Biological Report

for

Guerra Ranch Agricultural Reservoir

073-031-035
San Luis Obispo County

Prepared for

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by

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As a County-approved biologist, I hereby certify that this Biological Report was prepared according to the Guidelines established by the County of San Luis Obispo Department of Planning and Building and that the statements furnished in the report and associated maps are true and correct to the best of my knowledge and belief.

Signature

09/13/2019
Date

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Cover Page: Aerial photograph of the Study Area and surrounding area, view southeast, May 29, 2019.

SYNOPSIS

- This report describes biological resources associated with a 6.1-acre site (Study Area) located in an unincorporated portion of San Luis Obispo County, California. The Study Area is a portion of Assessor's Parcel Number (APN) 073-031-035.
- The proposed project (Project) is a 31-acre foot agriculture reservoir.
- Habitat types identified and mapped within the Study Area include nonnative annual grassland, coastal sage scrub, ruderal, and serpentine rock outcrop.
- Botanical surveys conducted in May and June 2019 identified 55 species, subspecies, and varieties of vascular plants in the Study Area. There are twelve special status plants with potential to occur in the Study Area. Four special status plant taxa were mapped in the Study Area.
- Four special status animals have potential to occur in the Study Area. No special status animals were detected in the Study Area; however, grasshopper sparrow, a Species of Special Concern was heard calling just west of the site where it likely was nesting.
- Biological resources that could be impacted by the Project include nonnative annual grassland, coastal sage scrub, and ruderal habitat, special status plants and nesting birds. Mitigation recommendations are provided to reduce potential impacts to sensitive biological resources.

1 INTRODUCTION

1.1 Purpose

The purpose of this report is to provide results from the study of biological resources on an approximately 6.1-acre site (Study Area) in San Luis Obispo County, California. This report also provides analysis on the potential impacts to those resources from the proposed Project. Results include a habitat assessment, botanical and wildlife inventory, special status species database search, and literature review. Discussion of special status species that have potential to occur within the Study Area, or be affected by the proposed Project, is also included. The effects of the proposed Project on biological resources are evaluated and mitigation recommendations are outlined.

1.2 Location

The Study Area is located at 1835 Atascadero Road (Highway 41) about three miles northeast of Highway 1. Approximate coordinates for the center of the Study Area are 35.4119 N, 120.8193° W (WGS84) in the United States Geological Survey (USGS) 7.5-minute topographic quadrangle Morro Bay North (Figure 1). Elevation ranges from approximately 290 to 450 feet above mean sea level. The Study Area is in Assessor's Parcel Number 073-031-035 (Property), which has a total area of 306.9 acres, and is within an unincorporated area of San Luis Obispo County.

1.3 Project Description

The proposed Project includes the construction of a 31-acre foot agricultural reservoir to irrigate existing avocado orchards in the summer months. The reservoir will be approximately 300 feet long by 230 feet wide and approximately 40 feet deep. It will be lined and have an overflow device. The proposed feed line will be placed on the ground surface and piped from the existing irrigation water system. Grading to construct the agricultural reservoir will disturb a total of 2.57 acres. Excess material excavated for pond construction will be moved to the existing rock quarry pit on the Property.

Figure 1. United States Geological Survey Topographic Map

Legend

★ Project Location

N

0 0.5 1 1.5 2 Miles

Guerra Ranch
Map Center: 120.82229°W 35.40335°N
Morro Bay, San Luis Obispo County

USGS Quadrangle: Morro Bay North

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Map Updated:
June 21, 2019 03:01 PM by JBB

1.4 Regulatory Framework

Standards for environmental protection and restoration, in the form of laws and regulations, are created within three different organizational levels of the government: Federal, State, and Local. Entities exist within each level to create and enforce regulations that help ensure protection of specific and pertinent regional issues threatening ecosystems and environments. The following regulations are applicable to the proposed Project.

1.4.1 Federal Law and Regulations

Clean Water Act. The Clean Water Act (CWA) establishes the basic structure for regulating discharges of pollutants into the waters of the United States and regulating quality standards for surface waters. The purpose of the CWA is to restore and maintain the chemical, physical, and biological integrity of all waters of the U.S. Permitting is required for filling waters of the U.S. (including wetlands). Permits may be issued on an individual basis or may be covered under approved nationwide permits.

Endangered Species Act. The federal Endangered Species Act (FESA) provides the legal framework for the listing and protection of species (and their habitats) identified as being endangered or threatened with extinction. "Critical Habitat" is a term within the FESA designed to guide actions by federal agencies and is defined as "an area occupied by a species listed as threatened or endangered within which are found physical or geographical features essential to the conservation of the species, or an area not currently occupied by the species which is itself essential to the conservation of the species." Actions that jeopardize endangered or threatened species and/or critical habitat are considered a 'take' under the FESA. "Take" under federal definition means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.

Projects that would result in "take" of any federally listed threatened or endangered species, or critical habitats, are required to obtain permits from the USFWS through either Section 7 (interagency consultation with a federal nexus) or Section 10 (Habitat Conservation Plan) of FESA, depending on the involvement by the federal government in permitting and/or funding of the project. Through Section 10, it is required to prepare a Habitat Conservation Plan (HCP) to be approved by the United States Fish and Wildlife Service (USFWS), which results in the issuance of an Incidental Take Permit (ITP). Through Section 7, which can only occur when a separate federal nexus in a project exists (prompting interagency consultation), a consultation by the various federal agencies involved can take place to determine appropriate actions to mitigate negative effects on endangered and threatened species and their habitat.

Migratory Bird Treaty Act. All migratory bird species that are native to the U.S. or its territories are protected under the federal Migratory Bird Treaty Act (MBTA) of 1918 (50 C.F.R. Section 10.13), as amended under the Migratory Bird Treaty Reform Act of 2004. The MBTA makes it illegal to purposefully take (pursue, hunt, shoot, wound, kill, trap, capture, or collect) any migratory bird, or the parts, nests, or eggs of such a bird, except under the terms of a valid Federal permit.

1.4.2 State Law and Regulations

California Endangered Species Act. The California Endangered Species Act (CESA), similar to FESA, contains a process for listing of species and regulating potential impacts to listed species. State threatened and endangered species include both plants and wildlife, but do not include invertebrates. The designation "rare species" applies only to California native plants. State threatened and endangered plant species are regulated largely under the Native Plant Preservation Act in conjunction with the CESA. State threatened and endangered animal species are legally protected against "take." The CESA authorizes the California Department of Fish and Wildlife (CDFW) to enter into a memorandum of agreement for take of listed species to issue an incidental take permit for a state-listed threatened and endangered species only if specific criteria are met. Section 2080 of the CESA prohibits the take of species listed as threatened or endangered pursuant to the Act. Section 2081 allows CDFW to authorize take prohibited under Section 2080 provided that: 1) the taking is incidental to an otherwise lawful activity; 2) the taking will be minimized and fully mitigated; 3) the applicant ensures adequate funding for minimization and mitigation; and 4) the authorization will not jeopardize the continued existence of the listed species.

California Coastal Act (CCA). California Coastal Act Section 30107.5 – Environmentally sensitive habitat (ESH) is 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 Act Section 30240 – (a) Environmentally sensitive habitat areas shall be protected against any significant disruption of habitat values, and only uses dependent on such resources shall be allowed within such areas. (b) Development in areas adjacent to environmentally sensitive habitat areas and parks and recreation areas shall be sited and designed to prevent impacts which would significantly degrade such areas, and shall be compatible with the continuance of such habitat areas.

California Environmental Quality Act (CEQA). CEQA defines a "project" as any action undertaken from public or private entity that requires discretionary governmental review (a non-ministerial permittable action). All "projects" are required to undergo some level of environmental review pursuant to CEQA, unless an exemption applies. CEQA's environmental review process includes an assessment of existing resources, broken up by categories (i.e., air quality, aesthetics, etc.), a catalog of potential impacts to those resources caused by the proposed project, and a quantifiable result determining the level of significance an impact would generate. The goal of environmental review under CEQA is to avoid or mitigate impacts that would lead to a "significant effect" on a given resource; section 15382 of the CEQA Guidelines defines a "significant effect" as

> *a substantial, or potentially substantial, adverse change in any of the physical conditions within the area affected by the project including land, air, water, minerals, flora, fauna, ambient noise, and objects of historic or aesthetic significance. An economic or social change by itself shall not be considered a significant effect on the environment, but may be considered in determining whether the physical change is significant.*

Public agencies are required to implement CEQA and execute jurisdiction to determine when applicable activities are or are not subject to CEQA. A public agency with the most prominent nexus and jurisdiction to a project is called the lead agency. The lead agencies determine the scope of what is considered an impact and what constitutes a "significant effect". "Biological resources" is one of the varying categories considered during environmental review through

CEQA. A lead agency can require a biological assessment to be prepared to report on existing biological resources and recommended mitigation measures that will reduce or lessen potential negative impacts to those biological resources. The questions listed in CEQA's Appendix G: Biological Resources section, which are used to guide assessment of impacts to biological resources are as follows:

- *Does the project have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?*
- *Does the project have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Game or US Fish and Wildlife Service?*
- *Does the project have a substantial adverse effect on state or federally protected wetlands (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?*
- *Does the project interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?*
- *Does the project conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?*
- *Does the project conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?*

The lead agency has the final determination over whether a project is or is not permissible, based upon the environmental review, completed requirements and environmental documentation, and their judgement that the project will not have a significant effect on the environment, or that all significant effects have been mitigated for.

California Fish and Game Code (CFGC). The California Fish and Game Code (CFGC) is one of the 29 legal codes that form the general statutory law of California. A myriad of statutes regarding fish and game are specified in the CFGC; the following codes are specifically relevant to the proposed Project:

California Native Plant Protection Act. Sections 1900-1913 of the California Fish and Game Code contain the regulations of the Native Plant Protection Act of 1977. The intent of this act is to help conserve and protect rare and endangered plants in the state. The act allowed the CFGC to designate plants as rare or endangered

Nesting Birds. Section 3503 of CFGC states that it is "unlawful to take, possess, or needlessly destroy the nest or eggs of any bird, except as otherwise provided by this code or any regulation made pursuant thereto," and "unlawful to take, possess, or destroy any birds of prey or to take, possess, or destroy the nest or eggs of any such bird" unless authorized.

Natural Community Conservation Planning (NCCP) Act of 1991. The NCCP Act is designed to conserve natural communities at the ecosystem scale while accommodating compatible land use. CDFW is the primary state agency that implements the NCCP. The NCCP plan provides for the comprehensive management and conservation of multiple wildlife species. It identifies and provides for regional protection of natural wildlife diversity while allowing for compatible and appropriate development and growth.

1.4.3 Local Policies and Regulations

San Luis Obispo County Code-Title 23. Coastal Zone Land Use Ordinance (CZLUO). The CZLUO was prepared to regulate land use in the coastal zone per the San Luis Obispo County General Plan and Local Coastal Program in order to minimize adverse effects on the public resulting from inappropriate development, to protect and enhance significant natural, historic, archaeological and scenic resources as identified by the General Plan, and to assist the public in identifying and understanding regulations affecting the development and use of land.

23.07.170 - Environmentally Sensitive Habitats

The provisions of this section apply to development proposed within or adjacent to (within 100 feet of the boundary of) an Environmentally Sensitive Habitat as defined by Chapter 23.11 of this title.

Environmentally Sensitive Habitat Area (Mapped ESHA). A type of Sensitive Resource Area where 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 easily disturbed or degraded by human activities and development. They include wetlands, coastal streams and riparian vegetation, terrestrial and marine habitats and are mapped as Land Use Element combining designations. Is the same as an Environmentally Sensitive Habitat. [Amended 2004, Ord. 3048]

Environmentally Sensitive Habitat Area (Unmapped ESHA). A type of Sensitive Resource Area where 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 easily be disturbed or degraded by human activities and development. They include, but are not limited to, known wetlands, coastal streams and riparian vegetation, terrestrial and marine habitats that may not be mapped as Land Use Element combining designations. The existence of Unmapped ESHA is determined by the County at or before the time of application acceptance and shall be based on the best available information. Unmapped ESHA includes but is not limited to:

- Areas containing features or natural resources when identified by the County or County approved expert as having equivalent characteristics and natural function as mapped other environmental sensitive habitat areas;
- Areas previously known to the County from environmental experts, documents or recognized studies as containing ESHA resources;
- Other areas commonly known as habitat for species determined to be threatened, endangered, or otherwise needing protection.

[Amended 2004, Ord. 3048]

1.5 Special Status Species and Sensitive Habitat Regulations

For the purposed of this Biological Report, special status species are those plants and animals listed, proposed for listing, or candidates for listing as threatened or endangered by the USFWS under the FESA; those listed or proposed for listing as rare, threatened, or endangered by the CDFW under the CESA; animals designated as "Species of Special Concern," "Fully Protected," or "Watch List" by the CDFW; and plants with a California Rare Plant Rank (CRPR) of 1, 2, 3, or 4. In the following sections, further details are provided to highlight the different guidelines and qualifications that are used to help identify special status species in this report. In Sections 3.7 and

3.8, the various qualifications are listed in the potential special status species tables (3 & 4) for each species with potential to occur in the project area.

1.5.1 California Natural Diversity Database (CNDDB)

"Special Plants" and "Special Animals" are broad terms used to refer to all the plant and animal taxa inventoried by the CNDDB, regardless of their legal or protection status (CDFW 2018b). The Special Plants list includes vascular plants, high priority bryophytes (mosses, liverworts, and hornworts), and lichens. The Special Animals list is also referred to by the California Department of Fish and Wildlife (CDFW) as the list of "species at risk" or "special status species."

According to the CNDDB (2018a, 2018b), Special Plants and Animals lists include: taxa that are officially listed or proposed for listing by California or the Federal Government as Endangered, Threatened, or Rare; taxa which meet the criteria for listing, as described in Section 15380 of CEQA Guidelines; taxa deemed biologically rare, restricted in range, declining in abundance, or otherwise vulnerable; population(s) in California that may be marginal to the taxon's entire range but are threatened with extirpation in California; and/or taxa closely associated with a habitat that is declining in California at a significant rate. Separately, the Special Plants List includes taxa listed in the California Native Plant Society's Inventory of Rare and Endangered Plants of California, as well as taxa determined to be Sensitive Species by the Bureau of Land Management, U.S. Fish and Wildlife Service, or U.S. Forest Service. The Special Animals List distinctively includes taxa considered by the CDFW to be a Species of Special Concern (SSC) and taxa designated as a special status, sensitive, or declining species by other state or federal agencies.

1.5.2 Federal and State Endangered Species Listings

The Federal and California Endangered Species Acts are the regulatory documents that govern the listing and protection of species, and their habitats, identified as being endangered or threatened with extinction (see Section 1.4.1). Possible listing status under both Federal and California ESA includes Endangered and Threatened (FE, FT, CE, or CT). Species in the process of being listed are given the status of either Proposed Federally Endangered/Threatened, Candidate for California Endangered/Threatened (PE, PT, CCE, or CCT). The CESA has one additional status: Rare (CR).

1.5.3 Global and State Ranks

Global and State Ranks reflect an assessment of the condition of the species (or habitats, see 1.5.6 below) across its entire range. Basic ranks assign a numerical value from 1 to 5, respectively for species with highest risk to most secure. Other ranking variations include rank ranges, rank qualifiers, and infraspecific taxon ranks. Rank definitions, where G represents Global and S represents State, are as follows:

- **G1/S1:** Critically imperiled globally/in state because of extreme rarity (5 or fewer populations).
- **G2/S2:** Imperiled globally/in state because of rarity (6 to 20 populations).
- **G3/S3:** Vulnerable; rare and local throughout range or in a special habitat or narrowly endemic (on the order of 21 to 100 populations).

- **G4/S4:** Apparently secure globally/in state; uncommon but not rare (of no immediate conservation concern).
- **G5/S5:** Secure; common, widespread, and abundant.
- **G#G#/S#S#:** Rank range - numerical range indicating uncertainty in the status of a species, (e.g., G2G3 more certain than G3, but less certain that G2).
- **G/S#?:** Inexact numeric rank
- **Q:** Questionable taxonomy - Taxonomic distinctiveness of this entity is questionable.
- **T#:** Infraspecific taxa (subspecies or varieties) – indicating an infraspecific taxon that has a lower numerical ranking (rarer) than the given global rank of species.

1.5.4 California Rare Plant Ranks

Plant species are considered rare when their distribution is confined to localized areas, their habitat is threatened, they are declining in abundance, or they are threatened in a portion of their range. The California Rare Plant Rank (CRPR) categories range from species with a low threat (4) to species that are presumed extinct (1A). All but a few species are endemic to California. All of them are judged to be vulnerable under present circumstances, or to have a high potential for becoming vulnerable. Threat ranks are assigned as decimal values to a CRPR to further define the level of threat to a given species. The rare plant ranks and threat levels are defined below.

- **1A:** Plants presumed extirpated in California and either rare or extinct elsewhere.
- **1B:** Plants rare, threatened, or endangered in California and elsewhere.
- **2A:** Plants presumed extirpated in California, but common elsewhere
- **2B:** Plants rare, threatened, or endangered in California, but more common elsewhere
- **4:** Plants of limited distribution - a watch list
- **0.1:** Seriously threatened in California (over 80% of occurrences threatened/high degree and immediacy of threat)
- **0.2:** Moderately threatened in California (20-80% occurrences threatened/moderate degree and immediacy of threat)
- **0.3:** Not very threatened in California (less than 20% of occurrences threatened/low degree and immediacy of threat or no current threats known)

1.5.5 California Department of Fish and Wildlife Animal Rank

The California Department of Fish and Wildlife (CDFW) assigns one of three ranks to Special Animals: Watch List (WL), Species of Special Concern (SSC), or Fully Protected (FP). Unranked species are referred to by the term Special Animal (SA).

Animals listed as Watch List (WL) are taxa that were previously designated as SSC, but no longer merit that status, or taxa that which do not yet meet SSC criteria, but for which there is concern and a need for additional information to clarify status.

Animals listed as California Species of Special Concern (SSC) may or may not be listed under California or federal Endangered Species Acts. They are considered rare or declining in abundance in California. The Special Concern designation is intended to provide the CDWF biologists, land

planners, and managers with lists of species that require special consideration during the planning process to avert continued population declines and potential costly listing under federal and state endangered species laws. For many species of birds, the primary emphasis is on the breeding population in California. For some species that do not breed in California but winter here, emphasis is on wintering range. The SSC designation thus may include a comment regarding the specific protection provided such as nesting or wintering.

Animals listed as Fully Protected (FP) are those species considered by CDFW as rare or faced with possible extinction. Most, but not all, have subsequently been listed under the CESA or FESA. Fully Protected species may not be taken or possessed at any time and no provision of the California Fish and Game code authorizes the issuance of permits or licenses to take any Fully Protected species.

1.5.6 Sensitive Habitats

Sensitive Natural Community is a state-wide designation given by CDFW to specific vegetation associations of ecological importance. Sensitive Natural Communities rarity and ranking involves the knowledge of range and distribution of a given type of vegetation, and the proportion of occurrences that are of good ecological integrity (CDFW 2018a). Evaluation is conducted at both the Global (G) and State (S) levels, resulting in a rank ranging from 1 for very rare and threatened to 5 for demonstrably secure. Natural Communities with ranks of S1-S3 are considered Sensitive Natural Communities in California and may need to be addressed in the environmental review processes of CEQA and its equivalents.

