AM
62	Quarry history and maybe El Granada history.	6/22/2017 1:25 AM
63	History of the coast and the El Granada community, native plants, geology of the coast range.	6/21/2017 10:46 PM
64	history, plants, animals	6/21/2017 10:20 PM

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65	Signage is not needed! Please let open space be just that....open space! No developments please!	6/21/2017 9:40 PM
66	How QP Quarried rock helped with the rebuilding of SF post 06 quake, How QP Quarried rock helped with Ocean Shore Railroad construction(if it did)	6/21/2017 8:23 PM
67	History and ecology	6/21/2017 7:00 PM
68	No	6/21/2017 6:23 PM
69	none	6/21/2017 6:16 PM
70	It might be interesting to know why the eucs are here, history of the quarry	6/21/2017 6:08 PM

Quarry Park Master Plan Survey, June 2017

Q6 Trail Improvements: Please tell us how important the following trail improvements are to you. Refer to the map when specific park locations are referenced.

Answered: 192 Skipped: 2

	Very	Somewhat	Neither important nor unimportant	Somewhat unimportant	Not at all important	Total
Establish trails for designated uses (examples: mountain biking, on-leash dog walking, equestrian)	**61.20%** 112	**20.77%** 38	**4.92%** 9	**4.37%** 8	**8.74%** 16	183
Create connection to Golden Gate National Recreation Area trail system (area A on map)	**53.23%** 99	**26.34%** 49	**9.14%** 17	**3.76%** 7	**7.53%** 14	186
Provide trail access into park from end of El Granada Boulevard (area B on map)	**36.07%** 66	**28.42%** 52	**21.86%** 40	**6.01%** 11	**7.65%** 14	183
Provide trail access into park from end of Dolphine Avenue (area C on map)	**28.89%** 52	**30.56%** 55	**25.00%** 45	**6.11%** 11	**9.44%** 17	180
Show degree of trail difficulty on park signs	**22.34%** 42	**35.64%** 67	**20.74%** 39	**10.11%** 19	**11.17%** 21	188
Improve trail along western edge of park (area D on map)	**30.90%** 55	**37.08%** 66	**19.10%** 34	**5.62%** 10	**7.30%** 13	178
Establish connection between Mirada E. Fire Road to South Ride Trail (area E on map)	**34.08%** 61	**37.43%** 67	**17.88%** 32	**4.47%** 8	**6.15%** 11	179

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Add spur hiking trail off South Ridge Trail to potential vista point (area F on map)	**26.92%** 49	**37.91%** 69	**18.13%** 33	**7.14%** 13	**9.89%** 18	182
Thin non-native Eucalyptus tress that may block views	**30.27%** 56	**30.81%** 57	**16.76%** 31	**4.32%** 8	**17.84%** 33	185

#	Please specify any other trail improvements that are important to you.	Date
1	Most pressing need of entire survey is a PUMP TRACK!!!!	7/6/2017 1:52 PM
2	Can a trail be built parallel to the private residence/private road to connect the north side of south ridge trail to the 932' high point and further to the Deer Creek Trail?	7/5/2017 10:13 AM
3	connections - connections - connections to GGNRA	7/1/2017 9:57 AM
4	Keep it simple. We all get along together fine, bikes, horses, dogs and people.	6/30/2017 8:23 AM
5	Consider adding small segments of trail at steepest segments of fire road to decrease grade and make it easier to climb.	6/29/2017 5:41 PM
6	Abate french broom, remove all euc sprouts, preserve/enhance willow grove wetland at trailhead by Hwy1	6/28/2017 6:25 PM
7	Please don't think Eucalyptus trees - they are the best feature of the park.	6/28/2017 3:02 PM
8	designation for off-leash dog walking	6/28/2017 12:25 PM
9	I think we can all use the trails together	6/26/2017 3:33 PM
10	Clear out poison oak on heavily used trails.	6/26/2017 1:53 AM
11	off leash dog trails	6/25/2017 2:23 PM
12	ALL of this is important because I do not want to see massive development and build up in ANY of these areas.	6/25/2017 1:21 PM
13	cut back poison oak far from trails	6/25/2017 10:41 AM
14	harbor view area should have trees thinned to enhance views.	6/25/2017 9:41 AM
15	keep dirt trails! and please designate off leash area trails for dogs!!	6/25/2017 7:53 AM
16	Clear the eucalyptus debris on the trails. I hate that our local park is full of eucalyptus, instead of native plants. I'd advocate more clearing than just thinning, and reintroduce native trees and plants.	6/25/2017 7:19 AM
17	trails for off-leash dog walking	6/24/2017 6:34 PM
18	I'd like to see all trails open to dogs not only designated trails. Also, I'd like most of the trails to be off leash	6/24/2017 9:12 AM
19	Poison oak removal next to trails	6/23/2017 10:16 PM
20	Off leash areas and trails for walking dogs	6/23/2017 6:58 PM
21	Trail quality is very important to me, we have many fireroads open to mountain bikes but very little single track. Interested in more single track open to bikes.	6/23/2017 4:42 PM
22	I think having online brochures and/or an informational kiosk with trail difficulty and descriptions is adequate, I don't think it's needed on the park signs.	6/23/2017 4:16 PM
23	"De-commission" one of parallel trails close to one another. Convert some of the multi-use trails to single-track walking/hiking trails.	6/23/2017 2:41 PM
24	More singletrack trails for mountain biking and or hiking. If possible direction specific to prevent user conflicts (i.e. uphill only mtb tracks shared with hikers, downhill only mtb tracks that are either: 1. limited to mtb or 2. on an odd/even day system with hikers/dogs)	6/23/2017 1:48 PM
25	It is a nature area that is easily accessible to those who like that. Leave it alone. No government meddling.	6/23/2017 12:40 PM
26	I concur with all of the proposed improvements on the map above :-) !	6/23/2017 12:28 PM
27	dog off leash riding trails	6/23/2017 11:46 AM
28	We want to keep Quarry Park as it is: natural and not over run by trash-leaving visitors	6/23/2017 11:14 AM
29	Keep the trees	6/23/2017 9:27 AM
30	So you're not ok w eucalyptus trees, but you're ok with the lack of control of poison oak?!	6/23/2017 2:04 AM
31	Wide enough to avoid poison oak	6/22/2017 8:16 PM