2 METHODS

2.1 Literature Review

Relevant literature and data were reviewed to determine what biological resources may occur near or in the Study Area. Information reviewed included species recovery plans, published research articles, species accounts, and queries of special-status species occurrence records. Research also included review of topographic maps and National Wetland Inventory data.

Prior to the site visit, the California Natural Diversity Database (CNDDB; July 2019 data), California Native Plant Society (CNPS) On-line Inventory of Rare and Endangered Plants of California, and U.S. Fish and Wildlife Service (USFWS) Critical Habitat data were reviewed for the eight USGS 7.5-minute quadrangles surrounding the site, including: Atascadero, Cayucos, Cypress Mountain, Morro Bay North, Morro Bay South, San Luis Obispo, Templeton, and York Mountain.

Additional special status species research consisted of searching online herbarium specimen records maintained by the Consortium of California Herbaria. Websites such as Californiaherps.com, iNaturalist.org, and eBird.org were also reviewed as secondary sources of information on special-status species occurrence records. Special status species lists produced by database and literature searches (refer to Appendix A and Appendix B) were cross-referenced with the described habitat types in the Study Area to identify all potential special status species that could occur in or near the Study Area. Each special status species that could occur in or near the Study Area is individually discussed (refer to Sections 3.7 and 3.8).

After review of the literature, the following criteria were used to determine the potential for special-status species to occur within the Study Area:

- **Present:** The species was observed in the Study Area during field surveys.
- **High Potential:** Highly suitable habitat and CNDDB or CNPS occurrence records indicate the species is likely to occur in the Study Area or the immediate vicinity. Individuals may not have been observed during field surveys; however, the species likely occurs in or immediately adjacent to the Study Area and (for wildlife) could move into the Study Area in the future.
- **Moderate Potential:** Moderately suitable habitat is present in the Study Area and CNDDB occurrences or surveys have recorded the species in the vicinity of the Study Area. Individuals were not observed during field surveys, but for wildlife, the species could be present, at least seasonally or as a transient.
- **Low Potential:** Marginally suitable habitat is present in the Study Area, and there are no occurrence records or other historical (i.e., 50 years or older) records within 10 miles of the Study Area. Individuals were not observed during surveys and are not expected to be present.
- **No Potential:** Suitable habitat for the species is not present in the Study Area, and/or the species is not known to occur in the region.

2.2 Mapping

Mapping efforts utilized Samsung Galaxy Tab 4 tablets equipped with Garmin GLO GPS Receivers and a third-party mapping application. Biological resource constraints were mapped in the field on site. Hand notation of habitats on high resolution aerials were digitized into polygon layers. Drone aerial imagery was created using a DJI Mavic Pro by certified pilot, Kyle Nessen. All FAA Part 107 regulations (commercial drone rules) were followed. Maps were created using aerial photo interpretation, field notation, and spatial data imported to Esri ArcGIS, a Geographic Information System (GIS) software program. Data were overlaid on a 2018 National Agriculture Imagery Program (NAIP) aerial of San Luis Obispo County (NAIP 2018).

2.3 Soils

A custom soil report was created by importing the Study Area as an Area of Interest (AOI) into the Natural Resources Conservation Service (NRCS) Soil Survey Geographic Database (SSURGRO) via their online portal. The resulting custom soils report was reviewed, and a map was created using the U.S. Department of Agriculture NRCS Soil Survey GIS data (USDA 2018).

2.4 Surveys

The Study Area was surveyed for biological resources on May 28 and June 19, 2019. Surveys were conducted by Principal Biologist Jason Dart, Environmental Scientist Jacqueline Tilligkeit, and Botanist Kyle Nessen. Surveys were conducted on foot to compile species lists, search for special status plants and animals, map habitats, and to photograph the Study Area. The entire Study Area was surveyed.

TABLE 1. BIOLOGICAL SURVEYS

Survey Date	Biologist(s)	Weather Observations	Activities
May 28, 2019	Jason Dart Jacqueline Tilligkeit Kyle Nessen	Clear, 67°F, 7 MPH winds	Wildlife and botanical surveys
June 19, 2019	Kyle Nessen	Mostly Cloudy, 62°F, 3 MPH winds	Rare plant mapping

2.4.1 Botanical

Each habitat type occurring in the Study Area was inspected, described, and catalogued (Section 3.4). All plant and animal species observed in the Study Area were identified and recorded (Sections 3.7.3 and 3.8.3). Reconnaissance transects were meandering with an emphasis on locating habitat appropriate for special status plants. Transects were utilized to map boundaries of different vegetation types, describe general conditions and dominant species, compile species lists, and evaluate potential habitat for special status species. Identification of botanical resources included field observations and laboratory analysis of collected material (refer to Table 4). Botanical surveys were conducted on May 28 and June 19, 2019 according to agency guidelines (USFWS 2000, CDFG [CDFW] 2018a, and CNPS 2001). Botanical surveys were appropriately timed to identify all of the special status plant species determined to have potential to occur in the

Study Area (refer to Table 3). Botanical nomenclature used in this document follows the Jepson Manual, Second Edition (Baldwin et al. 2012).

Habitats were mapped using a minimum quarter-acre mapping unit, unless the overall area was less than a quarter acre in size in which it was mapped at a finer scale as appropriate to define the boundaries of the polygon. Habitats are described according to the CNPS Manual of California Vegetation Online (CNPS 2019). Habitats are classified to the Alliance level, according to the hierarchical classification system used by the National Vegetation Classification Standard (NVCS).

2.4.2 Wildlife

Wildlife documentation included observations of animal presence and wildlife sign such as nests, tracks, and scat. Observations of wildlife were recorded during field surveys in all areas of the Study Area (refer to section 3.8.3). Birds were identified by sight, using 10-power binoculars, or by vocalizations. Reptiles and amphibians were identified by sight; traps were not used. Mammals recorded in the Study Area were identified by sight and tracks.

3 RESULTS

3.1 Regional Context

The Study Area occurs within the coastal foothills of the Santa Lucia Range, 3.6 miles northeast of the City of Morro Bay and 4.6 miles northwest of the City of Cayucos in San Luis Obispo County, California. Two unnamed seasonal creeks border the Study Area, feeding into Morro Creek which parallels Highway 41 south of the Study Area. The surrounding area is primarily cattle ranch land or agricultural fields. The Study Area is within the Coastal Zone defined by the Coastal Zone Land Use Ordinance (County of San Luis Obispo 2018).

3.2 Existing Conditions

The Study Area occupies the head of a narrow draw which divides the principal grassland ridge bisecting Guerra Ranch property. A flattened terrace makes up the top of the draw, where the majority of the Study Area lies. Two unnamed seasonal streams border the grassland ridge, while no streams or drainages were present in the Study Area. Nonnative annual grassland characterizes the Study Area and much of the surrounding property, with coastal sage scrub occurring on sloping, shallow soils, and serpentine rock outcrop where soil is absent. Several species of rare plants occur within serpentine outcrop and coastal sage scrub, and at least one species occurs within annual grassland. Coast live oak trees occur on the north-facing slopes of the surrounding vicinity, with one oak tree partially entering the eastern boundary of the Study Area. Fill soil has been deposited in the draw since at least 2006 (aerial interpretation). Ruderal habitat occurs on this artificial fill, primarily on the eastern side of the dirt ranch road that provides access to the Study Area. Cattle actively graze the site and surrounding hillsides, and weeds typical of long-term heavy grazing are abundant.

Photo 1. Aerial overview of Study Area. View northwest, May 28, 2019.

Photo 2. Aerial overview of Study Area. View southwest, May 28, 2019.

3.3 Soils

Two individual soil map units from the Natural Resource Conservation Service (NRCS) Soil Survey Geographic Database (SSURGO) overlap the Study Area (Figure 3): Diablo and Cibo

clays, 15 to 30 percent slopes and Lodo clay loam, 30 to 50 percent slopes (Soil Survey Staff et al. 2018). These soils are typically formed from residuum weathered from sandstone and shale on ridges and hillslopes with a clay or clay loam topsoil. Both are well-drained soils that have a "very high" runoff class. Diablo and Cibo Clays have "moderate" available water storage, while Lodo clay loam has "very low."

Figure 2. Aerial Photograph

Legend

Property Boundary

Study Area (6.1 acres)

N

0 500 1,000 Feet

Guerra Ranch
Map Center: 120.82148°W 35.41064°N
Morro Bay, San Luis Obispo County

Imagery Source: 2018 USDA NAIP

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Map Updated:
June 21, 2019 01:38 PM by JBB

Figure 3. USDA Soil Survey

Soil Type	Study Area
Lodo clay loam	45%
Diablo and Cibo clays	55%

Legend

Study Area (6.1 acres)

N

0 50 100 Feet

Guerra Ranch
Map Center: 120.81931°W 35.41187°N
Morro Bay, San Luis Obispo County

Soil Data Source: USDA NRCS Soil Survey
Imagery Source: Althouse and Meade, Inc., May 2019

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Map Updated:
August 26, 2019 01:53 PM by MMP

3.4 Habitat Types

The Study Area and surrounding area is predominately grassland with inclusions of coastal sage scrub and rock outcrops along the borders. A ruderal berm occurs in the southern portion of the Study Area and extends southward beyond it.

Table 2 lists four habitat types described and mapped within the 6.1-acre Study Area (see Figure 4). Most of the Study Area, approximately 4.6 acres, is mapped as nonnative annual grassland habitat. The remaining area consists of approximately 0.9 acres of shrub dominated habitat described as coastal sage scrub, 0.5 acres of disturbed habitat described as ruderal, and less than a tenth of an acre of serpentine rock outcrop.

TABLE 2. HABITAT TYPES

Habitat Type	Global/State Rarity Ranking	Location	Approximate Acreage
Nonnative Annual Grassland	Unranked	Site wide	4.6
Coastal Sage Scrub	G5 / S5	Eastern and northwestern boundaries of Study Area	0.9
Ruderal	None	Central strip in southern half of the Study Area	0.5
Serpentine Rock Outcrop	Unranked	Small inclusion in southeast corner	<0.1

3.4.1 Nonnative Annual Grassland

Nonnative annual grassland, described as *Lolium perenne* Herbaceous Semi-Natural Alliance (CNPS 2019), is the most common habitat within the Study Area, occupying approximately 4.6 acres. This habitat type is dominated by Italian rye grass (*Festuca perennis*) and is generally found in seasonally moist environments that are regularly disturbed. Within the Study Area, nonnative annual grassland occurs on deep clay soils on relatively flat terrain. Other nonnatives such as foxtail barley (*Hordeum murinum*) and wild oat (*Avena barbata*) are abundant throughout this habitat type and help characterize the dominant grasses. Weedy forbs such as purple star thistle (*Centaurea calcitrapa*) and woolly distaff thistle (*Carthamus lanatus*) are found in low abundance within the grassland. Native forbs such as woodrush tarweed (*Hemizonia congesta subsp. luzulifolia*) and clustered tarweed (*Deinandra fasciculata*) occur upslope of the Study Area where the soil is sufficiently deep and in low numbers. One rare plant species, Cambria morning glory (*Calystegia subacaulis* subsp. *episcopalis*), occurs in this habitat type. The annual grassland was actively grazed by cattle during our 2019 surveys.

Photo 3. Nonnative annual grassland habitat with weedy grasses and forbs in the foreground. View northeast, May 28, 2019.

Photo 4. Nonnative annual grassland habitat. View southeast, May 28, 2019.

3.4.2 Coastal Sage Scrub

Coastal sage scrub, described as *Artemisia californica* Shrubland Alliance (CNPS 2019), occupies approximately 0.9 acres of the Study Area. It has a State and Global rank of 5 (Secure). Presence of California sagebrush (*Artemisia californica*) is diagnostic of coastal sage scrub habitat and defines its boundaries. Within the Study Area, coastal sage scrub occurs as a low density shrubland on moderately sloped terrain in shallow soils, with bare serpentine bedrock occasionally exposed. Introduced annual grasses such as rattail grass (*Festuca myuros*), foxtail barley (*Hordeum murinum*), and wild oat (*Avena barbata*) make up the dominant herbaceous understory. Two rare plants species, club haired mariposa lily (*Calochortus clavatus* var. *clavatus*) and Blochman's dudleya (*Dudleya blochmaniae* subsp. *blochmaniae*), occur in the serpentine exposures within coastal sage scrub.

Photo 5. California sagebrush occurs with annual grasses in coastal sagescrub habitat. View southwest. May 28, 2019.

Photo 6. Low density coastal sage scrub habitat. View west. May 28, 2019.

3.4.3 Ruderal

Ruderal habitat, described as *Centaurea (virgata)* Provisional Herbaceous Semi-Natural Alliance (CNPS 2019), occupies approximately 0.5 acres of the Study Area. Nonnative purple-flowered thistles, such as purple star thistle (*Centaurea calcitrapa*), woolly distaff thistle (*Carthamus lanatus*), and milk thistle (*Silybum marianum*), dominate this disturbance following habitat type. Within the Study Area, ruderal habitat is restricted to a large area of artificial fill that occurs along the east side of the existing ranch road (Photo 8). Almost all plants occurring within ruderal habitat are ranked as invasive by the California Invasive Plant Council. No rare plants were found in ruderal habitat.

Photo 7. Woolly distaff thistle in ruderal habitat May 28, 2019.

Photo 8. Aerial image of stabilized artificial fill occuring between the road and hillside. View southeast. May 28, 2019.

3.4.4 Serpentine Rock Outcrop

Serpentine rock outcrop, described as *Nassella* spp. – *Melica* spp. Herbaceous Alliance (CNPS 2019), occupies approximately less than 0.1 acre within the Study Area although it is common in the vicinity. It has a State and Global rank of 4 (Apparently Secure). This habitat type commonly exists in deep clay soils but is also known to occur in sterile serpentine soils. Within the Study Area, serpentine rock outcrop occurs where there is exposed bedrock with little to no soil (Photos 9, 10). Rare and native plants, such as Palmer's spineflower (*Chorizanthe palmeri*), California plantain (*Plantago erecta*), and purple needle grass (*Stipa pulchra*) dominate rock outcrops with few invasive species present.

Photo 9. Exposed serpentine rock outcrop surrounded by annual grassland. View east. May 28, 2019.

Photo 10. Serpentine rock outcrop, view northeast. May 28, 2019.

Figure 4. Biological Resources

Legend

- Study Area (6.1 acres)
- Proposed Impacts (2.5 acres)

Habitats

- California Annual Grassland
- Coastal Sage Scrub
- Ruderal
- Serpentine Rock Outcrop

Special Status Plants

- Blochman's dudleya
- Cambria morning glory
- Club-haired mariposa lily
- Palmer's spineflower

N

0 50 100 Feet

Guerra Ranch
Map Center: 120.81933°W 35.41188°N
Morro Bay, San Luis Obispo County

Biological Survey Date: 06/16/2019
Imagery Source: Althouse and Meade, Inc., May 2019

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Map Updated:
September 13, 2019 10:03 AM by JBB

3.5 Potential Wetlands and Jurisdictional Waters

No potentially jurisdictional wetlands or waters are present in the Study Area or within 100 feet of the project footprint.

3.6 Habitat Connectivity and Wildlife Movement

Wildlife corridors and habitat connectivity are important for the movement of wildlife between different populations and habitats. The Study Area is not part of a significant wildlife movement corridor, although numerous common animals are likely to move through the area periodically or seasonally.

3.7 Botanical Resources

Research on special status plant occurrences conducted within the designated search area (refer to Methods) determined 101 special status plants are known to occur in the region (refer to Appendix A). Figure 5 depicts the current GIS data for special status species and critical habitat mapped near the Study Area by the CNDDB and the United States Fish and Wildlife Service (USFWS).

3.7.1 Potential Special Status Plant Species

Table 3 lists 12 special status plant species for which appropriate soil and habitat conditions exist, and therefore could potentially occur in the Study Area. Federal and California State status, global and State rank, CRPR, typical blooming periods, and habitat preference for each species are provided (CNPS 2019; CNDDB 2018b). Potential for occurrence or detection of a species on site is assessed and provided. Species are listed alphabetically by scientific name.

TABLE 3. SPECIAL STATUS PLANT LIST

	Common Name	Scientific Name	Federal/State Status	Global/State Rank	CA Rare Plant Rank	Blooming Period	Habitat Preference	Potential to Occur
1.	**Miles' milk-vetch**	*Astragalus didymocarpus* var. *milesianus*	-/-	G5T2/S2	1B.2	Mar-Jun	Coastal scrub, grassland.	**Low**. Appropriate habitat is present in the Study Area, however it is poor quality.
2.	**Club-haired mariposa lily**	*Calochortus clavatus* var. *clavatus*	-/-	G4T3/S3	4.3	(Mar)May-Jun	Usually serpentinite, clay, rocky.	**Present**. Club-haired mariposa lily occurs in the Study Area.
3.	**San Luis mariposa-lily**	*Calochortus obispoensis*	-/-	G2/S2	1B.2	May-Jul	Chaparral, cismontane woodland, coastal scrub, valley and foothill grassland.	**Low**. Suitable habitat is present but the species is not known to occur in the Morro Bay area.
4.	**Cambria morning-glory**	*Calystegia subacaulis* subsp. *episcopalis*	-/-	G3T2?/S2?	4.2	(Mar)Apr-Jun(Jul)	Chaparral, cismontane woodland, coastal prairie, valley and foothill grassland.	**Present.** Cambria morning-glory occurs in the Study Area.
5.	**San Luis Obispo owl's-clover**	*Castilleja densiflora* var. *obispoensis*	-/-	G5T2/S2	1B.2	Mar-May	Valley and foothill grassland, meadows and seeps.	**Moderate**. Appropriate habitat is present in the Study Area.
6.	**Brewer's spineflower**	*Chorizanthe breweri*	-/-	G3/S3	1B.3	Apr-Aug	Chaparral, cismontane woodland, coastal scrub, closed-cone coniferous forest.	**Low**. Appropriate habitat is present, but the species is not known to occur in coastal Morro Bay.
7.	**Palmer's spineflower**	*Chorizanthe palmeri*	-/-	G4/S4	4.2	Apr-Aug	Rocky, serpentinite.	**Present**. Palmer's spineflower occurs in the Study Area.