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32	Remove Pampas Grass and other non native plants	6/22/2017 8:14 PM
33	Come up with plan to prevent dumping.(garbage, leaves, grass etc) and enforce it. (Sherriff, ranger?	6/22/2017 6:16 PM
34	Remove french broom, jubuta grass to improve line of site along trails	6/22/2017 5:25 PM
35	Off leash dog areas	6/22/2017 4:45 PM
36	Establish off-leash dog walking trails throughout the range	6/22/2017 1:58 PM
37	ability to walk my dog unleashed as do so many other people who use this park area. Bikers tend to dominate any area their using so I would request no shared biking trails/paths	6/22/2017 1:29 PM
38	Designated trails for off leash dog walking separate from bikes hikers horses etc so there's a choice.	6/22/2017 1:16 PM
39	Off-leash dog walking	6/22/2017 1:09 PM
40	off-leash dog trails!	6/22/2017 1:05 PM
41	Trying to get control of the blue gum and cape ivy and get more ecological variety.	6/22/2017 1:04 PM
42	It's very important to keep trails open to off-leash for dogs.	6/22/2017 12:59 PM
43	off leash dog walking access	6/22/2017 12:28 PM
44	Trails designated for off leash dog walking	6/22/2017 12:21 PM
45	Off leash dog trails, all trails should have dog access-do not like to hike alone in the woods without dog	6/22/2017 12:08 PM
46	stop wasting tax dollars - fix HYW 1 traffic !	6/22/2017 12:06 PM
47	some shaded walk areas. Not familiar with whole park.	6/22/2017 12:04 PM
48	off leash dog walking area	6/22/2017 11:26 AM
49	As little as possible. I do not want to have to be afraid of encountering a horse anywhere and really dislike having to walk off a trail to avoid their poop. Keep all the area off leash for dogs as grandfathered in when property was transferred to county. There are hundreds if not thousands of miles of trails along entire coast for absolutely EVERYONE and EVERYTHING including horses, hikers, bikers, etc., except dogs. .	6/22/2017 11:15 AM
50	I'm very happy with the current mixed use trails (mountain biking and dogs together)	6/22/2017 11:08 AM
51	Highest priority should be connection to GGNRA	6/22/2017 10:45 AM
52	It's important to me to keep Quarry Park's trails multi-use - open to dog walking, biking, etc. Designating main trails for just one or a few uses would be mistake. Quarry Park is a park for all and should remain that way.	6/22/2017 10:02 AM
53	clean up the trails blocked by mud slides from last winter	6/22/2017 9:10 AM
54	Walking trail needed on either side of Coronado from Ave Alhambra to hwy 1	6/22/2017 8:07 AM
55	Don't establish anything! Maintain what exists! Don't limit/segregate use! ALL Trails are multi use!	6/21/2017 9:40 PM
56	No hiking only trails anywhere within the park, there are already enough hiker only trails within San Mateo Co Parks lands.	6/21/2017 8:23 PM
57	More mtn bike trails. Cut back vegetation and do trail maintanence on a routine basis. Work with clubs to engage mtn bike community and trails stewardship.	6/21/2017 8:13 PM
58	Less building structures. More trails, please protect the wildlife	6/21/2017 7:00 PM
59	A dirt trail already exists connecting quarry park to GGNRA trials where the letter A is marked on the map	6/21/2017 6:16 PM
60	Remove all equestrian access. Make entire park off leash dog. Stop cutting back the fire roads so wide make single or double track trails. All trails should be bike and hike.	6/21/2017 6:11 PM
61	Cut back the damn poison oak every once in a while please	6/21/2017 6:08 PM

Quarry Park Master Plan Survey, June 2017

Q7 Vista Points: Please indicate your preferred vista point locations referencing the Row numbers and Column letters as shown on the map. Provide additional comments in the box below.

Answered: 79 Skipped: 115

Answer Choices	Responses	
E, 3	**26.58%**	21
E, 4	**20.25%**	16
E, 5	**25.32%**	20
E, 18	**39.24%**	31
D, 18	**20.25%**	16
G, 20	**55.70%**	44
Total Respondents: 79		

#	Other (please specify)	Date
1	J17, F3, G4	7/5/2017 10:13 AM
2	The J side has good views too	6/30/2017 7:07 PM
3	F20	6/29/2017 5:41 PM
4	Sorry, been too long since I was there to remember the places - but there's lots of vista point opportunities there	6/28/2017 6:25 PM
5	D, 22	6/26/2017 6:55 PM

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6	K, 12: for a new Vista Point at the end of the proposed spur trail eastward off South Ridge Trail, for views of the State Beaches & the Pacific, all the way SW-ward to the Ritz.	6/25/2017 3:12 PM
7	This is a very poorly done survey! What do you mean by "preferred vista point location"? Are you going to "build" a vista point? What does that entail?	6/25/2017 1:21 PM
8	?	6/25/2017 7:53 AM
9	Any or none, just go daily to hike with my dog	6/24/2017 10:55 AM
10	As an avid hiker and mountain biker, I really enjoy when the vista points require a bit of a journey and are not right next to the parking area or road, such as E3,4,5.	6/23/2017 4:16 PM
11	Get rid of the eucs and the vistas will take care of themselves.	6/23/2017 2:41 PM
12	Not sure	6/23/2017 2:25 PM
13	no preference	6/23/2017 10:24 AM
14	Not sure, any would be nice	6/22/2017 8:16 PM
15	Don't care what vista points, care if park is clean and safew	6/22/2017 6:16 PM
16	Any and all would be nice. Hard to tell what the views would be from this map anyway.	6/22/2017 6:14 PM
17	Don't really care	6/22/2017 5:25 PM
18	Vista points don't really matter to me from this park - I like being in the trees	6/22/2017 1:58 PM
19	none - no parking - traffic jams	6/22/2017 12:06 PM
20	Don't know the Vista points	6/22/2017 12:04 PM
21	Any high up view spot could use a bench. More resting spots are useful for people in less than fit shape.	6/22/2017 11:25 AM
22	The ones there now are good.	6/22/2017 11:15 AM
23	Not really a priority for me	6/22/2017 10:45 AM
24	J, 18	6/22/2017 10:04 AM
25	More water views would be great.	6/22/2017 10:02 AM
26	K-10 is nice. Reward visitors for their effort. There may be better vista points but with all the Eucs they are hidden.	6/22/2017 7:35 AM
27	K, 10 to get view of coast range and down coast	6/21/2017 10:46 PM
28	K,12	6/21/2017 10:20 PM
29	No opinion	6/21/2017 6:23 PM
30	J, 10	6/21/2017 6:11 PM

Quarry Park Master Plan Survey, June 2017

Q8 How important are the following natural resource management activities to you (cost and implementation challenges may impact feasibility).

Answered: 187 Skipped: 7

	Very	Somewhat	Neither important nor unimportant	Somewhat unimportant	Not at all important	Total
Thinning of non-native Eucalyptus for fuel (fire) management	**36.76%** 68	**33.51%** 62	**11.89%** 22	**5.41%** 10	**12.43%** 23	185
Selective thinning/removal of non-native species and planting of native species for vegetation/habitat management	**23.37%** 43	**40.76%** 75	**19.57%** 36	**3.80%** 7	**12.50%** 23	184
Creek/wetland restoration	**39.01%** 71	**33.52%** 61	**14.29%** 26	**5.49%** 10	**7.69%** 14	182
Sensitive species habitat enhancement	**29.28%** 53	**35.91%** 65	**19.89%** 36	**4.97%** 9	**9.94%** 18	181
Management for improved sediment and drainage	**30.43%** 56	**46.74%** 86	**13.04%** 24	**4.89%** 9	**4.89%** 9	184

#	Other (please specify)	Date
1	please do not waste tax dollars thinning a forest of non native species. The entire hillside is non native trees. Just leave them alone. The thinning you did at the quarry over look caused more erosion and sped up the likely hood of the overlook deck to fall.	7/6/2017 2:41 PM
2	Thin/remove pampas grass aggressively.	7/5/2017 10:13 AM
3	Salvage the dam to save the pond	6/28/2017 6:25 PM
4	Please don't cut down trees, who cares that they are non-native? They look nice.	6/28/2017 3:02 PM
5	Again, how can you ask a question about importance w/out explaining what it entails?	6/25/2017 1:21 PM
6	Way more important than more artificial development in the park outside current established play areas.	6/23/2017 2:41 PM