	Common Name	Scientific Name	Federal/State Status	Global/State Rank	CA Rare Plant Rank	Blooming Period	Habitat Preference	Potential to Occur
8.	**Eastwood's larkspur**	*Delphinium parryi* subsp. *eastwoodiae*	-/-	G4T2/S2	1B.2	(Feb) Mar-Mar	Chaparral, valley and foothill grassland.	**Moderate**. Appropriate habitat is present in the Study Area.
9.	**Betty's dudleya**	*Dudleya abramsii* subsp. *bettinae*	-/-	G4T2/S2	1B.2	May-Jul	Coastal scrub, valley and foothill grassland, chaparral.	**High**. Appropriate habitat is present in the Study Area.
10.	**Mouse-gray dudleya**	*Dudleya abramsii* subsp. *murina*	-/-	G4T2/S2	1B.3	May-Jun	Chaparral, cismontane woodland, valley and foothill grassland.	**Moderate**. Appropriate serpentine outcrops occur in the Study Area.
11.	**Blochman's dudleya**	*Dudleya blochmaniae* subsp. *blochmaniae*	-/-	G3T2/S2	1B.1	Apr-Jun	Coastal scrub, coastal bluff scrub, chaparral, valley and foothill grassland.	**Present**. Blochman's dudleya occurs in the Study Area.
12.	**Jones' layia**	*Layia jonesii*	-/-	G2/S2	1B.2	Mar-May	Chaparral, valley and foothill grassland.	**High**. Appropriate serpentine grassland habitat is prsent in the Study Area.

See section 1.5 for status and rank definitions

3.7.2 Special Status Plants Discussion

Based on an analysis of known ecological requirements for the special status plant species reported from the region (see Appendix A), and the habitat conditions that were observed in the Study Area, it was determined that six special status plant species have a High potential to occur in the Study Area (club-haired mariposa lily, Cambria morning glory, Palmer's spineflower, Blochman's dudleya, Betty's dudleya, and Jones' layia), two species have a Moderate potential to occur (San Luis Obispo owl's clover, Eastwood's larkspur), and four species have a Low potential to occur (Brewer's spineflower, Mile's milk-vetch, San Luis mariposa-lily, mouse-gray dudleya). We discuss a total of 12 species below and describe habitat, range restrictions, known occurrences, and survey results for the Study Area.

A. Miles' Milkvetch (*Astragalus didymocarpus* var. *milesianus*) is a CRPR 1B.2 taxon endemic to Ventura, Santa Barbara and San Luis Obispo Counties. It is known to occur on clay or serpentine soils in coastal scrub and grassland habitats at 20 to 400 meters in elevation. It is an annual herb that typically blooms between March and June. The closest known record is approximately 2.7 miles southeast of the Study Area (CNDDB #9) and is a historical record from 1969. The grassland and coastal scrub habitats on clay soils in the Study Area are suitable for this species but it is unlikely to occur due to persistent disturbance from cattle grazing and invasive weeds. Miles' Milkvetch was determined to have Low potential to occur in the Study Area. Miles' Milkvetch was not detected in the Study Area during appropriately timed botanical surveys in May and June 2019.

B. Club-haired Mariposa Lily (*Calochortus clavatus* var. *clavatus*) is a CRPR 4.3 taxon that is endemic to California, where it occurs in San Benito County, and from San Luis Obispo County south to Los Angeles County. It is known to occur on serpentine, clay or rocky soils in grassland, coastal scrub, chaparral, and cismontane woodland habitats below 1,300 meters elevation. It is a bulbiferous perennial herb that typically blooms between (March) May and June. The closest known record is approximately 3.6 miles south of the Study Area (OBI 25BH). Club-haired mariposa lily was determined to have High potential to occur and was detected in the Study Area during the spring 2019 surveys. An estimated 50 individual club-haired mariposa lilies were mapped within two polygons totaling approximately 4,545 square feet during 2019 surveys, primarily in serpentine exposures within coastal sage scrub habitat (Figure 4; Photo 11).

Photo 11. Club-haired mariposa lily seen during spring surveys, May 28, 2019.

Photo 12. Serpentine exposures in coastal sage scrub support club-haired mariposa liy within the Study Area, view east, May 28, 2019.

C. **San Luis Mariposa Lily** (*Calochortus obispoensis*) is a CRPR 1B.2 species endemic to San Luis Obispo County. It is known to occur on serpentinite and occasionally sandstone substrates in grassland, coastal scrub, chaparral and cismontane woodland habitats between 50 to 730 meters elevation. It is a bulbiferous perennial herb that typically blooms between May and July. The closest known record is approximately 3.9 miles southeast of the Study Area (CNDDB #45). The emergent serpentine outcrops within grassland and coastal scrub habitats are potentially suitable for this species, but San Luis mariposa lily is known to be an endemic of San Luis Valley and is not known to occur elsewhere. San Luis mariposa lily was determined to have Low potential to occur and was not detected in the Study Area during appropriately timed botanical surveys in May and June 2019.

D. **Cambria Morning-glory** (*Calystegia subacaulis* subsp. *episcopalis*) is a CRPR 4.2 subspecies endemic to California. It is known to occur in chaparral, cismontane woodland, coastal prairie, and valley and foothill grassland or clay soils below 500 meters elevation. It is a perennial rhizomatous herb that typically blooms between April and June. The closest known record is approximately 3.1 miles SW of the Study Area (CNDDB #4). Cambria morning-glory was determined to have High potential to occur and was detected in the Study Area during the Spring 2019 surveys. An estimated 39 Cambria morning-glory plants were mapped during 2019 surveys in two polygons totaling approximately 1,632 square feet of nonnative annual grassland habitat. (Photo 13; Figure 4).

Photo 13. Cambria morning glory found during spring surveys, June 19, 2019.

E. **San Luis Obispo Owl's-clover** (*Castilleja densiflora* subsp. *obispoensis*) is a CRPR 1B.2 subspecies endemic to San Luis Obispo County. It is known to occur in coastal grasslands on sandy or clay soils below 400 meters elevation. It is an annual hemi parasitic herb that typically blooms between March and May. The closest known record is approximately 2.5 miles southwest of the Study Area (CNDDB #9). The heavy clay soils and grassland habitat in the Study Area are suitable for this species and it is commonly found in similar habitat nearby. San Luis Obispo Owl's-clover was determined to have Moderate potential to occur and was not detected in the Study Area during appropriately timed botanical surveys in May and June 2019.

F. **Brewer's Spineflower** (*Chorizanthe breweri*) is a CRPR 1B.3 species endemic to southwest San Luis Obispo County. It is known to occur on rocky serpentine soil in open areas of chaparral, coastal scrub, cismontane woodland, and close-cone coniferous forest habitats between 45- and 145-meters elevation. It is an annual herb that typically blooms between April and August. The closest known record is approximately 3.9 miles southwest of the Study Area (CNDDB #45). The rocky serpentine soil in the Study Area is suitable for this species but is unlikely to occur as Brewer's spineflower is endemic to San Luis Valley and is not known to occur elsewhere. Brewer's spineflower was determined to have Low potential to occur and was not detected in the Study Area during the spring 2019 surveys.

G. **Palmer's Spineflower** (*Chorizanthe palmeri*) is a CRPR 4.2 species endemic to San Benito, Monterey, San Luis Obispo, and Santa Barbara Counties. It is known to occur on rocky soils in grassland, chaparral and cismontane woodland habitats between 55- and 945-meters elevation. It is an annual herb that typically blooms between April and August. The closest known record is approximately 3.6 miles south of the Study Area (OBI 26BH). Palmer's spineflower was determined to have High potential to occur and was detected in the Study Area during the spring 2019 survey. An estimated 380 Palmer's spineflower individuals were mapped during 2019 surveys within an approximately 2,031 square foot polygon in serpentine rock outcrop and coastal sage scrub along the southeastern edge of the Study Area (Photo 14; Figure 4).

Photo 14. Palmer's spineflower found during spring surveys, May 28, 2019.

H. Eastwood's Larkspur (*Delphinium parryi* subsp. *eastwoodiae*) is a CRPR 1B.2 species native and endemic to California. It is known to occur on serpentine in coastal chaparral and grasslands between 100-500 meters elevation. It is a perennial herb that typically blooms between April and May. The closest known record is approximately 3.2 miles south of the Study Area at the intersection of Highway 1 and South Bay Boulevard (Dart unpublished field notes). The habitat and soil conditions in the Study Area are suitable for this species, and it was determined to have a Moderate potential to occur. Eastwood's larkspur was not detected in or near the Study Area during an appropriately timed botanical survey conducted in May 2019.

I. Betty's Dudleya (*Dudleya abramsii* subsp. *bettinae*) is a CRPR 1B.2 subspecies endemic to San Luis Obispo County. It is known to occur on serpentine substrates in chaparral, valley grassland, and coastal sage scrub habitats between 50- and 180-meters elevation. It is a succulent perennial herb that typically blooms between May and June. The closest known record is approximately 1.6 miles southwest of the Study Area (CNDDB #12). The serpentine outcrops in the Study Area is suitable for this species and it is known to occur in similar habitat nearby. Betty's dudleya was determined to have High potential to occur, however it was not detected in the Study Area during appropriately timed botanical surveys conducted in May and June 2019.

J. San Luis Obispo Dudleya (*Dudleya abramsii* subsp. *murina*) is a CRPR 1B.3 subspecies endemic to San Luis Obispo County. It is known to occur on serpentine substrates in chaparral, cismontane woodland, and grassland habitats between 90- and 525-meters elevation. It is a succulent perennial herb that typically blooms between May and June. The closest known record is approximately 2.3 miles southwest of the Study Area (CNDDB #33). The serpentine outcrops in the Study Area are potentially suitable for this species but is known to occur only in the surrounding area of San Luis Obispo. San Luis Obispo Dudleya was determined to have Low potential to occur and was not detected in the Study Area during appropriately timed botanical surveys conducted in May and June 2019.

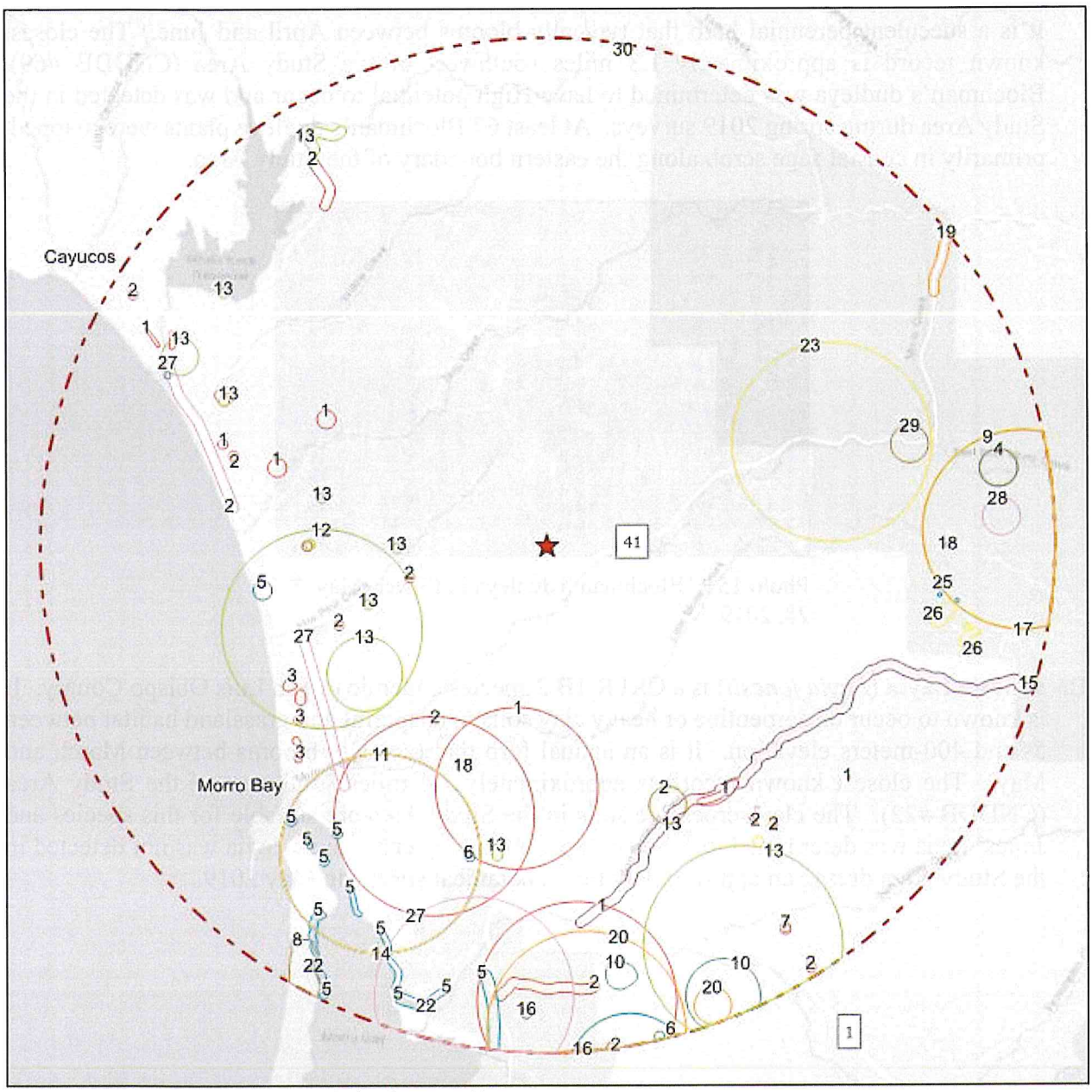
K. Blochman's Dudleya (*Dudleya blochmaniae* subsp. *blochmaniae*) is a CRPR 1B.1 subspecies that occurs in coastal areas from San Luis Obispo County south to Baja California. It grows in open rocky slopes composed of serpentine or clay soils between 5- and 450-meters elevation.

It is a succulent perennial herb that typically blooms between April and June. The closest known record is approximately 1.3 miles southwest of the Study Area (CNDDB #69). Blochman's dudleya was determined to have High potential to occur and was detected in the Study Area during spring 2019 surveys. At least 67 Blochman's dudleya plants were mapped, primarily in coastal sage scrub along the eastern boundary of the Study Area.

Photo 15. Blochman's dudleya in flower, May 28, 2019.

L. **Jones's Layia** (*Layia jonesii*) is a CRPR 1B.2 species endemic to San Luis Obispo County. It is known to occur on serpentine or heavy clay soils in chaparral and grassland habitat between 5- and 400-meters elevation. It is an annual forb that typically blooms between March and May. The closest known record is approximately 1.4 miles southwest of the Study Area (CNDDB #22). The clay serpentine soils in the Study Area are suitable for this species and Jones' layia was determined to have High potential to occur. Jones' layia was not detected in the Study Area during an appropriately timed botanical survey in May 2019.

Figure 5. California Natural Diversity Database Plant Records



Label	Common Name	Label	Common Name
1	Betty's dudleya	18	Mouse-gray dudleya
2	Blochman's dudleya	19	Ojai fritillary
3	Blochman's leafy daisy	20	Oso manzanita
4	Brewer's spineflower	21	Palmer's monardella
5	California seablite	22	Salt marsh bird's-beak
6	Cambria morning-glory	23	San Benito fritillary
7	Chaparral ragwort	24	San Joaquin spearscale
8	Coast woolly-heads	25	San Luis mariposa-lily
9	Cuesta Ridge thistle	26	San Luis Obispo fountain thistle
10	Dacite manzanita	27	San Luis Obispo owl's-clover
11	Dune larkspur	28	San Luis Obispo sedge
12	Eastwood's larkspur	29	Santa Lucia bush-mallow
13	Jones' layia	30	Umbrella larkspur
14	Kellogg's horkelia		
15	Miles' milk-vetch		
16	Morro manzanita		
17	Most beautiful jewelflower		

Legend

Project Location

5-Mile Radius

N

0 0.5 1 2 Miles

Guerra Ranch
Map Center: 120.8194°W 35.41154°N
Morro Bay, San Luis Obispo County

CNDDB GIS Data Last Updated: June 2019

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Map Updated:
July 19, 2019 04:39 PM by JBB

3.7.3 Botanical Survey Results

Botanical surveys conducted on May 29 and June 16, 2019 identified 55 species, subspecies, and varieties of vascular plant taxa in the Study Area (Table 4). The list includes 25 species native to California and 30 introduced (naturalized or planted) species. Native plant species account for approximately 45 percent of the Study Area flora; introduced species account for approximately 55 percent. Four special status plant species were identified in the Study Area.

TABLE 4. VASCULAR PLANT LIST

Common Name	Scientific Name	Special Status	Origin
Trees – 1 Species			
Coast live oak	*Quercus agrifolia*	None	Native
Shrubs – 4 Species			
Coastal sage brush	*Artemisia californica*	None	Native
Coyote brush	*Baccharis pilularis*	None	Native
Saw toothed goldenbush	*Hazardia squarrosa*	None	Native
Poison oak	*Toxicodendron diversilobum*	None	Native
Forbs – 39 Species			
Dog fennel	*Anthemis cotula*	None	Introduced
South coast milk vetch	*Astragalus curtipes*	None	Native
Clay mariposa	*Calochortus argillosus*	None	Native
Club haired mariposa lily	*Calochortus clavatus* var. *clavatus*	CRPR 4.3	Native
Island morning glory	*Calystegia macrostegia*	None	Native
Cambria morning glory	*Calystegia subacaulis* subsp. *episcopalis*	CRPR 4.2	Native
Woolly distaff thistle	*Carthamus lanatus*	None	Introduced
Italian thistle	*Carduus pycnocephalus* subsp. *pycnocephalus*	None	Introduced
Purple star thistle	*Centaurea calcitrapa*	None	Introduced
Tocalote	*Centaurea melitensis*	None	Introduced
Soap plant	*Chlorogalum pomeridianum*	None	Native
Palmer's spineflower	*Chorizanthe palmeri*	CRPR 4.2	Native
Common sandaster	*Corethrogyne filaginifolia*	None	Native
Clustered tarweed	*Deinandra fasciculata*	None	Native
Blochman's dudleya	*Dudleya blochmaniae* subsp. *blochmaniae*	CRPR 1B.1	Native
Willow herb	*Epilobium brachycarpum*	None	Native
Long stemmed buckwheat	*Eriogonum elongatum* var. *elongatum*	None	Native

Common Name	Scientific Name	Special Status	Origin
Big heron bill	*Erodium botrys*	None	Introduced
Coastal heron's bill	*Erodium cicutarium*	None	Introduced
California poppy	*Eschscholzia californica*	None	Native
Fennel	*Foeniculum vulgare*	None	Introduced
Crete weed	*Hedypnois rhagadioloides*	None	Introduced
Woodrush tarweed	*Hemizonia congesta* subsp. *luzulifolia*	None	Native
Mustard	*Hirschfeldia incana*	None	Introduced
Smooth cats ear	*Hypochaeris glabra*	None	Introduced
Caraway leaved lomatium	*Lomatium caruifolium*	None	Native
Valley sky lupine	*Lupinus nanus*	None	Native
Scarlet pimpernel	*Lysimachia arvensis*	None	Introduced
Cheeseweed	*Malva parviflora*	None	Introduced
California burclover	*Medicago polymorpha*	None	Introduced
Annual yellow sweetclover	*Melilotus indicus*	None	Introduced
Imbricate phacelia	*Phacelia imbricate*	None	Native
California plantain	*Plantago erecta*	None	Native
Ribwort	*Plantago lanceolata*	None	Introduced
Prostrate knotweed	*Polygonum aviculare*	None	Introduced
Jointed charlock	*Raphanus sativus*	None	Introduced
Fiddleleaf dock	*Rumex pulcher*	None	Introduced
Hummingbird sage	*Salvia spathacea*	None	Native
Milk thistle	*Silybum marianum*	None	Introduced
Grasses – 11 Species			
Wild oat	*Avena barbata*	None	Introduced
Purple false brome	*Brachypodium distachyon*	None	Introduced
Ripgut brome	*Bromus diandrus*	None	Introduced
Foxtail brome	*Bromus madritensis* subsp. *rubens*	None	Introduced
Rattail sixweeks grass	*Festuca myuros*	None	Introduced
Italian rye grass	*Festuca perennis*	None	Introduced
Goldentop	*Lamarckia aurea*	None	Introduced
Barley	*Hordeum marinum* subsp. *gussoneanum*	None	Introduced
Foxtail barley	*Hordeum murinum*	None	Introduced
Annual beard grass	*Polypogon monspeliensis*	None	Introduced
Purple needle grass	*Stipa pulchra*	None	Native

3.8 Wildlife Resources

Research on special status animal occurrences conducted within the designated search area (see Methods) determined 47 special status animal species are known to occur in the region (refer to Appendix B). Figure 6 and Figure 7 depict the current GIS data for special status species and critical habitat mapped in the vicinity of the Property by the CNDDB and the United States Fish and Wildlife Service (USFWS).