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7	Leave it alone .	6/23/2017 12:40 PM
8	Expect you will ban everyone from area (humans) and arrest people to help banana slugs or something	6/22/2017 6:16 PM
9	Why can't you just leave that beautiful park ALONE	6/22/2017 2:46 PM
10	Can't really comment on how important these things are because I don't know how feasible they are in that area, e.g., wetland restoration??	6/22/2017 1:58 PM
11	tax waste	6/22/2017 12:06 PM
12	Dependent upon rainfall, the last one may become critical.	6/22/2017 11:25 AM
13	Going back to native species depends on how far back you want to go. What was here before the Indians - 10,000 years ago? How will you keep non-natives out in future - huge on-going expense. Waste of time and money.	6/22/2017 11:15 AM
14	Very concerned you are conflating fire hazard with non-native trees	6/22/2017 11:03 AM
15	This park is almost all non-native plants. However, it is lovely, green and cool year round. I like to think of it as an English Garden that's gone wild.	6/22/2017 10:04 AM
16	I support habitat restoration, but not at the expense of recreational opportunities and access, including dog walking.	6/22/2017 10:02 AM
17	remove poison oak	6/22/2017 9:10 AM
18	manage native vegetation to bring in birds	6/21/2017 10:46 PM
19	There is nothing natural about this land. Eucalyptus are invasive, it has been quarried, cultivated, grazed etc. Reduce fire risk, improve/maintain trails and drainage.	6/21/2017 9:40 PM
20	Pampas grass,French Broom removed throughout park please.	6/21/2017 8:23 PM

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Q9 San Mateo County Parks is developing a dog management policy for all of its parks. Please indicate how important the following aspects of dog access are to you at Quarry Park and Mirada Surf.

Answered: 186 Skipped: 8

	Very	Somewhat	Neither important or unimportant	Somewhat unimportant	Not at all important	Total
Dogs on-leash (all trails)	**51.65%** 94	**11.54%** 21	**13.19%** 24	**7.69%** 14	**15.93%** 29	182
Dogs on-leash (restricted trails)	**29.41%** 50	**22.94%** 39	**15.29%** 26	**1.76%** 3	**30.59%** 52	170
Dogs on-leash (restricted hours)	**19.64%** 33	**13.10%** 22	**14.88%** 25	**7.14%** 12	**45.24%** 76	168
Dogs off-leash in fenced area, dogs separated by small/large size (Quarry Park only)	**43.89%** 79	**21.67%** 39	**13.33%** 24	**4.44%** 8	**16.67%** 30	180
Restrict number of dogs per visitor	**18.99%** 34	**23.46%** 42	**19.55%** 35	**9.50%** 17	**28.49%** 51	179
No dogs permitted at Quarry Park/Mirada Surf	**8.52%** 15	**3.98%** 7	**9.66%** 17	**6.82%** 12	**71.02%** 125	176
Establish a friends support group of dog owners/walkers	**16.37%** 28	**19.88%** 34	**30.41%** 52	**7.02%** 12	**26.32%** 45	171

#	Other (please specify)	Date
1	A dog on a leash should be allowed at all times. Restricted trails/times just leads to confusion.	6/30/2017 7:07 PM
2	Allow dogs to be walked off leash.	6/30/2017 8:23 AM