3.8.1 Potential Special Status Animals List

Table 5 lists four special status animal species reported from the region. Federal and California State status, Global and State rank, and CDFW listing status for each species are given. Typical nesting or breeding period, habitat (from CNDDB) preference, potential for occurrence on site, detection of the species within the Study Area, and effect of proposed activity are also provided. Species are listed alphabetically by scientific name.

TABLE 5. SPECIAL STATUS ANIMAL LIST

	Common name	Scientific Name	Federal/State Status	Global/State Rank	CDFW Status	Nesting/ Breeding Period	Habitat Preference	Potential to Occur
1.	**Grasshopper sparrow***	*Ammodramus savannarum*	-/-	G5/S3	SSC	February 1 – September 15	Dense grasslands on rolling hills, lowland plains, in valleys and on hillsides on lower mountain slopes.	**High**. Grasshopper sparrows were heard singing on a hillside just west of the Study Area in May 2019.
2.	**Northern harrier**	*Circus hudsonius*	-/-	G5/S3	SSC	February 1 – September 15	Coastal salt & freshwater marsh. Nest and forage in grasslands.	**Low**. Potential nesting habitat is present in grasslands in the Study Area.
3.	**California horned lark**	*Eremophila alpestris actia*	-/-	G5T4Q/S4	WL	February 1 – September 15	Coastal regions, chiefly from Sonoma County to San Diego County. Also main part of San Joaquin Valley and east to foothills.	**Moderate**. Potentially suitable nesting habitat is present.
4.	**San Diego desert woodrat**	*Neotoma lepida intermedia*	-/-	G5T3T4/S3S4	SSC	n/a	Coastal scrub of Southern California from San Diego County to San Luis Obispo County.	**Low**. Rocky serpentine outcrops could provide habitat.

*Not listed in the CNDDB for the search area, but species is a possibility for the location.
See section 1.5 for status and rank definitions.

3.8.2 Special Status Animals Discussion

Based on an analysis of known ecological requirements for the special-status wildlife species reported or known from the region (Appendix B), and the habitat conditions that were observed in the Study Area, it was determined that one species has a high potential to occur (grasshopper sparrow), one species has a moderate potential to occur (California horned lark), and two species have a low potential to occur in the Study Area (northern harrier, San Diego desert woodrat). We discuss four species below and describe habitat, range restrictions, known occurrences, and survey results for the Study Area.

A. **Grasshopper Sparrow** (*Ammodramus savannarum*) is a California Species of Special Concern (nesting occurrences only) with a Global rank of G5 and a State rank of S3. The species is distributed across California west of the Cascade-Sierra Nevada crest, primarily as a summer resident from March to September. It has been seen as far north as Del Norte County, with a single disjunct population in Siskiyou County, and more scattered populations as far south as San Diego County. The grasshopper sparrow has been known to winter in California, but this is rare. The breeding season is generally April to July with the peak being in May and June (CDFW 2014). This bird prefers large dense, dry grasslands on rolling hills, lowland plains, lower mountain slopes and valleys with scattered sage shrubs for perching (CDFW 2014; CDFW 2018a). The bird needs grassland with patches of bare ground which is important for its foraging behavior (Shuford and Gardali 2008, CDFW 2014). Nests are built in grasses and forbs near the ground (CDFW 2014). The grasshopper sparrow's main food source is grasshoppers, but it also eats other insects and seeds of pigweed, knotweed, campion and oats (Shuford and Gardali 2008). There are no reports of nesting grasshopper sparrow in the 9-quadrangle search of the CNDDB. Singing male grasshopper sparrows were heard on May 28, 2019 on a hillside just west of the Study Area. We determined grasshopper sparrow has a High potential to nest in the Study Area.

B. **Northern Harrier** (*Circus hudsonius*) is a California Species of Special Concern found year-round throughout California (CDFW 2014). They occur in greater numbers during migration and less during the breeding season. Northern harriers are typically found in open habitats such as marshes, fields, and prairies. The species nests on the ground in grasses or wetland vegetation. (Loughman & McLandress, 1994). There are two nesting records in the CNDDB for northern harrier in coastal grasslands in the vicinity of Harmony approximately 12 miles northwest of the Study Area (CNDDB #53, 54). Grassland habitat in the Study Area is grazed and may be shorter than preferred by harriers as nesting habitat. We determined northern harrier has a Low potential to nest in the Study Area. Surveys in May and June 2019 did not detect northern harrier in or near the Study Area.

C. **California Horned Lark** (*Eremophila alpestris actia*) is a CDFW Watch List species known from Sonoma County south to San Diego County, as well as east to the foothills of the Sierra Nevada Mountains. It breeds in opens, flat habitats with short vegetation, including grasslands, alkali flats, fallow grain fields, and meadows. Horned larks are common in the interior areas of San Luis Obispo County. They are known to make local movements through the seasons and may not breed in all areas they are observed.

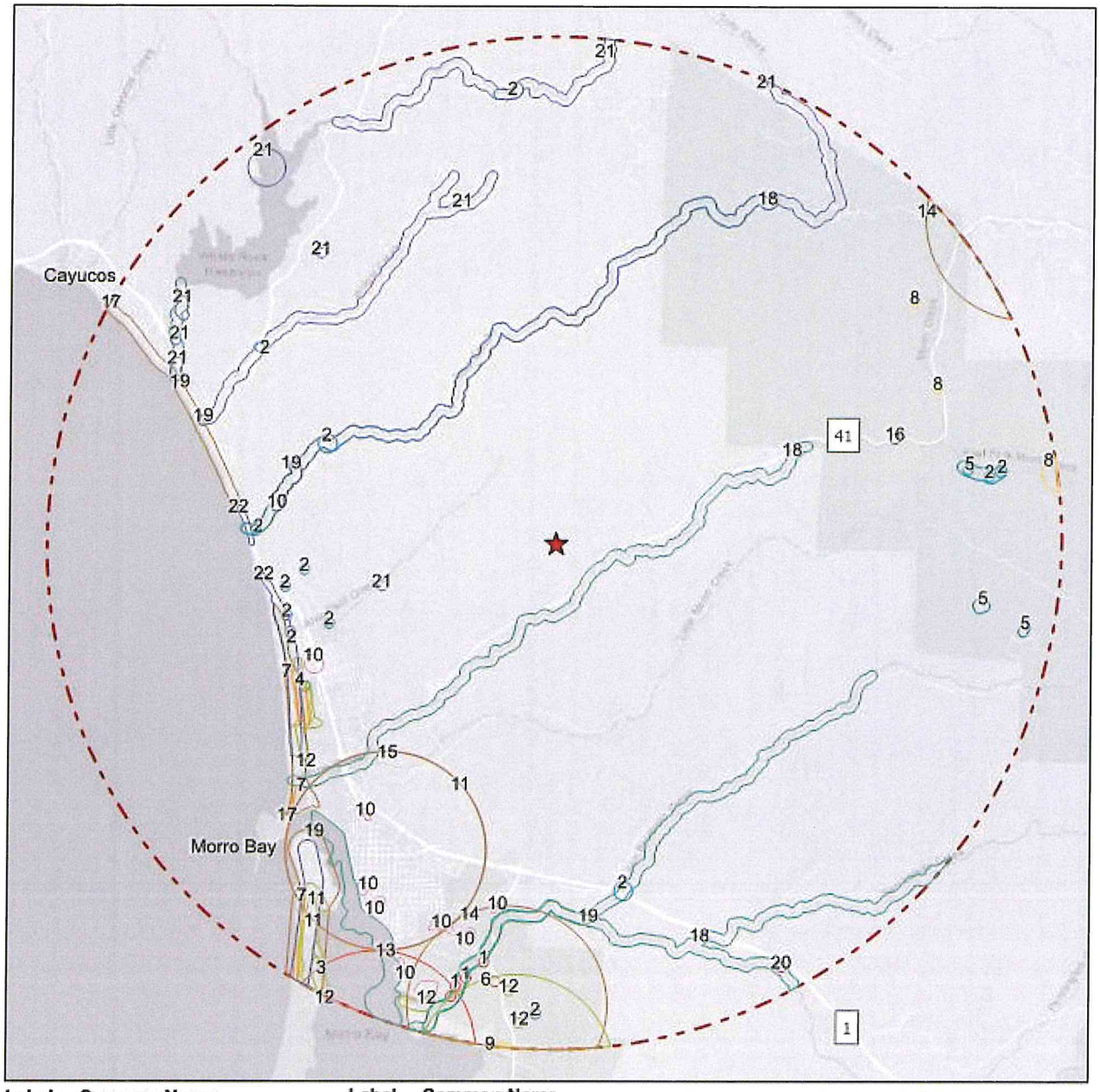
D. **San Diego Desert Woodrat** (*Neotoma lepida intermedia*) is a California Species of Special Concern (CDFW 2018b) that has a Global Rank of G5T3T4 (rounded to T3 - Vulnerable) and

a State Rank S3S4. The Global Rank of this species is based on the presumption that populations in southwestern California have declined due to habitat loss from commercial/residential/agricultural development (NatureServe 2018). San Diego desert woodrat occurs in southwestern California (north to about San Luis Obispo) south to northwestern Baja California. The northernmost record in the CNDDB is from approximately 12 miles south of the Study Area near the mouth of Coon Creek in Montana de Oro State Park. San Diego desert woodrat inhabits coastal scrub habitat with moderate to dense understory and is particularly abundant in rock outcrops, rocky cliffs, and slopes (CNDDB 2018a).

3.8.3 Wildlife Survey Results

Very little wildlife was observed in the Study Area during site visits in May and June 2019. One reptile, the coast range lizard (*Sceloporus occidentalis bocourtii*), was observed in rocky areas of coastal scrub habitat. A red-tailed hawk (*Buteo jamaicensis*) and an American crow (*Corvus brachyrhynchos*) were observed flying over the site. One adult male grasshopper sparrow (*Ammodramus savannarum*), a Species of Special Concern in California, was heard singing just west of the Study Area on a hillside with tall grasses. California ground squirrels (Otospermophilus beecheyi) were observed along the ranch road accessing the Study Area, along with sign of coyote (*Canis latrans*) and pocket gopher (*Thomomys bottae*). No other special status species were observed in or near the Study Area.

Figure 6. California Natural Diversity Database Animal Records



Label	Common Name	Label	Common Name
1	California black rail	15	Pallid bat
2	California red-legged frog	16	San Luis Obispo pyrg
3	California Ridgway's rail	17	Sandy beach tiger beetle
4	Coast horned lizard	18	Steelhead - south-central California coast DPS
5	Coast Range newt	19	Tidewater goby
6	Cooper's hawk	20	Townsend's big-eared bat
7	Globose dune beetle	21	Western pond turtle
8	Lesser slender salamander	22	Western snowy plover
9	Mimic tryonia (=California brackishwater snail)		
10	Monarch - California overwintering population		
11	Morro Bay blue butterfly		
12	Morro shoulderband (=banded dune) snail		
13	Northern California legless lizard		
14	Obscure bumble bee		

Legend

Project Location

5-Mile Radius

N

0 0.5 1 2 Miles

Guerra Ranch
Map Center: 120.81995°W 35.4117°N
Morro Bay, San Luis Obispo County

CNDDB GIS Data Last Updated: June 2019

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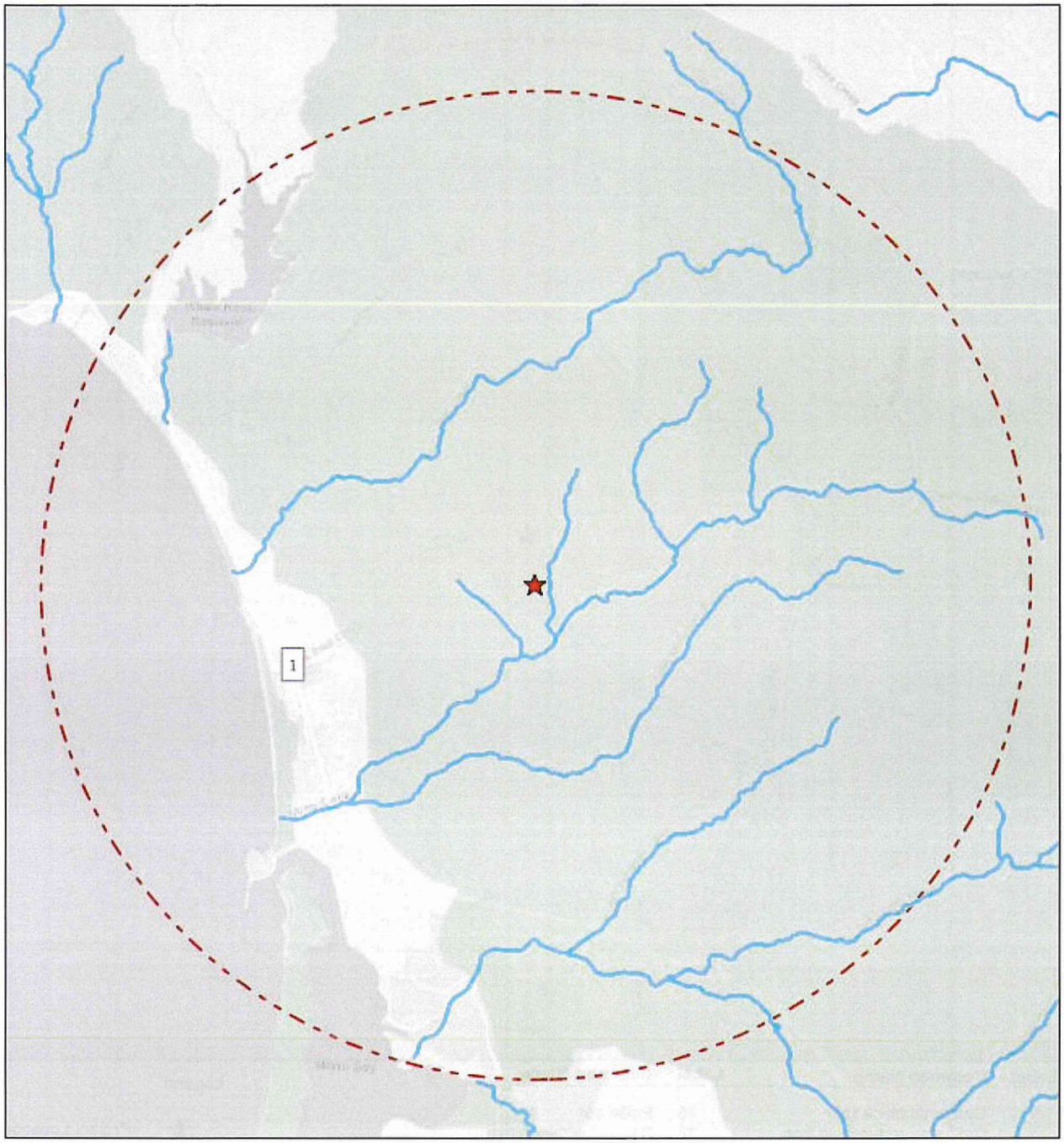
BIOLOGICAL AND ENVIRONMENTAL SERVICES

Map Updated:
July 19, 2019 04:39 PM by JBB

Figure 7. United States Fish and Wildlife Service Critical Habitat



Legend

Project Location

5-Mile Radius

Critical Habitat

Steelhead

California red-legged frog

N

0 0.5 1 2 Miles

Guerra Ranch
Map Center: 120.81992°W 35.41383°N
Morro Bay, San Luis Obispo County

USFWS Critical Habitat Data Last Updated: December 2018

ALTHOUSE AND MEADE, INC.
BIOLOGICAL AND ENVIRONMENTAL SERVICES

Map Updated:
July 19, 2019 04:39 PM by JBB

4 ENVIRONMENTAL IMPACT ANALYSIS

The proposed 31-acre foot agricultural reservoir is approximately 300 feet long by 230 feet wide and would be approximately 40 feet deep. Total area of disturbance is estimated to be 2.5 acres. The Project could affect biological resources, including nonnative annual grassland, coastal sage scrub, and ruderal habitats, special status plants, common and special status nesting birds. Mitigation measures are provided to reduce potential impacts to sensitive biological resources. Table 6 summarizes the potential or present biological resources within the Study Area, the proposed Project's level of effect on biological resources, and the mitigation measure recommended to reduce or offset potential adverse effects that could occur from the Project.

TABLE 6. IMPACT AND MITIGATION SUMMARY

Biological Resource	Effect of Proposed Project	Mitigation Measures	Mitigation Type
Nonnative Annual Grassland	Negligible	--	--
Coastal Sage Scrub	Negligible	BR-1, BR-2	Habitat Avoidance & Protection
Ruderal	Negligible	--	--
Serpentine Rock Outcrop	No Effect	--	--
Special Status Plants	Negligible	BR-1, B2-2	Habitat Avoidance & Protection
Common/Special Status Nesting Birds	Mitigable	BR-4	Pre-construction survey

4.1 Habitats

There are four types of habitat present within the Study Area: nonnative annual grassland, coastal sage scrub, ruderal, and serpentine rock outcrop. The proposed Project would permanently affect three of those habitat types. Temporary impacts could occur outside the footprint of the permanent impact area, but information on staging and other activities was not available. Temporary impacts, if any, are expected to be small and would be limited to nonnative grassland and ruderal habitats.

Two acres of nonnative annual grassland would be permanently removed by the Project, along with 0.15 acres of coastal sage scrub and 0.37 acres of weedy ruderal habitat. Serpentine rock outcrop habitat would be avoided (Table 7; Figure 4). Coastal sage scrub is the only native habitat that would be affected. Coastal sage scrub has a Global and State rank of 5 (G5/S5), which indicates the habitat is common and secure. Mitigation for impacts to non-native or common (G4/S4 or above) habitat types is not required except where special status plants are affected. Impacts to native habitat in the Study Area should be minimized, and therefore we recommend BR-1 and BR-2 be implemented to ensure coastal sage scrub and associated special status plants are protected.