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3	I don't have a dog, but I don't mind dogs or their owners in our parks.	6/28/2017 3:02 PM
4	Dogs OFF-leash on trails	6/28/2017 12:25 PM
5	8 out of 10 people have their dogs off leash in this park. Please provide off leash trails, not just a rectangular box with wood chips. Some dogs need room to run and if their owner is unable to run then we need resources.	6/26/2017 6:55 PM
6	San Mateo County Parks are the most dog unfriendly parks in the state.	6/26/2017 3:33 PM
7	Again I would like to advocate off leash dog trails.	6/26/2017 1:53 AM
8	off leash trails	6/25/2017 2:23 PM
9	These issues are AL important in that they are being considered, not that I want to see a particular element established.	6/25/2017 1:21 PM
10	Limit dog access to reduce impact on fauna.	6/25/2017 8:19 AM
11	dogs desperately need off leash trails and I notice there is no provision for this needed inclusion	6/25/2017 7:53 AM
12	Let dog walkers walk their dogs. I don't have dogs, and I'm fine with well-trained dogs with good recall being off lead. In the enclosed park dogs should be on leash in case there are kids who are scared of dogs. I support having an enclosed dog park. I want dogs to keep running around and chasing balls at Mirada Surf.	6/25/2017 7:19 AM
13	Dogs off-leash walking on designated trails	6/24/2017 6:34 PM
14	Dogs off leash all trails	6/24/2017 10:55 AM
15	I disagree with limiting dog walking in any form.	6/24/2017 9:12 AM
16	Keep Quarry Park dog friendly please!! :)	6/24/2017 9:06 AM
17	We need recreational areas for our dogs to enjoy the outdoors and to be able to run and roam. There are already too many restrictions and rules regarding dogs in San Mateo County.	6/23/2017 6:58 PM
18	I support dogs off leash	6/23/2017 4:42 PM
19	As a mountain biker, it would be great if there were no dogs allowed on some of the mountain bike trails, as sometimes dogs get scared of bikes, even when appropriately slowing down and saying hello to the owner.	6/23/2017 4:16 PM
20	please create off leash dog trails- we have had access to quarry park for walking our dogs for the d10 yrs we lived here	6/23/2017 3:41 PM
21	MUST be able to take dogs to Quarry Park	6/23/2017 2:58 PM
22	ALL on-leash dog areas in parks have an off-leash dog problem. The problem is less with active enforcement, but all parks in San Mateo County that allow dogs are very weak on enforcement.	6/23/2017 2:41 PM
23	off leash under voice controll on some trails	6/23/2017 1:24 PM
24	Put in a game camera and see that 80% of visitors have dogs.	6/23/2017 12:40 PM
25	re: "no dogs " at Quarry...DOGS should continue to be allowed at Quarry Park. .. responsible owners should pick up dog waste and keep their dogs under voice control if off leash.. on leash in parking lot ..ok..until they are on the trail	6/23/2017 12:28 PM
26	Please keep all the trails open to dogs	6/23/2017 11:48 AM
27	dogs off leash is very important to me. and allowed on trails on leash.	6/23/2017 11:46 AM
28	very important: dogs off-leash on specific trails (or hours)	6/23/2017 11:38 AM
29	Not sure of meaning of first three choices	6/23/2017 10:28 AM
30	Given how few county parks are open to dogs I am not in favor of any restrictions at Quarry Park	6/22/2017 9:17 PM
31	Only if they self police poop pick up and keeping dogs on leash	6/22/2017 8:16 PM
32	portion of trail allows dogs off-leash for hiking (e.g. Pulgas Ridge)	6/22/2017 6:31 PM
33	I believe dogs should be allowed off leash, and if there are incidents, prosecute lazy dog owners.	6/22/2017 6:16 PM
34	I really don't like dog parks	6/22/2017 5:25 PM
35	This is THE dog park! Please Keep it!!	6/22/2017 3:12 PM
36	We already have our own dog groups. All aspects are very important as clearly you discriminate against certain species. This human superiority it becoming so disgusting.	6/22/2017 2:46 PM
37	Ideally, I would like all trails to be off-leash.	6/22/2017 1:58 PM

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38	why do you guys have to ruin a good thing -- all of the people who use the park and bring their dogs are respectful and clean.	6/22/2017 1:29 PM
39	The majority of dog owners are responsible and all dogs should be welcome with on AND off leash trail options	6/22/2017 1:16 PM
40	Off-leash trails are very important	6/22/2017 1:09 PM
41	dog owners need access to space also.	6/22/2017 1:05 PM
42	Dogs off-leash most everywhere	6/22/2017 1:05 PM
43	Very important that there be off leash trails. Any further restrictions on dogs would be extremely negative. The community has a large number of dogs and dog owners don't want to go places without their dog. We stopped going to state parks when we got our dog 12 years ago. The more exposure and off leash experience a dog gets, the more harmonious and at ease they are. People walking around tense and nervous with a tense and nervous dog on leash is not a good thing.	6/22/2017 1:04 PM
44	I've lived here for 9 years in El Granada, and I think it's critical for dogs to have trails available to them for off-leash.	6/22/2017 12:59 PM
45	Dogs should have restricted hours to allow for off-leash trail walking. Dogs need more than a fenced area to run about. A dog park is not enough. Quarry Park has been our haven for decades and it is not fair to take that away from us!! The majority of people there are walking dogs!	6/22/2017 12:42 PM
46	Off leash dog trails/fire road access	6/22/2017 12:28 PM
47	OFF leash dog trails!	6/22/2017 12:08 PM
48	no commercial dog walking companies on trails !	6/22/2017 12:06 PM
49	off leash dog walking trails. if restricted, please have some flat trails accessible.	6/22/2017 12:04 PM
50	I am a dog owner and lover but I hope that people that come to any park can be made to understand how important it is to clean up after them always.	6/22/2017 11:26 AM
51	Dogs NEED space to run free for awhile and chase balls. Their normal spots for this crucial exercise is being taken away all over the Bay Area. This area has a huge population of dog lovers who enjoy getting out and exercising with their pups. Quarry Park has traditionally been off leash (although not legally) forever. We must preserve at least some space, preferably large, for off leash activities.	6/22/2017 11:25 AM
52	Keep all dogs off leash as grandfathered in when property given to county. Stop discriminating against dog owners. We are probably the majority on the coast and deserve some acknowledgement. There are hundreds if not thousands of miles of trail that EVERYONE, even horses, except dog owners with their dogs can enjoy.	6/22/2017 11:15 AM
53	Who not offer some off-leash trails? Why does your survery omit that when you are very aware of the support for it and the problems engulfing GGNRA for refusing to offer some?	6/22/2017 11:03 AM
54	You must maintain current levels of dog access - leashed access to all trails.	6/22/2017 10:45 AM
55	What is a friends support group?	6/22/2017 10:23 AM
56	Dogs should be permitted off leash everywhere in the park	6/22/2017 10:23 AM
57	9 out of 10 regular visitors to Quarry Park walk dogs there. This is the MOST IMPORTANT recreational activity to preserve at this park. It is ideal, since it is mostly non native plants, and less environmentally sensitive than other areas that need tighter restrictions on dogs - such as plover nesting areas, or red-legged frog water lands.	6/22/2017 10:04 AM
58	At the community meeting, folks said they are interested in having off-leash dog walking on trails. I'm disappointed that SMC Parks did not include this in the list of options above. Quarry Park is the perfect place to have some off-leash dog trails.	6/22/2017 10:02 AM
59	How are you supposed to answer the "No dogs permitted...) if you DISagree with that policy? Dogs SHOULD be allowed, so is it VERY IMPORTANT or NOT AT ALL Important? (I put not at all important that No Dogs Permitted, because I think they should be.)	6/22/2017 9:54 AM
60	I have never seen horse up there, but they should definitely have a separate trail from mountain bikes. One of my dogs got badly spooked by a mountain bike that came barreling down and took off, ran all the way home. If that happens with a horse, someone could get seriously injured.	6/22/2017 9:53 AM
61	I don't have a dog	6/22/2017 9:10 AM
62	I want to bring my dog to the park with our family anytime, any day	6/22/2017 8:07 AM
63	A well trained dog on trails off leash is fine. The picking up of dog poop is most important -and that does not mean leaving your little bags on the side of the road.	6/22/2017 7:35 AM

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64	Dogs off-leash on certain trails.	6/21/2017 10:46 PM
65	Please do not limit access to dog owners! No segregation!	6/21/2017 9:40 PM
66	Dogs off leash on weekdays on all trails from sunup until 1pm.	6/21/2017 8:23 PM
67	It's not the dogs..It's always the handlers	6/21/2017 7:39 PM
68	Dog off leash on all trails all times	6/21/2017 6:11 PM

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Q10 Given that there are limited resources with which to make improvements, please rank the following areas in order of importance to you (1=most important....3=least important)

Answered: 176 Skipped: 18

	1	2	3	Total
Park improvements/additions (see Q:4)	**23.17%** 38	**36.59%** 60	**40.24%** 66	164
Trail improvements (Q:6)	**55.36%** 93	**32.14%** 54	**12.50%** 21	168
Natural resource management	**21.51%** 37	**30.81%** 53	**47.67%** 82	172

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Q11 Please tell us how you would like to be involved in the future of Quarry Park/Mirada Surf. Check all that apply.

Answered: 89 Skipped: 105

Answer Choices	Responses	
Fundraising with San Mateo County Parks Foundation	**19.10%**	17
Volunteer	**64.04%**	57
Volunteer/partner with existing group	**41.57%**	37
Volunteer to form new group with special focus	**14.61%**	13
Total Respondents: 89		

#	Other (please specify)	Date
1	already volunteering at Pescadero Park	7/7/2017 3:05 PM
2	Participate in bike trails and track. Local liaison.	7/6/2017 2:41 PM
3	Volunteer to maintain pump track	7/6/2017 1:52 PM
4	I'd volunteer with an IMBA national bike patrol team if one is formed.	7/5/2017 10:13 AM
5	Depends on what SM county parks does with Quarry Park/Mirada Surf	6/26/2017 3:33 PM
6	coastside dog	6/26/2017 1:53 AM
7	Because I serve on the GCSD Parks & rec Advisory Committee, I would be interested in being a liaison for it & County Parks	6/25/2017 3:12 PM
8	Involved in restricting development as much as possible.	6/25/2017 1:21 PM
9	I'll volunteer if you keep the dog policy as is - allow dog access to all trails	6/24/2017 9:12 AM
10	Support initiatives that allow dogs to enjoy nature	6/23/2017 6:58 PM
11	Volunteer with trail building/improvement groups to benefit mountain bikers, hikers, and equestrians	6/23/2017 5:02 PM