TABLE 7. POTENTIAL HABITAT IMPACTS

Habitat Type	Permanent Impact (Acres)
Nonnative annual grassland	2.00
Coastal sage scrub	0.1
Ruderal	0.4
Serpentine Rock Outcrop	0.00

4.2 Potential Wetlands and Jurisdictional Waters

Potentially jurisdictional wetlands and waters do not occur in the Study Area.

4.3 Botanical Resources

Twelve special status plants were determined to have some potential to occur in the Study Area. Botanical surveys conducted in May and June 2019 were appropriately timed to identify all special status plants with potential to occur in the Study Area. Four special status plant species were identified in the Study Area, all of which have an affinity for the serpentine rock or serpentine-derived soils. Thirty-nine Cambria morning glory plants (CRPR 4.2) were counted in two polygons totaling 1,632 square feet of occupied habitat within the Study Area, with a total plant count of 39. Club-haired mariposa lily (CRPR 4.3) occupies 4,545 square feet of habitat within the Study Area, with a total plant count of 50.

Construction of the proposed Project would affect two special status plant species, Cambria morning glory and club-haired mariposa lily. Impacts are estimated to result in loss of approximately 450 square feet of Cambria morning glory habitat and 240 square feet of club-haired mariposa lily habitat, based on polygon data collected in the field overlaid by the grading plans. Individual plant locations were not collected in the field due to the GPS unit's inaccuracy at that scale. Therefore, the number of plants impacted is calculated as a percent of the total onsite plant count based on the percent of impacted occupied habitat (Table 8; Figure 4). The Project would impact an estimated 11 Cambria morning glory plants (28% of the onsite total plant count) and 3 club-haired mariposa lily plants (5% of the onsite total plant count).

Special status plants with a CRPR ranking of 4.2 and 4.3 are "watchlist" species with limited distributions that are moderately to not very threatened in California (CNPS 2019). Cambria morning glory and club-haired mariposa lily are locally common in coastal serpentine habitats in San Luis Obispo County. Avoidance of special status plants, resulting in no net loss, is recommended where feasible. Because these two species are on the CRPR 4 list and are expected to be locally common outside the Study Area, minor impacts to these species are considered negligible and do not require mitigation. We recommend a 30 percent impact threshold be implemented, where impacts greater than 30 percent of the onsite patch size would trigger mitigation. Mitigation should be comprised of occupied habitat creation by transplanting impacted plants to expand onsite protected habitat areas.

Direct impacts to club-haired mariposa lily are estimated at 5 percent of the onsite occupied onsite habitat and therefore no mitigation is recommended. Direct impacts to Cambria morning glory

are estimated at 28 percent of the onsite occupied habitat and therefore no mitigation is recommended. Avoidance and protection measures are recommended to ensure incidental impacts to special status plants do not occur (refer to BR-1 and BR-2).

TABLE 8. POTENTIAL SPECIAL STATUS PLANTS IMPACTS

Special Status Plants	Onsite Occupied Habitat (sq. ft.)	Estimated Impacted Occupied Habitat (sq. ft.)	% Occupied Habitat Impacted	Onsite No. Plants	Estimated Impacted No. Plants
Cambria Morning Glory CRPR 4.2	1,632	450	28	39	11
Club-haired Mariposa Lily CRPR 4.3	4,545	240	5	50	3
Palmer's Spineflower CRPR 4.2	2,031	0	0	380	0
Blochman's Dudleya CRPR 1B.1	2,861	0	0	67	0

BR-1. **Avoidance**. Where feasible, project components shall be adjusted to avoid and/or minimize impacts to the mapped locations of coastal sage scrub habitat and associated special status plants in the Study Area. These resource areas should be shown on all project plans. If permanent impacts to special status plants cannot be avoided, Measures BR-2 and BR-3 shall be implemented as applicable.

BR-2. **Protection**. Construction fencing shall be used to delineate protected sensitive habitat areas within 50 feet of Project activities. Fencing shall be installed under the direction of a biologist at a location that protects coastal sage scrub and special status plants to the maximum extent feasible. Fencing shall be installed prior to commencement of construction and shall be maintained in good condition throughout construction, or until the biologist confirms the remaining work activities do not pose a risk for impacting sensitive habitat areas. Signage stating "Environmental Sensitive Area: Keep Out" shall be placed along the fencing. Entry into the protected area shall be prohibited during construction. Where approved Project impact areas are within the protected area, fencing shall be temporarily moved to facilitate the work. A biological monitor shall be present during approved Project activities within the sensitive area.

BR-3. **Mitigation**. If direct impacts to special status plants cannot be avoided, CRPR 4 species such as Cambria morning glory and club-haired mariposa lily shall be mitigated by creating onsite habitat in protected areas of the site at a minimum ratio of 1:1 for all impacts greater than 30% of the onsite occupied habitat. A mitigation monitoring plan shall be completed if proposed impacts exceed 30% of the onsite populations.

4.4 Wildlife Resources

Four special status animals have potential to occur in the Study Area. Only one, grasshopper sparrow, was detected during 2019 site surveys, and it was not present inside the Study Area but still has a High potential to occur. Nesting California horned larks and northern harriers are unlikely but possible for the area. Preconstruction surveys for nesting birds are recommended to offset potential adverse impacts on special status bird species.

Nest sites of San Diego desert woodrat were not observed in the rocky habitats in the Study Area, and we expect this species is not present even though a trapping study was not conducted. The proposed Project is not likely to impact desert woodrats and no further surveys or mitigations are recommended.

4.4.1 Nesting Birds

Impacts to or take of nesting birds could occur if Project construction activities or operations phase vegetation management activities are conducted during nesting season (February 1 through September 15). A variety of common bird species are expected to nest in all habitat types in the Project 1 footprint. Raptor nests were not present within 500 feet of the Project 1 footprint during the spring 2019 surveys. To reduce potential adverse effects of the proposed Project on nesting birds, the following mitigation measure is recommended.

BR-4. During the construction and operation phase of the Project, within one week prior to any ground or vegetation disturbance activities, including equipment staging and mowing, if work occurs between February 1 and September 15, nesting bird surveys shall be conducted. Surveys may be phased if appropriate to coincide with scheduled construction activities. If surveys do not locate nesting birds, construction activities may be conducted. If nesting birds are located, no construction activities shall occur within 100 feet of nests. Occupied nests of special status bird species within Project work areas shall be mapped using GPS or survey equipment. Work shall not be allowed within a 300-foot buffer (for non-raptors) or 500-foot buffer (for raptors) while the nest is in use. The buffer zone shall be delineated on the ground with highly visible fencing or rope barriers where it overlaps work areas. The Project biologist conducting the nesting survey shall have the authority to reduce or increase the recommended buffer depending upon site conditions and the species. Occupied nests of special status bird species shall be monitored at least every two weeks through the nesting season to document nest success and check for Project compliance with buffer zones. Once nests are deemed inactive and/or chicks have fledged and are no longer dependent on the nest, work may commence in these areas. A pre-construction survey report shall be submitted to the County immediately upon completion of the survey. The report shall detail appropriate fencing or flagging of the buffer zone and make recommendations on additional monitoring requirements, where applicable. A map of the Project site and nest locations shall be included with the report.

5 REFERENCES

Baldwin BG, Goldman DH, Keil DJ, Patterson R, Rosatti TJ, Dieter H. Wilken DH, editors. 2012. The Jepson manual: vascular plants of California. 2nd ed. Berkeley (CA): UC Press.

[CDFW] California Department of Fish and Wildlife, California Interagency Wildlife Task Group. 2014. CWHR version 9.0 personal computer program. Sacramento, CA.

[CDFW] California Department of Fish and Wildlife. 2018. Guidelines for assessing the effects of proposed projects on rare, threatened, and endangered plants and natural communities. [cited 2019 August 28]. 2nd ed.

[CDFW] California Department of Fish and Wildlife. 2018. Protocols for surveying and evaluating impacts to special status native plant populations and natural communities. California Department of Fish and Wildlife.

[CNDDB] California Department of Fish and Wildlife, Natural Diversity Database. 2018. Special Animals List [Internet]. Sacramento (CA): California Department of Fish and Wildlife; [August 2018]. Available from http://www.dfg.ca.gov/wildlife/nongame/list.html.

[CNDDB] California Department of Fish and Wildlife, Natural Diversity Database. 2018. Special vascular plants, bryophytes, and lichens list [Internet]. Sacramento (CA): California Department of Fish and Wildlife; [August 2019]. Available from http://www.dfg.ca.gov/wildlife/nongame/list.html.

[CNPS] California Native Plant Society. 2001. CNPS botanical survey guidelines [Internet]. Sacramento (CA): California Native Plant Society; [cited 2019 August 28] Available from https://www.cnps.org/plant-science/field-protocols-guidelines.

[CNPS] California Native Plant Society, Rare Plant Program. 2019. Inventory of Rare and Endangered Plants of California (online edition, v8-03 0.39). Website http://www.rareplants.cnps.org.

Consortium of California Herbaria [Internet] 2011. Berkeley (CA): Regents of the University of California; [cited 2019 August 28]. Available from http://ucjeps.berkeley.edu/consortium/.

County of San Luis Obispo, Planning and Building Department. 2016. Draft guidelines for biological resources assessments. San Luis Obispo (CA): County of San Luis Obispo.

County of San Luis Obispo, Planning and Building Department. 2018. Coastal zone land use ordinance, local coastal program. San Luis Obispo (CA): County of San Luis Obispo.

Loughman DL, McLandress MR. 1994. Reproductive success and nesting habitats of northern harriers in California. California Waterfowl Assoc. 4630.

[NAIP] National Agriculture Imagery Program. 2018. Aerial photomosaic of San Luis Obispo County [Internet]. Washington (DC): United States Department of Agriculture (USDA); Available from https://www.fsa.usda.gov/programs-and-services/aerial-photography/index

NatureServe. 2018. Neotoma macrotis luciana. Arlington, VA: NatureServe. [accessed 2018 Aug]. http://explorer.natureserve.org/servlet/NatureServe?searchName=Neotoma+macrotis+luciana.

Shuford WD, Gardali T, editors. 2008. California bird species of special concern 2006: A ranked assessment of species, subspecies, and distinct populations of birds of immediate conservation concern in California. Camarillo and Sacramento (CA): Western Field Ornithologists and California Department of Fish and Game 65 p.

Soil Survey Staff, Natural Resources Conservation Service. 2018. Web soil survey [Internet]. Washington (DC): United States Department of Agriculture (US); [cited 2019 July 18]. Available from http://websoilsurvey.nrcs.usda.gov/.

[USFWS] U.S. Fish and Wildlife Service (US). 2000. Guidelines for conducting and reporting botanical inventories for federally, proposed, and candidate species. Washington (DC): U.S. Fish and Wildlife.

6 APPENDICES

- **Appendix A. Special Status Plants Reported from the Region**
- **Appendix B. Special Status Animals Reported from the Region**
- **Appendix C. Site Plans**
- **Appendix D. CNDDB Reports**

APPENDIX A. SPECIAL STATUS PLANTS REPORTED FROM THE REGION

	Common Name	Scientific Name	Federal/State Status	Global/State Rank	CA Rare Plant Rank	Blooming Period	Habitat Preference	Potential to Occur
1.	**Red sand-verbena**	*Abronia maritima*	-/-	G4/S3?	4.2	Feb-Nov	Dunes.	No. Appropriate habitat is not present in the Study Area.
2.	**Hoover's bent grass**	*Agrostis hooveri*	-/-	G2/S2	1B.2	Apr-Jul	Chaparral, cismontane woodland, closed-cone coniferous forest, valley and foothill grassland.	No. Appropriate habitat is not present in the Study Area.
3.	**Douglas' fiddleneck**	*Amsinckia douglasiana*	-/-	G4/S4	4.2	Mar-May	Monterey shale, dry.	No. Appropriate habitat is not present in the Study Area.
4.	**Arroyo de la Cruz manzanita**	*Arctostaphylos cruzensis*	-/-	G1G2/S1S2	1B.2	Dec-Mar	Coastal chaparral and scrub, Los Osos to Big Sur.	No. Appropriate habitat is not present in the Study Area.
5.	**Santa Lucia manzanita**	*Arctostaphylos luciana*	-/-	G2/S2	1B.2	Dec-Mar	Chaparral, cismontane woodland.	No. Appropriate habitat is not present in the Study Area.
6.	**Morro manzanita**	*Arctostaphylos morroensis*	Threatened/-	G1/S1	1B.1	Dec-Mar	Chaparral, cismontane woodland, coastal dunes, coastal scrub.	No. Study Area is outside the known range of the species.
7.	**Bishop manzanita**	*Arctostaphylos obispoensis*	-/-	G3/S3	4.3	Feb-Jun	Rocky, gen serpentine soils, chaparral, open close-cone forest near coast.	No. Habitat is suitable, but Study Area is outside the known range of the species.
8.	**Oso manzanita**	*Arctostaphylos osoensis*	-/-	G1/S1	1B.2	Feb-Mar	Chaparral, cismontane woodland.	No. Appropriate habitat is not present in the Study Area.

	Common Name	Scientific Name	Federal/State Status	Global/State Rank	CA Rare Plant Rank	Blooming Period	Habitat Preference	Potential to Occur
9.	**Pecho manzanita**	*Arctostaphylos pechoensis*	-/-	G2/S2	1B.2	Nov-Mar	Closed-cone coniferous forest, chaparral, coastal scrub.	No. Appropriate habitat is not present in the Study Area.
10.	**Santa Margarita manzanita**	*Arctostaphylos pilosula*	-/-	G2?/S2?	1B.2	Dec-May	Closed-cone coniferous forest, chaparral, broadleafed upland forest, cismontane woodland.	No. Appropriate habitat is not present in the Study Area.
11.	**Dacite manzanita**	*Arctostaphylos tomentosa* subsp. *daciticola*	-/-	G4T1/S1	1B.1	Mar-May	Chaparral, cismontane woodland.	No. Appropriate habitat is not present in the Study Area.
12.	**Marsh sandwort**	*Arenaria paludicola*	Endangered/ Endangered	G1/S1	1B.1	May-Aug	Marshes and swamps.	No. Appropriate habitat is not present in the Study Area
13.	**Carlotta Hall's lace fern**	*Aspidotis carlotta-halliae*	-/-	G3/S3	4.2	Jan-Dec	Generally serpentine slopes, crevices, outcrops.	No. Suitable habitat but the Study Area is outside the known range of the species.
14.	**Miles' milk-vetch**	*Astragalus didymocarpus var. milesianus*	-/-	G5T2/S2	1B.2	Mar-Jun	Coastal scrub, grassland, often in serpentine soil.	**Low**. Appropriate habitat is present in the Study Area, however it is poor quality.
15.	**Salinas milk-vetch**	*Astragalus macrodon*	-/-	G4/S4	4.3	Apr-Jul	Sandstone, shale, or serpentinite	No. Appropriate habitat is not present in the Study Area.
16.	**Ocean bluff milk-vetch**	*Astragalus nuttallii* var. *nuttallii*	-/-	G4T4/S4	4.2	Jan-Nov	Rocks, coastal bluff scrub, coastal dunes	No. Appropriate habitat is not present in the Study Area.

	Common Name	Scientific Name	Federal/State Status	Global/State Rank	CA Rare Plant Rank	Blooming Period	Habitat Preference	Potential to Occur
17.	**Coulter's saltbush**	*Atriplex coulteri*	-/-	G3/S1S2	1B.2	Mar-Oct	Coastal bluff scrub, coastal dunes, coastal scrub, valley and foothill grassland.	No. Appropriate habitat is not present in the Study Area.
18.	**False gray horsehair lichen**	*Bryoria pseudocapillaris*	-/-	G3/S2	3.2	n/a	Maritime chaparral in Los Osos and Baywood.	No. Appropriate habitat is not present in the Study Area.
19.	**Twisted horsehair lichen**	*Bryoria spiralifera*	-/-	G3/S1S2	1B.1	n/a	Maritime chaparral in Los Osos and Baywood.	No. Appropriate habitat is not present in the Study Area.
20.	**Club-haired mariposa lily**	*Calochortus clavatus* var. *clavatus*	-/-	G4T3/S3	4.3	(Mar)May-Jun	Usually serpentinite, clay, rocky	**Present**. Club-haired mariposa lily occurs in the Study Area.
21.	**Arroyo de la Cruz mariposa lily**	*Calochortus clavatus* var. *recurvifolius*	-/-	G4T1/S1	1B.2	Jun-Jul	Coastal chaparral, scrub, prairie, yellow pine forest.	No. Study Area is outside the known range of this variety.
22.	**San Luis mariposa-lily**	*Calochortus obispoensis*	-/-	G2/S2	1B.2	May-Jul	Chaparral, cismontane woodland, coastal scrub, valley and foothill grassland.	**Low**. Suitable habitat is present but the species is not known to occur in the Morro Bay area.
23.	**La Panza mariposa-lily**	*Calochortus simulans*	-/-	G2/S2	1B.3	Apr-Jun	Valley and foothill grassland, cismontane woodland, chaparral, lower montane coniferous forest.	No. Appropriate habitat is not present in the Study Area.
24.	**Dwarf calycadenia**	*Calycadenia villosa*	-/-	G3/S3	1B.1	May-Oct	Rocky, fine soils	No. Appropriate habitat is not present in the Study Area.

	Common Name	Scientific Name	Federal/State Status	Global/State Rank	CA Rare Plant Rank	Blooming Period	Habitat Preference	Potential to Occur
25.	**Cambria morning-glory**	*Calystegia subacaulis* subsp. *episcopalis*	-/-	G3T2?/S2?	4.2	(Mar) Apr-Jun (Jul)	Chaparral, cismontane woodland, coastal prairie, valley and foothill grassland.	**Present.** Cambria morning-glory occurs in the Study Area.
26.	**Hardham's evening-primrose**	*Camissoniopsis hardhamiae*	-/-	G2/S2	1B.2	Mar-May	Chaparral, cismontane woodland.	No. Appropriate habitat is not present in the Study Area.
27.	**San Luis Obispo sedge**	*Carex obispoensis*	-/-	G3?/S3?	1B.2	Apr-Jun	Closed-cone coniferous forest, chaparral, coastal prairie, coastal scrub, valley and foothill grassland.	No. Appropriate habitat is not present in the Study Area.
28.	**Lemmon's jewelflower**	*Caulanthus lemmonii*	-/-	G3/S3	1B.2	Feb-May	Pinyon and juniper woodland, valley and foothill grassland.	No. Appropriate habitat is not present in the Study Area.
29.	**San Luis Obispo owl's-clover**	*Castilleja densiflora* var. *obispoensis*	-/-	G5T2/S2	1B.2	Mar-May	Valley and foothill grassland, meadows and seeps.	**Moderate**. Appropriate habitat is present in the Study Area.
30.	**Lompoc ceanothus**	*Ceanothus cuneatus* var. *fascicularis*	-/-	G5T4/S4	4.2	Feb-Apr	Coastal chaparral with sandy substrates.	No. Appropriate habitat is not present in the Study Area.
31.	**San Luis Obispo ceanothus**	*Ceanothus thyrsiflorus* var. *obispoensis*	-/-	G5T1/S1	1B.1	Jun	Dacite soils in chapparal and woodland.	No. Appropriate habitat is not present in the Study Area.
32.	**Congdon's tarplant**	*Centromadia parryi* subsp. *congdonii*	-/-	G3T1T2/S1S2	1B.1	May-Oct (Nov)	Valley and foothill grassland.	No. Appropriate habitat is not present in the Study Area.

	Common Name	Scientific Name	Federal/State Status	Global/State Rank	CA Rare Plant Rank	Blooming Period	Habitat Preference	Potential to Occur
33.	**Island mountain-mahogany**	*Cercocarpus betuloides* var. *blancheae*	-/-	G5T4/S4	4.3	Feb-May	Chapparal	No. Appropriate habitat is not present in the Study Area.
34.	**Coastal goosefoot**	*Chenopodium littoreum*	-/-	G1/S1	1B.2	Apr-Aug	Coastal dunes.	No. Appropriate habitat is not present in the Study Area.
35.	**Dwarf soaproot**	*Chlorogalum pomeridianum* var. *minus*	-/-	G5T3/S3	1B.2	May-Aug	Chaparral.	No. Appropriate habitat is not present in the Study Area.
36.	**Salt marsh bird's-beak**	*Chloropyron maritimum* subsp. *maritimum*	Endangered/ Endangered	G4?T1/S1	1B.2	May-Oct (Nov)	Marshes and swamps, coastal dunes.	No. Appropriate habitat is not present in the Study Area.
37.	**Brewer's spineflower**	*Chorizanthe breweri*	-/-	G3/S3	1B.3	Apr-Aug	Chaparral, cismontane woodland, coastal scrub, closed-cone coniferous forest.	**Low**. Appropriate habitat is present, but the species is not known to occur in coastal Morro Bay.
38.	**Douglas' spineflower**	*Chorizanthe douglasii*	-/-	G4/S4	4.3	Apr-Jul	Sandy or gravelly	No. Appropriate habitat is not present in the Study Area.
39.	**Peninsular spineflower**	*Chorizanthe leptotheca*	-/-	G3/S3	4.2	May-Aug	Alluvial fan, granitic	No. Appropriate habitat is not present in the Study Area.
40.	**Palmer's spineflower**	*Chorizanthe palmeri*	-/-	G4/S4	4.2	Apr-Aug	Rocky, serpentinite	**Present**. Palmer's spineflower occurs in the Study Area.

	Common Name	Scientific Name	Federal/State Status	Global/State Rank	CA Rare Plant Rank	Blooming Period	Habitat Preference	Potential to Occur
41.	**Straight-awned spineflower**	*Chorizanthe rectispina*	-/-	G2/S2	1B.3	Apr-Jul	Chaparral, cismontane woodland, coastal scrub.	No. Appropriate habitat is not present in the Study Area.
42.	**Potbellied spineflower**	*Chorizanthe ventricosa*	-/-	G3/S3	4.3	May-Sep	Serpentinite soils in grassland and scrub.	No. Suitable habitat may be present but the Study Area is outside the known range of the species.
43.	**San Luis Obispo fountain thistle**	*Cirsium fontinale* var. *obispoense*	Endangered/ Endangered	G2T2/S2	1B.2	Feb-Jul (Aug-Sep)	Chaparral, cismontane woodland, coastal scrub, valley and foothill grassland.	No. Appropriate habitat is not present in the Study Area.
44.	**Compact cobwebby thistle**	*Cirsium occidentale* var. *compactum*	-/-	G3G4T2/S2	1B.2	Apr-Jun	Chaparral, coastal dunes, coastal prairie, coastal scrub.	No. Appropriate habitat is not present in the Study Area.
45.	**Cuesta Ridge thistle**	*Cirsium occidentale* var. *lucianum*	-/-	G3G4T2/S2	1B.2	Apr-Jun	Chaparral, woodland or forest openings, often on serpentine, on Cuesta Ridge.	No. Suitable habitat may be present but the Study Area is outside the known range of the variety.
46.	**Surf thistle**	*Cirsium rhothophilum*	-/CT	G1/S1	1B.2	Apr-Jun	Marshes, dune wetlands.	No. Appropriate habitat is not present in the Study Area.
47.	**La Graciosa thistle**	*Cirsium scariosum* var. *loncholepis*	FE/CT	G5T1/S1	1B.1	May-Aug	Marshes, dune wetlands.	No. Appropriate habitat is not present in the Study Area.
48.	**Popcorn lichen**	*Cladonia firma*	-/-	G4/S1	2B.1	n/a	Coastal dunes, coastal scrub; on sand.	No. Appropriate habitat is not present in the Study Area.

	Common Name	Scientific Name	Federal/State Status	Global/State Rank	CA Rare Plant Rank	Blooming Period	Habitat Preference	Potential to Occur
49.	**Pismo clarkia**	*Clarkia speciosa* subsp. *immaculata*	Endangered/ Rare	G4T1/S1	1B.1	May-Jul	Chaparral, cismontane woodland, valley and foothill grassland.	No. Appropriate habitat is not present in the Study Area.
50.	**Monkey-flower savory**	*Clinopodium mimuloides*	-/-	G3/S3	4.2	Jun-Oct	Moist places, streambanks, chaparral, woodland.	No. Appropriate habitat is not present in the Study Area.
51.	**Paniculate tarplant**	*Deinandra paniculata*	-/-	G4/S4	4.2	(Mar)Apr-Nov(Dec)	Usually vernally mesic, sometimes sandy	No. Appropriate habitat is not present in the Study Area.
52.	**Small-flowered gypsum-loving larkspur**	*Delphinium gypsophilum* subsp. *parviflorum*	-/-	G4T2T3Q/S2S3	3.2	(Mar)Apr-Jun	Rocky clay, sometimes serpentinite.	No. Appropriate habitat is not present in the Study Area.
53.	**Dune larkspur**	*Delphinium parryi* subsp. *blochmaniae*	-/-	G4T2/S2	1B.2	Apr-Jun	Chaparral, coastal dunes (maritime).	No. Appropriate habitat is not present in the Study Area.
54.	**Eastwood's larkspur**	*Delphinium parryi* subsp. *eastwoodiae*	-/-	G4T2/S2	1B.2	(Feb)Mar-Mar	Chaparral, valley and foothill grassland.	**Moderate**. Appropriate habitat is present in the Study Area.
55.	**Umbrella larkspur**	*Delphinium umbraculorum*	-/-	G3/S3	1B.3	Apr-Jun	Cismontane woodland, chaparral.	No. Appropriate habitat is not present in the Study Area.
56.	**Beach spectaclepod**	*Dithyrea maritima*	-/Threatened	G1/S1	1B.1	Mar-May	Coastal dunes, coastal scrub.	No. Appropriate habitat is not present in the Study Area.
57.	**Betty's dudleya**	*Dudleya abramsii* subsp. *bettinae*	-/-	G4T2/S2	1B.2	May-Jul	Coastal scrub, valley and foothill grassland, chaparral.	**High**. Appropriate habitat is present in the Study Area.

	Common Name	Scientific Name	Federal/State Status	Global/State Rank	CA Rare Plant Rank	Blooming Period	Habitat Preference	Potential to Occur
58.	**Mouse-gray dudleya**	*Dudleya abramsii* subsp. *murina*	-/-	G4T2/S2	1B.3	May-Jun	Chaparral, cismontane woodland, valley and foothill grassland.	**Moderate**. Appropriate serpentine outcrops occur in the Study Area.
59.	**Blochman's dudleya**	*Dudleya blochmaniae* subsp. *blochmaniae*	-/-	G3T2/S2	1B.1	Apr-Jun	Coastal scrub, coastal bluff scrub, chaparral, valley and foothill grassland.	**Present**. Blochman's dudleya occurs in the Study Area.
60.	**Yellow-flowered eriastrum**	*Eriastrum luteum*	-/-	G2/S2	1B.2	May-Jun	Broadleafed upland forest, cismontane woodland, chaparral.	No. Appropriate habitat is not present in the Study Area.
61.	**Blochman's leafy daisy**	*Erigeron blochmaniae*	-/-	G2/S2	1B.2	Jun-Aug	Coastal dunes, coastal scrub.	No. Appropriate habitat is not present in the Study Area.
62.	**Indian Knob mountainbalm**	*Eriodictyon altissimum*	Endangered/ Endangered	G1/S1	1B.1	Mar-Jun	Chaparral (maritime), cismontane woodland, coastal scrub.	No. Appropriate habitat is not present in the Study Area.
63.	**Hoover's button-celery**	*Eryngium aristulatum* var. *hooveri*	-/-	G5T1/S1	1B.1	Jun-Aug	Vernal pools.	No. Appropriate habitat is not present in the Study Area.
64.	**Suffrutescent wallflower**	*Erysimum suffrutescens*	-/-	G3/S3	4.2	Jan-Jul (Aug)	Coastal dunes and bluffs.	No. Appropriate habitat is not present in the Study Area.
65.	**San Joaquin spearscale**	*Extriplex joaquinana*	-/-	G2/S2	1B.2	Apr-Oct	Chenopod scrub, alkali meadow, playas, valley and foothill grassland.	No. Appropriate habitat is not present in the Study Area.
66.	**Stinkbells**	*Fritillaria agrestis*	-/-	G3/S3	4.2	Mar-Jun	Clay, sometimes serpentinite, easetrn part of SLO County.	No. Appropriate habitat is not present in the Study Area.

	Common Name	Scientific Name	Federal/State Status	Global/State Rank	CA Rare Plant Rank	Blooming Period	Habitat Preference	Potential to Occur
67.	**Ojai fritillary**	*Fritillaria ojaiensis*	-/-	G3/S3	1B.2	Feb-May	Chaparral, lower montane coniferous forest, cismontane woodland.	No. Appropriate habitat is not present in the Study Area.
68.	**San Benito fritillary**	*Fritillaria viridea*	-/-	G2/S2	1B.2	Mar-May	Chaparral, cismontane woodland.	No. Appropriate habitat is not present in the Study Area.
69.	**Hardham's bedstraw**	*Galium hardhamiae*	-/-	G3/S3	1B.3	Apr-Oct	Closed-cone coniferous forest, chaparral.	No. Appropriate habitat is not present in the Study Area.
70.	**San Francisco gumplant**	*Grindelia hirsutula* var. *maritima*	-/-	G5T1Q/S1	3.2	Jun-Sep	Sandy or serpentine slopes, sea bluffs	No. Varieties of G. hirsutula are no longer recognized.
71.	**Mesa horkelia**	*Horkelia cuneata* var. *puberula*	-/-	G4T1/S1	1B.1	Feb-Jul (Sep)	Chaparral, cismontane woodland, coastal scrub; sandy soils.	No. Appropriate habitat is not present in the Study Area.
72.	**Kellogg's horkelia**	*Horkelia cuneata* var. *sericea*	-/-	G4T1?/S1?	1B.1	Apr-Sep	Closed-cone coniferous forest, coastal scrub, coastal dunes, chaparral.	No. Appropriate habitat is not present in the Study Area.
73.	**Santa Lucia horkelia**	*Horkelia yadonii*	-/-	G3/S3	4.2	Apr-Jul	Sandy meadow edges, seasonal streambeds in chaparral or foothill-pine woodland	No. Appropriate habitat is not present in the Study Area.
74.	**Santa Lucia dwarf rush**	*Juncus luciensis*	-/-	G3/S3	1B.2	Apr-Jul	Vernal pools, meadows and seeps, lower montane coniferous forest, chaparral, Great Basin scrub.	No. Appropriate habitat is not present in the Study Area.

	Common Name	Scientific Name	Federal/State Status	Global/State Rank	CA Rare Plant Rank	Blooming Period	Habitat Preference	Potential to Occur
75.	**Perennial goldfields**	*Lasthenia californica* subsp. *macrantha*	-/-	G3T2/S2	1B.2	Jan-Nov	Coastal bluff scrub, coastal dunes, coastal scrub.	No. Appropriate habitat is not present in the Study Area.
76.	**Coulter's goldfields**	*Lasthenia glabrata* subsp. *coulteri*	-/-	G4T2/S2	1B.1	Feb-Jun	Coastal salt marshes, playas, vernal pools.	No. Appropriate habitat is not present in the Study Area.
77.	**Jones' layia**	*Layia jonesii*	-/-	G2/S2	1B.2	Mar-May	Chaparral, valley and foothill grassland.	**High**. Appropriate serpentine grassland habitat is prsent in the Study Area.
78.	**Small-leaved lomatium**	*Lomatium parvifolium*	-/-	G4/S4	4.2	Jan-Jun	Pine woods, serpentine outcrops and soils.	No. Appropriate habitat is not present in the Study Area.
79.	**Jones' bush-mallow**	*Malacothamnus jonesii*	-/-	G4/S4	4.3	(Mar) Apr-Oct	Open chaparral in foothill woodland	No. Appropriate habitat is not present in the Study Area.
80.	**Carmel Valley bush-mallow**	*Malacothamnus palmeri* var. *involucratus*	-/-	G3T2Q/S2	1B.2	Apr-Oct	Chaparral, cismontane woodland, coastal scrub.	No. Appropriate habitat is not present in the Study Area.
81.	**Santa Lucia bush-mallow**	*Malacothamnus palmeri* var. *palmeri*	-/-	G3T2Q/S2	1B.2	May-Jul	Chaparral, cismontane woodland, coastal scrub.	No. Appropriate habitat is not present in the Study Area.
82.	**Oregon meconella**	*Meconella oregana*	-/-	G2G3/S2	1B.1	Mar-Apr	Shaded canyons.	No. Appropriate habitat is not present in the Study Area.
83.	**Palmer's monardella**	*Monardella palmeri*	-/-	G2/S2	1B.2	Jun-Aug	Cismontane woodland, chaparral, on serpentine.	No. Appropriate habitat is not present in the Study Area.

	Common Name	Scientific Name	Federal/State Status	Global/State Rank	CA Rare Plant Rank	Blooming Period	Habitat Preference	Potential to Occur
84.	**Southern curly-leaved monardella**	*Monardella sinuata* subsp. *sinuata*	-/-	G3T2/S2	1B.2	Apr-Sep	Coastal dunes, coastal scrub, chaparral, cismontane woodland.	No. Appropriate habitat is not present in the Study Area.
85.	**San Luis Obispo monardella**	*Monardella undulata* subsp. *undulata*	-/-	G2/S2	1B.2	May-Sep	Stabilized dunes, sandy scrub	No. Appropriate habitat is not present in the Study Area.
86.	**Woodland woollythreads**	*Monolopia gracilens*	-/-	G3/S3	1B.2	(Feb) Mar-Jul	Chaparral, serpentine grassland, cismontane woodland, sandy to rocky soils	No. Appropriate habitat is not present in the Study Area.
87.	**Shining navarretia**	*Navarretia nigelliformis* subsp. *radians*	-/-	G4T2/S2	1B.2	(Mar) Apr-Jul	Cismontane woodland, valley and foothill grassland, vernal pools.	No. Appropriate habitat is not present in the Study Area.
88.	**Coast woolly-heads**	*Nemacaulis denudata* var. *denudata*	-/-	G3G4T2/S2	1B.2	Apr-Sep	Coastal dunes.	No. Appropriate habitat is not present in the Study Area.
89.	**Narrow-petaled rein orchid**	*Piperia leptopetala*	-/-	G4/S4	4.3	May-Jul	Generally dry sites, scrub, woodland	No. Appropriate habitat is not present in the Study Area.
90.	**Hooked popcornflower**	*Plagiobothrys uncinatus*	-/-	G2/S2	1B.2	Apr-May	Chaparral, cismontane woodland, valley and foothill grassland.	No. Appropriate habitat is not present in the Study Area.
91.	**Diablo Canyon blue grass**	*Poa diaboli*	-/-	G2/S2	1B.2	Mar-Apr	Chaparral (mesic sites), cismontane woodland, coastal scrub, closed-cone coniferous forest.	No. Appropriate habitat is not present in the Study Area.
92.	**Hoffmann's sanicle**	*Sanicula hoffmannii*	-/-	G3/S3	4.3	Mar-May	Shady places in chaparral, coastal scrub.	No. Appropriate habitat is not present in the Study Area.

	Common Name	Scientific Name	Federal/State Status	Global/State Rank	CA Rare Plant Rank	Blooming Period	Habitat Preference	Potential to Occur
93.	**Adobe sanicle**	*Sanicula maritima*	-/Rare	G2/S2	1B.1	Feb-May	Meadows and seeps, valley and foothill grassland, chaparral, coastal prairie.	No. Appropriate habitat is not present in the Study Area.
94.	**Chaparral ragwort**	*Senecio aphanactis*	-/-	G3/S2	2B.2	Jan-Apr(May)	Chaparral, cismontane woodland, coastal scrub.	No. Appropriate habitat is not present in the Study Area.
95.	**San Gabriel ragwort**	*Senecio astephanus*	-/-	G3/S3	4.3	May-Jul	Rocky slopes.	No. Appropriate habitat is not present in the Study Area.
96.	**Cuesta Pass checkerbloom**	*Sidalcea hickmanii* subsp. *anomala*	-/Rare	G3T1/S1	1B.2	May-Jun	Closed-cone coniferous forest, chaparral	No. Appropriate habitat is not present in the Study Area.
97.	**Most beautiful jewelflower**	*Streptanthus albidus* subsp. *peramoenus*	-/-	G2T2/S2	1B.2	(Mar)Apr-Sep(Oct)	Chaparral, valley and foothill grassland, cismontane woodland.	No. Plants in SLO Co. have been determined to be *S. glandulosa*.
98.	**California seablite**	*Suaeda californica*	Endangered/-	G1/S1	1B.1	Jul-Oct	Marshes and swamps.	No. Appropriate habitat is not present in the Study Area.
99.	**Splitting yarn lichen**	*Sulcaria isidiifera*	-/-	G1/S1	1B.1	n/a	Maritime chaparral, only known from Los Osos and Baywood.	No. Appropriate habitat is not present in the Study Area.
100	**Saline clover**	*Trifolium hydrophilum*	-/-	G2/S2	1B.2	Apr-Jun	Marshes and swamps, valley and foothill grassland, vernal pools.	No. Appropriate habitat is not present in the Study Area.
101	**Cook's triteleia**	*Triteleia ixioides* subsp. *cookii*	-/-	G5T2T3/S2S3	1B.3	May-Jun	Cismontane woodland, closed-cone coniferous forest.	No. Appropriate habitat is not present in the Study Area.