Quarry Park Master Plan Survey, June 2017

12	I only volunteer in parks that are positively managed for natural features and never in parks where more artificial development is being pushed.	6/23/2017 2:41 PM
13	Email updates	6/23/2017 2:25 PM
14	I think there is a large enough contingent of mountain bikers on the coastside (and potentially in the greater peninsula area) that would be willing to donate time and money if QP were a viable resource for them.	6/23/2017 1:48 PM
15	I have cleared branches and downed trees after storms from the trails for years.	6/23/2017 12:40 PM
16	Dog owners for unleashed walks. Why are we so discriminated against and harrassed by San Mateo County?	6/23/2017 11:14 AM
17	would volunteer for specific projects, but am totally skeptical if county government is involved	6/22/2017 6:16 PM
18	I am so disappointed in the parks. I used to be an avid volunteer until recently	6/22/2017 2:46 PM
19	Off leash dog group	6/22/2017 1:59 PM
20	Work with Coastside dog groups to ensure dog owners have a say!	6/22/2017 12:42 PM
21	I work with an existing group supporting off-leash dogs.	6/22/2017 11:15 AM
22	Having directional mountain bike specific trails would eleminate conflicts between user groups. Hikers can design trails that are preferable to foot travel and cyclists could design trails that are preferable for bicycle riding. It's important to get both groups involved in trail design, building and maintenance.	6/21/2017 8:24 PM

Quarry Park Master Plan Survey, June 2017

Q12 If you want to receive regular updates about Quarry Park/Mirada Surf and/or San Mateo County Parks, please select from the choices below and provide your email contact information.

Answered: 108 Skipped: 86

Answer Choices	Responses	
Keep me updated about Quarry Park/Mirada Surf news	89.81%	97
Keep me updated about San Mateo County Parks	52.78%	57
Total Respondents: 108		

#	Please provide email address:	Date
1	personal information	7/7/2017 6:24 PM
2		7/7/2017 3:05 PM
3		7/7/2017 2:44 PM
4		7/7/2017 1:55 PM
5		7/6/2017 2:41 PM
6		7/5/2017 10:13 AM
7		7/5/2017 9:24 AM
8		7/4/2017 1:53 PM
9		7/1/2017 9:57 AM
10		6/30/2017 8:53 AM
11		6/29/2017 9:29 PM
12		6/29/2017 6:22 PM
13		6/29/2017 11:02 AM
14		6/28/2017 7:29 PM
15		6/28/2017 6:25 PM
16		6/26/2017 6:55 PM
17		6/26/2017 3:33 PM

Quarry Park Master Plan Survey, June 2017

18	personal information		6/26/2017 1:53 AM
19			6/25/2017 10:50 PM
20			6/25/2017 3:12 PM
21			6/25/2017 1:21 PM
22			6/25/2017 10:41 AM
23			6/25/2017 9:41 AM
24			6/25/2017 8:42 AM
25			6/25/2017 8:19 AM
26			6/25/2017 7:53 AM
27			6/25/2017 7:19 AM
28			6/24/2017 6:34 PM
29			6/24/2017 10:55 AM
30			6/24/2017 9:39 AM
31			6/24/2017 9:12 AM
32			6/24/2017 9:06 AM
33			6/23/2017 10:16 PM
34			6/23/2017 4:42 PM
35			6/23/2017 4:27 PM
36			6/23/2017 4:16 PM
37			6/23/2017 2:58 PM
38			6/23/2017 2:25 PM
39			6/23/2017 1:48 PM
40			6/23/2017 1:24 PM
41			6/23/2017 1:00 PM
42			6/23/2017 12:40 PM
43			6/23/2017 12:28 PM
44			6/23/2017 12:24 PM
45			6/23/2017 11:48 AM
46			6/23/2017 11:46 AM
47			6/23/2017 11:44 AM
48			6/23/2017 11:38 AM
49			6/23/2017 11:25 AM
50			6/23/2017 11:14 AM
51			6/23/2017 10:48 AM
52			6/23/2017 10:28 AM
53			6/23/2017 10:24 AM
54			6/23/2017 10:10 AM
55			6/23/2017 5:54 AM
56			6/22/2017 9:17 PM
57			6/22/2017 8:16 PM
58			6/22/2017 8:14 PM

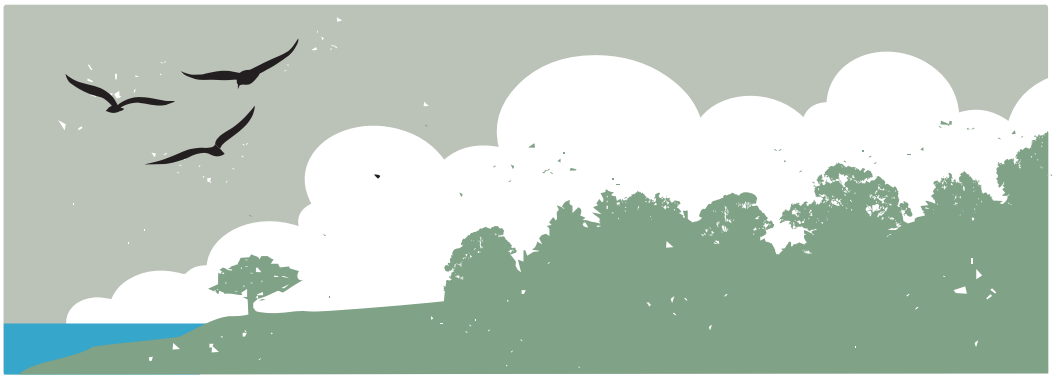
Quarry Park Master Plan Survey, June 2017