APPENDIX B. SPECIAL STATUS ANIMALS REPORTED FROM THE REGION

	Common Name	Scientific Name	Federal/State Status	Global/State Rank	CDFW Status	Nesting / Breeding Period	Habitat Preference	Potential to Occur
1.	**Cooper's hawk**	*Accipiter cooperii*	-/-	G5/S4	WL	February 1 – September 15	Woodland, chiefly of open, interrupted or marginal type.	No. Appropriate nesting habitat is not present in the Study Area.
2.	**Tricolored blackbird**	*Agelaius tricolor*	-/Threatened	G2G3/S1S2	SSC	February 1 – September 15	Highly colonial species, most numerous in Central Valley & vicinity. Largely endemic to California.	No. Appropriate nesting or wintering habitat is not present in the Study Area.
3.	**Grasshopper sparrow***	*Ammodramus savannarum*	-/-	G5/S3	SSC	March 15 - August 15	Dense grasslands on rolling hills, lowland plains, in valleys and on hillsides on lower mountain slopes.	**High**. Grasshopper sparrows were heard singing on a hillside just west of the Study Area in May 2019.
4.	**Northern California legless lizard**	*Anniella pulchra*	-/-	G3/S3	SSC	May - September	Sandy or loose loamy soils under sparse vegetation.	No. Clay soils in the Study Area are not suitable for legless lizards.
5.	**Pallid bat**	*Antrozous pallidus*	-/-	G5/S3	SSC	Spring - Summer	Deserts, grasslands, shrublands, woodlands and forests. Most common in open, dry habitats with rocky areas for roosting.	No. Appropriate habitat is not present in the Study Area.
6.	**Golden eagle**	*Aquila chrysaetos*	-/-	G5/S3	WL/FP	February 1 – September 15	Rolling foothills, mountain areas, sage-juniper flats, and desert.	No. Appropriate nesting habitat is not present in the Study Area.

	Common Name	Scientific Name	Federal/State Status	Global/State Rank	CDFW Status	Nesting / Breeding Period	Habitat Preference	Potential to Occur
7.	**Burrowing owl**	*Athene cunicularia*	-/-	G4/S3	SSC	February 1 – September 15	Open, dry annual or perennial grasslands, deserts, and scrublands characterized by low-growing vegetation.	No. Suitable burrows are not present in the Study Area.
8.	**Lesser slender salamander**	*Batrachoseps minor*	-/-	G1/S1	SSC	n/a	South Santa Lucia Mountains in tanbark oak, coast live oak, blue oak, sycamore & laurel.	No. Appropriate habitat is not present in the Study Area.
9.	**Obscure bumble bee**	*Bombus caliginosus*	-/-	G4?/S1S2	SA	Spring	Coastal areas from Santa Barbara county to north to Washington state.	No. Appropriate habitat is not present in the Study Area.
10.	**Crotch bumble bee**	*Bombus crotchii*	-/-	G3G4/S1S2	SA	Spring	Coastal California east to the Sierra-Cascade crest and south into Mexico.	No. Appropriate habitat is not present in the Study Area.
11.	**Vernal pool fairy shrimp**	*Branchinecta lynchi*	Threatened/-	G3/S3	SA	Rainy Season	Endemic to the grasslands of the Central Valley, Central Coast mountains, and South Coast mountains, in astatic rain-filled pools.	No. Appropriate habitat is not present in the Study Area.
12.	**Ferruginous hawk**	*Buteo regalis*	-/-	G4/S3S4	WL	October - April (Wintering)	Open grasslands, sagebrush flats, desert scrub, low foothills and fringes of pinyon and juniper habitats.	No. Appropriate habitat is not present in the Study Area.
13.	**Western snowy plover**	*Charadrius alexandrinus nivosus*	Threatened/-	G3T3/S2S3	SSC	February 1 – September 15	Sandy beaches, salt pond levees & shores of large alkali lakes.	No. Appropriate habitat is not present in the Study Area.

	Common Name	Scientific Name	Federal/State Status	Global/State Rank	CDFW Status	Nesting / Breeding Period	Habitat Preference	Potential to Occur
14.	**Sandy beach tiger beetle**	*Cicindela hirticollis gravida*	-/-	G5T2/S2	SA	n/a	Inhabits areas adjacent to non-brackish water along the coast of California from San Francisco Bay to northern Mexico.	No. Appropriate habitat is not present in the Study Area.
15.	**Northern harrier**	*Circus hudsonius*	-/-	G5/S3	SSC	February 1 – September 15	Coastal salt & freshwater marsh. Nest and forage in grasslands, from salt grass in desert sink to mountain cienagas.	**Low**. Potential nesting habitat is present in grasslands in the Study Area.
16.	**Globose dune beetle**	*Coelus globosus*	-/-	G1G2/S1S2	SA	n/a	Inhabitant of coastal sand dune habitat; erratically distributed from Ten Mile Creek in Mendocino County south to Ensenada, Mexico.	No. Appropriate habitat is not present in the Study Area.
17.	**Townsend's big-eared bat**	*Corynorhinus townsendii*	-/-	G3G4/S2	SSC	Spring - Summer	Throughout California in a wide variety of habitats. Most common in mesic sites.	No. Appropriate habitat is not present in the Study Area.
18.	**Monarch - California overwintering population**	*Danaus plexippus pop. 1*	-/-	G4T2T3/S2S3	SA	September - March (aggregations)	Winter roost sites extend along the coast from northern Mendocino to Baja California, Mexico.	No. Appropriate habitat is not present in the Study Area.
19.	**Morro Bay kangaroo rat**	*Dipodomys heermanni morroensis*	Endangered/ Endangered	G3G4TH/SH	FP	n/a	Coastal sage scrub on the south side of Morro Bay.	No. Appropriate habitat is not present in the Study Area.

	Common Name	Scientific Name	Federal/State Status	Global/State Rank	CDFW Status	Nesting / Breeding Period	Habitat Preference	Potential to Occur
20.	**White-tailed kite**	*Elanus leucurus*	-/-	G5/S3S4	FP	February 1 – September 15	Rolling foothills and valley margins with scattered oaks & river bottomlands or marshes next to deciduous woodland.	No. Appropriate habitat is not present in the Study Area.
21.	**Western pond turtle**	*Emys marmorata*	-/-	G3G4/S3	SSC	April - August	A thoroughly aquatic turtle of ponds, marshes, rivers, streams and irrigation ditches, usually with aquatic vegetation, below 6000 ft elevation.	No. Appropriate habitat is not present in the Study Area.
22.	**California horned lark**	*Eremophila alpestris actia*	-/-	G5T4Q/S4	WL	February 1 – September 15	Coastal regions, chiefly from Sonoma County to San Diego County. Also main part of San Joaquin Valley and east to foothills.	**Moderate**. Potentially suitable nesting habitat is present.
23.	**Tidewater goby**	*Eucyclogobius newberryi*	Endangered/-	G3/S3	SSC	n/a	Brackish water habitats along the California coast from Agua Hedionda Lagoon, San Diego County to the mouth of the Smith River.	No. Appropriate habitat is not present in the Study Area.
24.	**Western mastiff bat**	*Eumops perotis californicus*	-/-	G5T4/S3S4	SSC	Spring-Fall	Many open, semi-arid to arid habitats, including conifer & deciduous woodlands, coastal scrub, grasslands, chaparral, etc.	No. Appropriate habitat is not present in the Study Area.

	Common Name	Scientific Name	Federal/State Status	Global/State Rank	CDFW Status	Nesting / Breeding Period	Habitat Preference	Potential to Occur
25.	**Morro shoulderband (=banded dune) snail**	*Helminthoglypta walkeriana*	Endangered/-	G1/S1S2	SA	n/a	Restricted to the coastal strand in the immediate vicinity of Morro Bay.	No. Appropriate habitat is not present in the Study Area.
26.	**Loggerhead shrike**	*Lanius ludovicianus*	-/-	G4/S4	SSC	February 1 – September 15	Broken woodlands, savannah, pinyon-juniper, Joshua tree, and riparian woodlands, desert oases, scrub & washes.	No. Appropriate nesting habitat is not present in the Study Area.
27.	**California black rail**	*Laterallus jamaicensis coturniculus*	-/Threatened	G3G4T1/S1	FP	February 1 – September 15	Inhabits freshwater marshes, wet meadows and shallow margins of saltwater marshes bordering larger bays.	No. Appropriate habitat is not present in the Study Area.
28.	**California linderiella**	*Linderiella occidentalis*	-/-	G2G3/S2S3	SA	Rainy season	Seasonal pools in unplowed grasslands with old alluvial soils underlain by hardpan or in sandstone depressions.	No. Appropriate habitat is not present in the Study Area.
29.	**San Diego desert woodrat**	*Neotoma lepida intermedia*	-/-	G5T3T4/S3S4	SSC	n/a	Coastal scrub of Southern California from San Diego County to San Luis Obispo County.	**Low**. Rocky serpentine outcrops could provide habitat.
30.	**Big free-tailed bat**	*Nyctinomops macrotis*	-/-	G5/S3	SSC	Spring - Summer	Low-lying arid areas in Southern California.	No. Appropriate habitat is not present in the Study Area.

	Common Name	Scientific Name	Federal/State Status	Global/State Rank	CDFW Status	Nesting / Breeding Period	Habitat Preference	Potential to Occur
31.	**Steelhead - southern California DPS**	*Oncorhynchus mykiss irideus pop. 10*	Endangered/-	G5T1Q/S1	SA	February - April	Federal listing refers to populations from Santa Maria River south to southern extent of range (San Mateo Creek in San Diego County).	No. Appropriate habitat is not present in the Study Area.
32.	**Steelhead - south-central California coast DPS**	*Oncorhynchus mykiss irideus pop. 9*	Threatened/-	G5T2Q/S2	SA	February - April	Federal listing refers to runs in coastal basins from the Pajaro River south to, but not including, the Santa Maria River.	No. Appropriate habitat is not present in the Study Area.
33.	**Coast horned lizard**	*Phrynosoma blainvillii*	-/-	G3G4/S3S4	SSC	May - September	Frequents a wide variety of habitats, most common in lowlands along sandy washes with scattered low bushes.	No. Appropriate habitat is not present in the Study Area.
34.	**Morro Bay blue butterfly**	*Plebejus icarioides moroensis*	-/-	G5T2/S2	SA	n/a	Inhabits stabilized dunes and adjacent areas of coastal San Luis Obispo and NW Santa Barbara counties.	No. Appropriate habitat is not present in the Study Area.
35.	**Atascadero June beetle**	*Polyphylla nubila*	-/-	G1/S1	SA	Summer	Known only from inland sand dunes in San Luis Obispo County.	No. Appropriate habitat is not present in the Study Area.
36.	**Purple martin**	*Progne subis*	-/-	G5/S3	SSC	February 1 – September 15	Inhabits woodlands, low elevation coniferous forest of Douglas-fir, ponderosa pine, and Monterey pine.	No. Appropriate nesting habitat is not present in the Study Area.
37.	**San Luis Obispo pyrg**	*Pyrgulopsis taylori*	-/-	G1/S1	SA	n/a	Freshwater habitats in San Luis Obispo County.	No. Appropriate habitat is not present in the Study Area.

	Common Name	Scientific Name	Federal/State Status	Global/State Rank	CDFW Status	Nesting / Breeding Period	Habitat Preference	Potential to Occur
38.	**California Ridgway's rail**	*Rallus obsoletus obsoletus*	Endangered/ Endangered	G5T1/S1	FP	n/a	Saltwater and brackish marshes traversed by tidal sloughs in the vicinity of San Francisco Bay.	No. Appropriate habitat is not present in the Study Area.
39.	**Foothill yellow-legged frog**	*Rana boylii*	-/Candidate Threatened	G3/S3	SSC	March - September	Partly shaded, shallow streams and riffles with a rocky substrate in a variety of habitats.	No. Appropriate habitat is not present in the Study Area.
40.	**California red-legged frog**	*Rana draytonii*	Threatened/-	G2G3/S2S3	SSC	January - September	Lowlands and foothills in or near permanent sources of deep water with dense, shrubby or emergent riparian vegetation.	No. Appropriate habitat is not present in the Study Area.
41.	**Western spadefoot**	*Spea hammondii*	-/-	G3/S3	SSC	January - August	Occurs primarily in grassland habitats but can be found in valley-foothill hardwood woodlands.	No. Appropriate habitat is not present in the Study Area.
42.	**Coast Range newt**	*Taricha torosa*	-/-	G4/S4	SSC	December - May	Coastal drainages from Mendocino County to San Diego County.	No. Appropriate habitat is not present in the Study Area.
43.	**American badger**	*Taxidea taxus*	-/-	G5/S3	SSC	February – May	Most abundant in drier open stages of most shrub, forest, and herbaceous habitats, with friable soils.	No. Appropriate habitat is not present in the Study Area.
44.	**Lompoc grasshopper**	*Trimerotropis occulens*	-/-	G1G2/S1S2	SA	n/a	Known only from Santa Barbara and San Luis Obispo counties.	Unknown.

	Common Name	Scientific Name	Federal/State Status	Global/State Rank	CDFW Status	Nesting / Breeding Period	Habitat Preference	Potential to Occur
45.	**Mimic tryonia (=California brackishwater snail)**	*Tryonia imitator*	-/-	G2/S2	SA	n/a	Inhabits coastal lagoons, estuaries and salt marshes, from Sonoma County south to San Diego County.	No. Appropriate habitat is not present in the Study Area.
46.	**Least Bell's vireo**	*Vireo bellii pusillus*	Endangered/ Endangered	G5T2/S2	SA	February 1 – September 15	Summer resident of Southern California in low riparian in vicinity of water or in dry river bottoms; below 2000 ft.	No. Appropriate nesting habitat is not present in the Study Area.
47.	**San Joaquin kit fox**	*Vulpes macrotis mutica*	Endangered/ Threatened	G4T2/S2	SA	December - July	Annual grasslands or grassy open stages with scattered shrubby vegetation.	No. The Study Area is outside the known range of the species.

APPENDIX C. SITE PLANS

GUERRA RANCH AG RESERVOIR
ONSITE IMPROVEMENT PLANS
MORRO BAY, CALIFORNIA

PROPERTY OWNER:
DALE GUERRA
TRUSTEE OF DALE GUERRA FAMILY TRUST
PHONE:

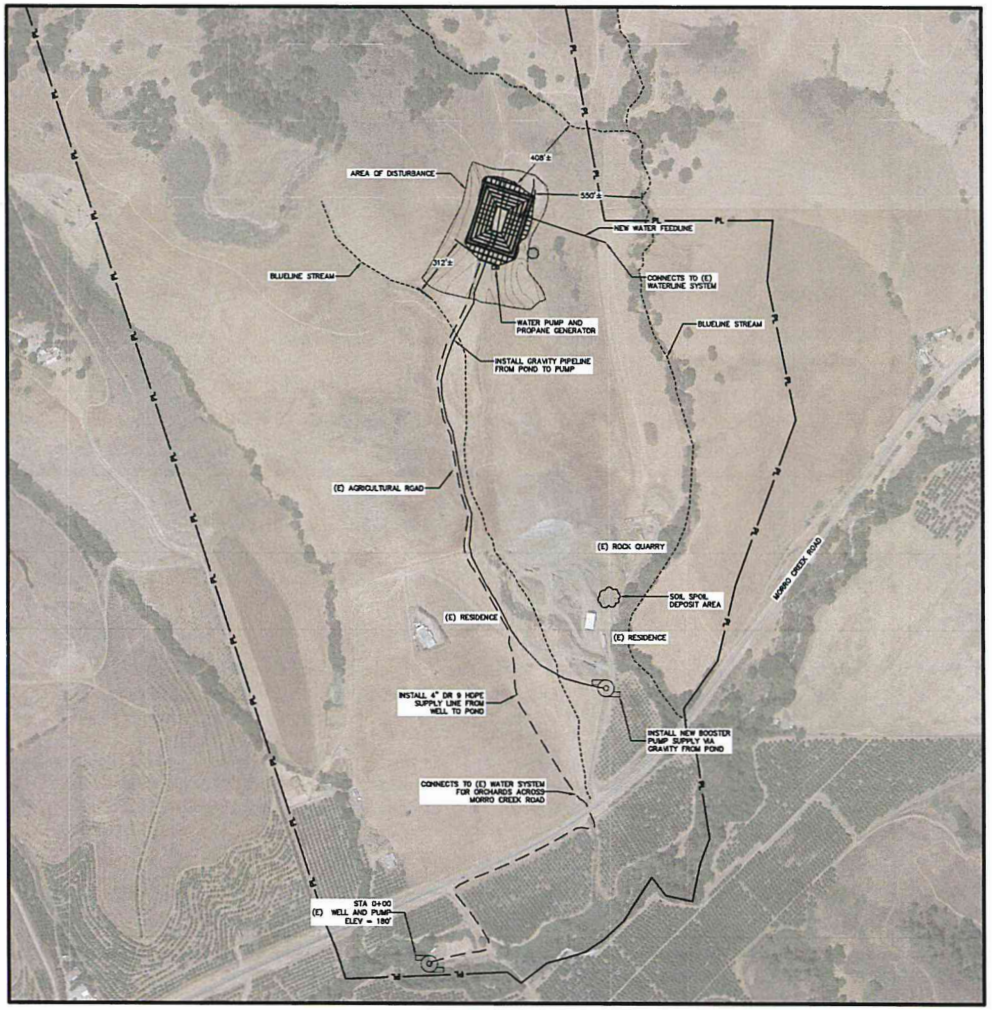
ZONING:
AGRICULTURE

PROJECT ADDRESS:
1835 ATASADERO RD
MORRO BAY, CA 93442

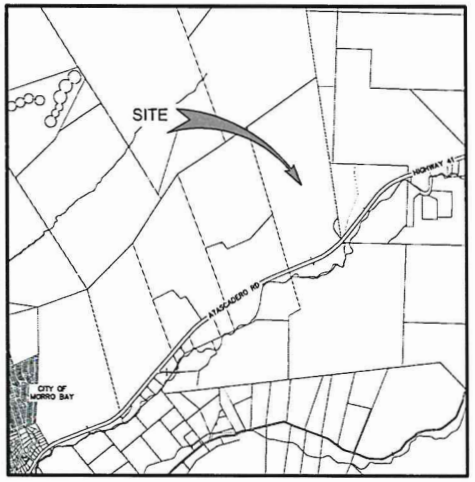
LEGAL DESCRIPTION:
PARCEL 35 (APN: 073-031-035)

Sheet List Table

Sheet Number	Sheet Title
CIVIL PLANS	
C1	SITE PLAN
C2	GRADING PLAN
C3	CROSS SECTIONS



SITE PLAN
SCALE HORIZ 1"=300'



VICINITY MAP
SCALE HORIZ 1"=2000'

1 INCH = 300 FEET

REV NO	DATE	REVISED	REV BY	CKD BY	APVD BY
		UNSIGNED ALL PRINTS REMAIN UNDER DATE			

Cannon
1000 Southwood Drive
San Luis Obispo CA 93401
P 805.543.1627 F 805.544.3963