59	personal information		6/22/2017 6:16 PM
60			6/22/2017 6:14 PM
61			6/22/2017 5:25 PM
62			6/22/2017 4:45 PM
63			6/22/2017 3:44 PM
64			6/22/2017 2:46 PM
65			6/22/2017 1:59 PM
66			6/22/2017 1:29 PM
67			6/22/2017 1:23 PM
68			6/22/2017 1:16 PM
69			6/22/2017 1:09 PM
70			6/22/2017 1:04 PM
71			6/22/2017 1:00 PM
72			6/22/2017 12:59 PM
73			6/22/2017 12:42 PM
74			6/22/2017 12:38 PM
75			6/22/2017 12:28 PM
76			6/22/2017 12:25 PM
77			6/22/2017 12:06 PM
78			6/22/2017 11:25 AM
79			6/22/2017 11:15 AM
80			6/22/2017 11:08 AM
81			6/22/2017 11:03 AM
82			6/22/2017 10:45 AM
83			6/22/2017 10:28 AM
84			6/22/2017 10:23 AM
85			6/22/2017 10:04 AM
86			6/22/2017 9:10 AM
87			6/22/2017 8:28 AM
88			6/22/2017 7:35 AM
89			6/22/2017 7:11 AM
90			6/22/2017 1:25 AM
91			6/21/2017 10:46 PM
92			6/21/2017 10:20 PM
93			6/21/2017 9:40 PM
94			6/21/2017 8:26 PM
95			6/21/2017 8:24 PM
96			6/21/2017 8:23 PM
97			6/21/2017 8:13 PM
98			6/21/2017 8:02 PM
99			6/21/2017 7:15 PM

Quarry Park Master Plan Survey, June 2017

100	personal information		6/21/2017 7:00 PM
101			6/21/2017 6:58 PM
102			6/21/2017 6:23 PM
103			6/21/2017 6:16 PM
104			6/21/2017 6:08 PM
105			6/21/2017 6:08 PM
106			6/21/2017 6:04 PM
107			6/21/2017 6:04 PM

Appendix F | Visitor counts 2016 to 2021



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The Quarry Park Visitor Counts were captured by the San Mateo County Park Department.

VISITOR COUNTS FOR QUARRY PARK							
	2015	2016	2017	2018	2019	2020	2021
January	--	2,525	1,224	1,732	2,970	0	1,598
February	--	3,109	1,025	1,746	2,469	897	1,859
March	--	3,071	958	1,631	3,115	915	1,594
April	--	2,557	1,020	1,820	2,792	1460	1,339
May	--	1,534	720	1,160	2,381	1924	1,616
June	3,274	1,642	405	1,839	1,078	1,391	1,385
July	3,243	2,054	40	2,077	1,286	2,136	--
August	2,536	1,380	0	1,895	834	1,361	--
September	1,984	1,321	446	2,006	735	1,138	--
October	1,598	1,741	822	1,523	850	886	--
November	1,921	1,734	1,556	1,520	584	972	--
December	1,535	1,747	1,679	2,794	790	1,314	--
Total	16,091	24,415	9,895	21,743	19,884	14,394	9,391

Quarry Park counters placed at two gates at main park entrance.
Inconsistencies and blank data due to counter damage or theft.

VISITOR COUNTS FOR MIRADA SURF WEST							
	2015	2016	2017	2018	2019	2020	2021
January	--	8,253	9,631	405	617		3,018
February	--	11,498	6,914	316	516	287	897
March	--	8,022	971	637	824	1,763	1,235
April	--	9,909	1,808	1,009	425	1,802	1,446
May	--	7,730	821	701	373	1,371	2,590
June	11,449	7,502	641	786	136		2,795
July	12,055	10,238	729	1,519	581		--
August	12,000	9,581		1,379	468	1,960	--
September	10,733	9,194	551	566	600	1,142	--
October	9,748	7,088	810	368	68	1,557	--
November	7,634	8,025	482	470	100	692	--
December	6,476	6,998	410	1,495	960	4,241	--
Total	70,095	104,038	23,769	9,650	5,668	14,814	11,981

Mirada Surf West counter placed at southern end of trail by the kiosk and restrooms.
Inconsistencies and blank data due to counter damage or theft.

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