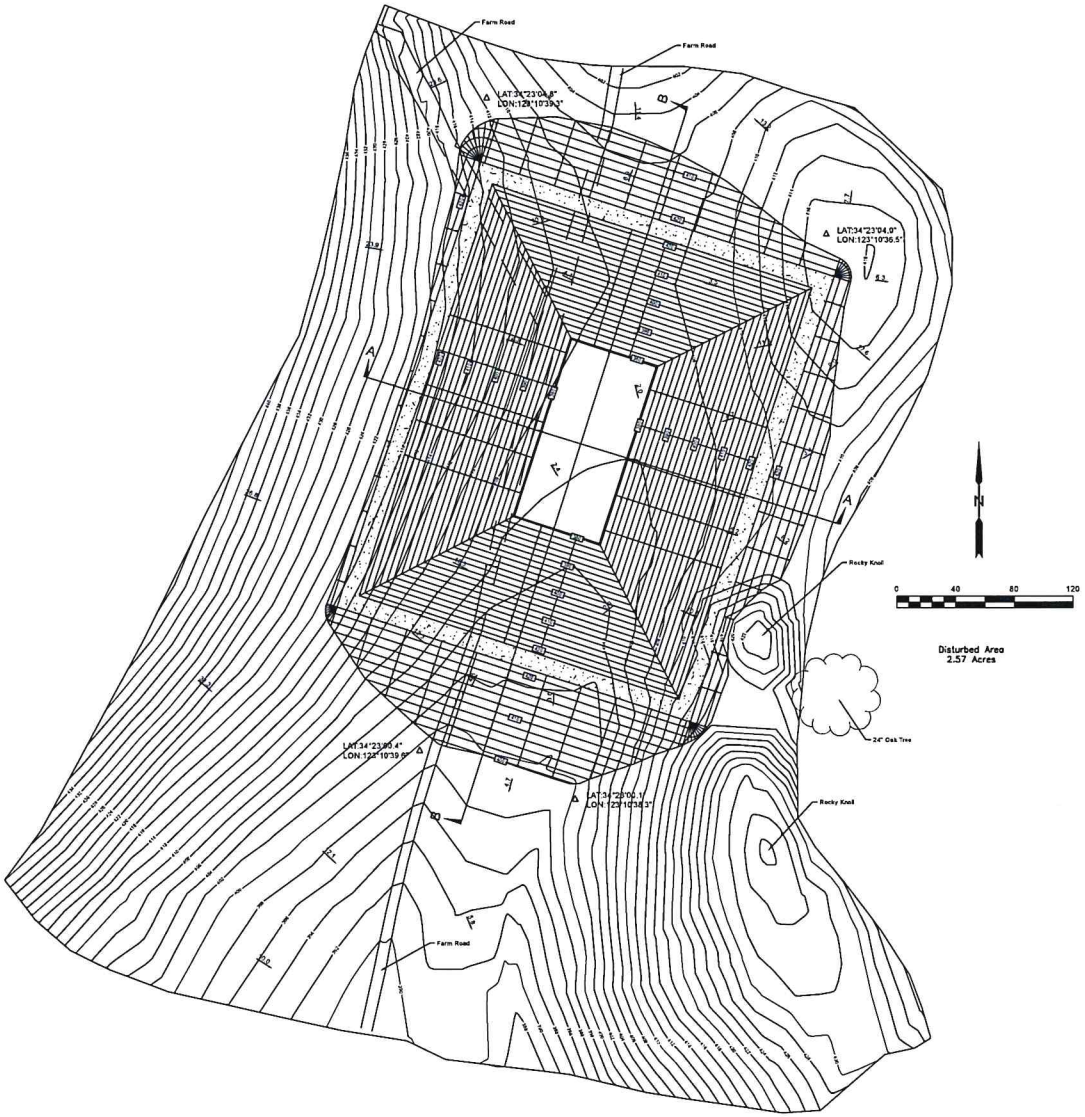
DRAWN BY TSM	DATE 5/15/2019
CHECKED BY	SCALE
	CA JOB NO. 190410

THESE DRAWINGS ARE INSTRUMENTS OF SERVICE THROUGH EXECUTION OF THE PROJECT AND ARE THE PROPERTY OF CANNON. THEY MAY NOT BE USED OR REPRODUCED WITHOUT WRITTEN PERMISSION OF CANNON.

GUERRA RANCH AG RESERVOIR
1835 ATASCADERO RD
MORRO BAY, CA 93442

SHEET
C1
OF XX

F:\proj\2019\190410\4 Production and Drafting\Const Dwgs\Civil\C1190410SP3001.dwg 5-15-19 05:08:43 PM tom



Pond Report

Top of dam elevation: 421.50
Bottom of pond elevation: 379.50
Top of dam width: 12.0
Cut Slope: 2.0:1
Fill Slope: 3.0:1
Interior Slope: 2.0:1
Existing Surface: D:\Carlson Projects\Guerra Reservoir\Guerra OG.tin

Pond Earthwork Volumes
Fill Factor: 1.30
Total cut : 23,359 C.Y.
Total fill : 22,634 C.Y.
Total disturbed area: 2.57 acres

Pond Storage Volumes

Water Elev	Storage(AcreFt)	(Gallons)	Area(Acre)
379.50	0.000	0.0	0.175
381.50	0.384	125,270	0.210
383.50	0.842	274,655	0.249
385.50	1.380	449,886	0.290
387.50	2.004	653,094	0.334
389.50	2.718	885,812	0.381
391.50	3.529	1,149,970	0.430
393.50	4.441	1,44,7400	0.483
395.50	5.462	1,779,934	0.538
397.50	6.596	2,149,403	0.596
399.50	7.849	2,557,638	0.657
401.50	9.226	3,006,472	0.721
403.50	10.734	3,497,735	0.787
405.50	12.377	4,033,260	0.857
407.50	14.162	4,614,878	0.929
409.50	16.094	5,244,419	1.004
411.50	18.179	5,923,717	1.081
413.50	20.422	6,654,602	1.162
415.50	22.829	7,438,905	1.245
417.50	25.405	8,278,459	1.332
419.50	28.157	9,175,095	1.421
421.50	31.089	10,130,683	1.514

REGISTERED PROFESSIONAL ENGINEER
TOM A. HOWELL
No. C 27037
Expires 3/30/2021
CIVIL
STATE OF CALIFORNIA

Guerra Irrigation Pond		
DRAWN TH	DATE 3/30/19	1835 Atascadero Rd Morro Bay
APPROVED	DATE	Grading Plan For review only
SCALE 1"=40'	SHEET 1 of 2	PROJECT NO. 20190327

APPENDIX D. CNDDB REPORTS

CNDDB Online Field Survey Form Report

California Natural Diversity Database
Department of Fish and Wildlife
1416 9th Street, Suite 1266
Sacramento, CA 95814
Fax: 916.324.0475
cnddb@wildlife.ca.gov
www.dfg.ca.gov/biogeodata/cnddb/

This data has been reported to the CNDDB, but may not have been evaluated by the CNDDB staff

Source code NES19F0001
Quad code 3512047
Occ. no.
EO index no.
Map index no.

Scientific name: *Chorizanthe palmeri*

Common name: Palmer's spineflower

Date of field work (mm-dd-yyyy): 06-19-2019

Comment about field work date(s):

OBSERVER INFORMATION

Observer: Kyle Nessen

Affiliation: Althouse and Meade, Inc

Address: 335 Plymouth St , Cambria, CA 93428

Email: kyle.nessen@gmail.com

Phone: (818) 522-8207

Other observers:

DETERMINATION

Keyed in:

Compared w/ specimen at:

Compared w/ image in:

By another person: Jason Dart

Other:

Identification explanation:

Identification confidence: Very confident

Species found: Yes **If not found, why not?**

Level of survey effort: Mapping effort conforms to our project area and more may be present beyond what is reported. I surveyed by meandering in serpentine outcrop. I estimated plant count by grouping.

Total number of individuals: 380

Collection? No **Collection number:**

Museum/Herbarium:

PLANT INFORMATION

Phenology:

vegetative	flowering	fruiting

SITE INFORMATION

Habitat description: Growing in serpentine outcrop with little to no soil.

Slope: Land owner/manager: Private

Aspect: South

Site condition + population viability: Good

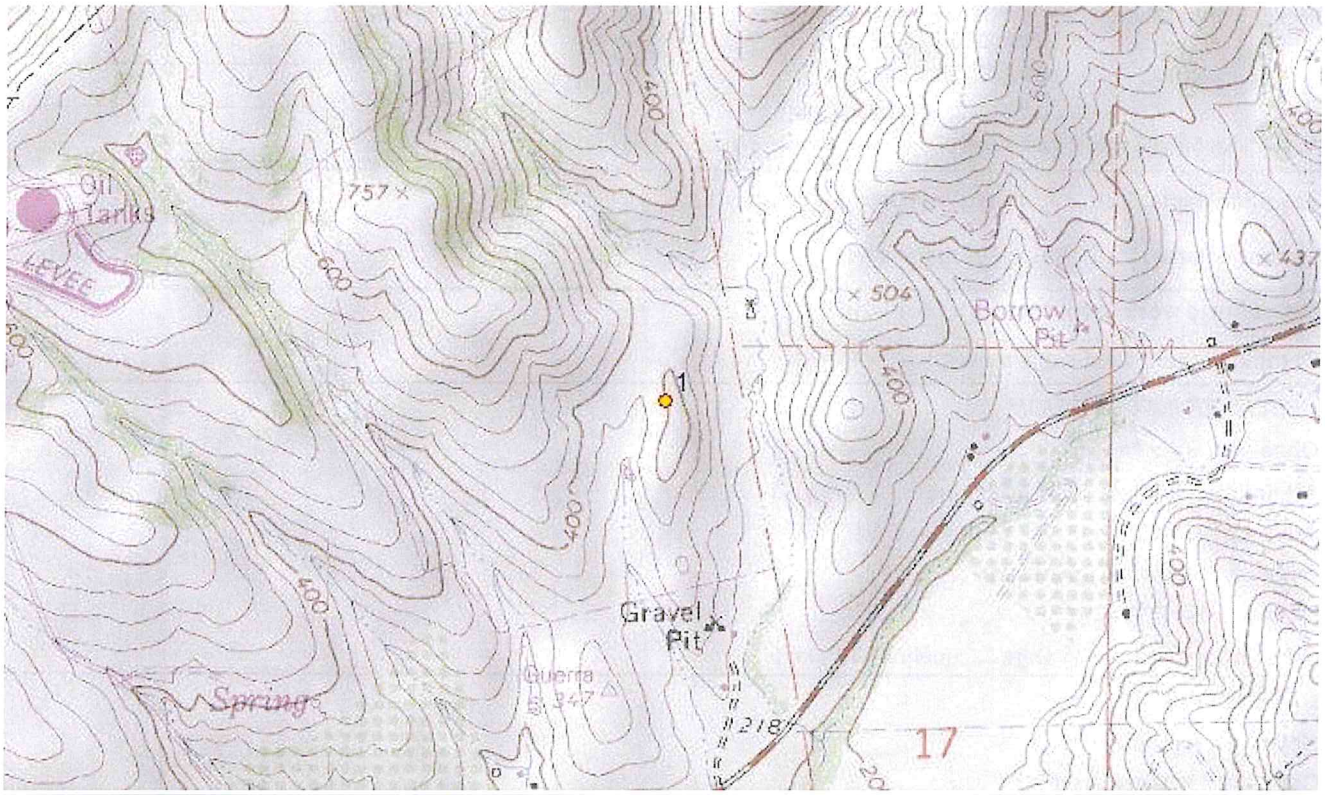
Immediate & surrounding land use: Cattle and agriculture

Visible disturbances:

Threats: Cattle grazing

General comments:

MAP INFORMATION



ID	County	24K Quadrangle	Elev. (ft)	Latitude NAD83	Longitude NAD83	UTM E NAD83	UTM N NAD83	UTM Zone
	San Luis Obispo	Morro Bay North	398	35.41100	-120.81893	698042	3920808	10
1	**Public Land Survey**	**Feature Comment**						
	M T29S R11E 17							

The mapped feature is accurate within: 5 m

Source of mapped feature: GPS

Mapping notes: Grows within serpentine outcrop.

Location/directions comments:

Attachment(s):

CNDDB Online Field Survey Form Report

California Natural Diversity Database
Department of Fish and Wildlife
1416 9th Street, Suite 1266
Sacramento, CA 95814
Fax: 916.324.0475
cnddb@wildlife.ca.gov
www.dfg.ca.gov/biogeodata/cnddb/

This data has been reported to the CNDDB, but may not have been evaluated by the CNDDB staff

Source code NES19F0002
Quad code 3512047
Occ. no.
EO index no.
Map index no.

Scientific name: *Calochortus clavatus var. clavatus*

Common name: club-haired mariposa-lily

Date of field work (mm-dd-yyyy): 06-19-2019

Comment about field work date(s):

OBSERVER INFORMATION

Observer: Kyle Nessen

Affiliation: Althouse and Meade, Inc

Address: 335 Plymouth St , Cambria, CA 93428

Email: kyle.nessen@gmail.com

Phone: (818) 522-8207

Other observers: Jason Dart, Jacqueline Tilligkeit

DETERMINATION

Keyed in: Jepson eFlora

Compared w/ specimen at:

Compared w/ image in:

By another person:

Other:

Identification explanation:

Identification confidence: Very confident

Species found: Yes **If not found, why not?**

Level of survey effort: Mapping effort conforms to our project area and more may be present beyond what is reported. I surveyed by meandering in serpentine outcrop.

Total number of individuals: 51

Collection? No **Collection number:**

Museum/Herbarium:

PLANT INFORMATION

Phenology:

vegetative	flowering	fruiting
	100 %	

SITE INFORMATION

Habitat description: Growing among serpentine rocks in annual grassland

Slope: Land owner/manager: Private

Aspect:

Site condition + population viability: Good

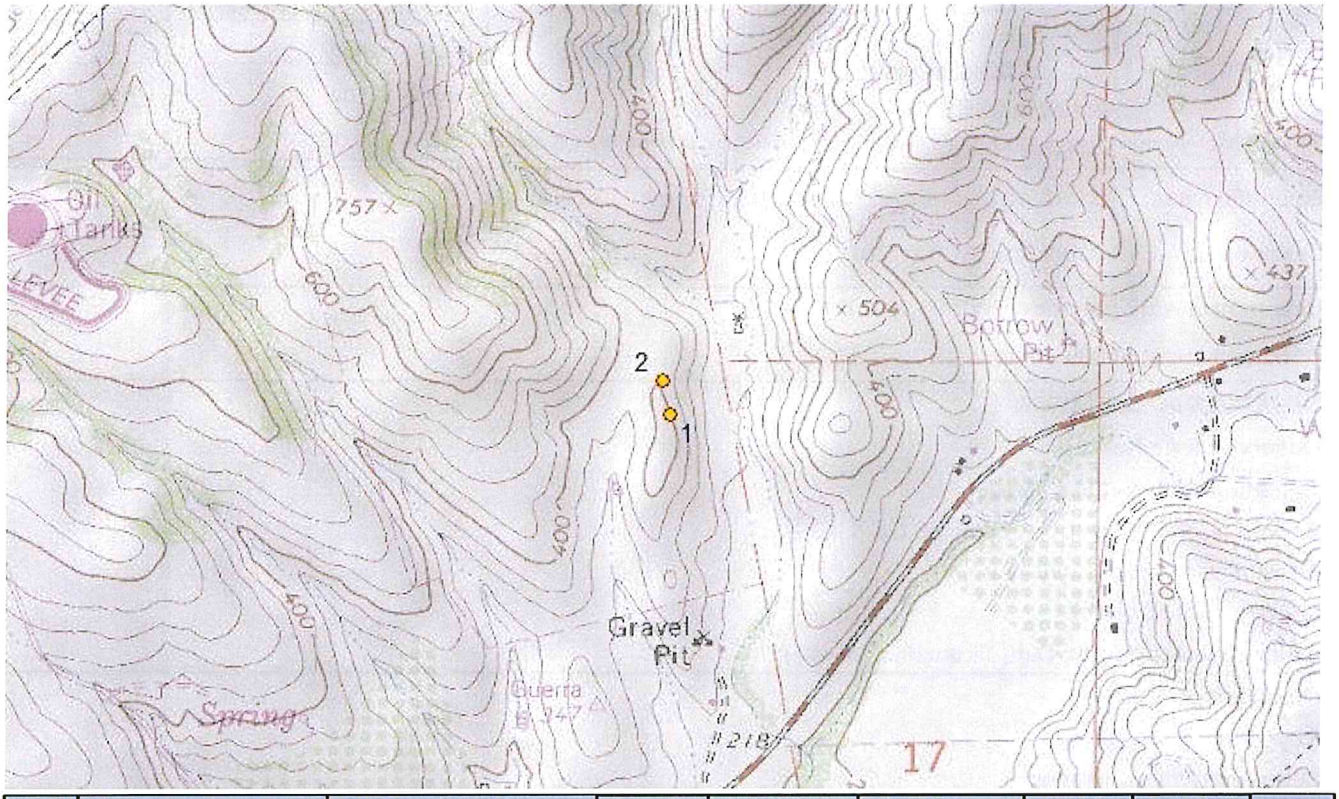
Immediate & surrounding land use: Cattle and agriculture

Visible disturbances:

Threats: Grazing

General comments:

MAP INFORMATION



ID	County	24K Quadrangle	Elev. (ft)	Latitude NAD83	Longitude NAD83	UTM E NAD83	UTM N NAD83	UTM Zone
	San Luis Obispo	Morro Bay North	407	35.41103	-120.81854	698077	3920812	10
1	**Public Land Survey**	**Feature Comment**						
	M T29S R11E 17	45 here						
ID	**County**	**24K Quadrangle**	**Elev. (ft)**	**Latitude NAD83**	**Longitude NAD83**	**UTM E NAD83**	**UTM N NAD83**	**UTM Zone**
	San Luis Obispo	Morro Bay North	391	35.41164	-120.81867	698063	3920880	10
2	**Public Land Survey**	**Feature Comment**						
	M T29S R11E 17	5 here						

The mapped feature is accurate within: 10 m

Source of mapped feature: GPS

Mapping notes:

Location/directions comments:

Attachment(s):

CNDDB Online Field Survey Form Report

California Natural Diversity Database
Department of Fish and Wildlife
1416 9th Street, Suite 1266
Sacramento, CA 95814
Fax: 916.324.0475
cnddb@wildlife.ca.gov
www.dfg.ca.gov/biogeodata/cnddb/

This data has been reported to the CNDDB, but may not have been evaluated by the CNDDB staff

Source code NES19F0003
Quad code 3512047
Occ. no.
EO index no.
Map index no.

Scientific name: *Calystegia subacaulis ssp. episcopalis*

Common name: Cambria morning-glory

Date of field work (mm-dd-yyyy): 06-19-2019

Comment about field work date(s):

OBSERVER INFORMATION

Observer: Kyle Nessen

Affiliation: Althouse and Meade, Inc

Address: 335 Plymouth St , Cambria, CA 93428

Email: kyle.nessen@gmail.com

Phone: (818) 522-8207

Other observers: Jason Dart, Jacqueline Tilligkeit

DETERMINATION

Keyed in: Jepson eFlora

Compared w/ specimen at:

Compared w/ image in:

By another person:

Other:

Identification explanation:

Identification confidence: Very confident

Species found: Yes **If not found, why not?**

Level of survey effort: Mapping effort conforms to our project area and more may be present beyond what is reported. I surveyed by meandering in serpentine outcrop.

Total number of individuals: 36

Collection? No **Collection number:**

Museum/Herbarium:

PLANT INFORMATION

Phenology:

vegetative	flowering	fruiting
80 %	20 %	

SITE INFORMATION

Habitat description: Growing in open disturbed grassland

Slope: Land owner/manager: Private

Aspect:

Site condition + population viability:

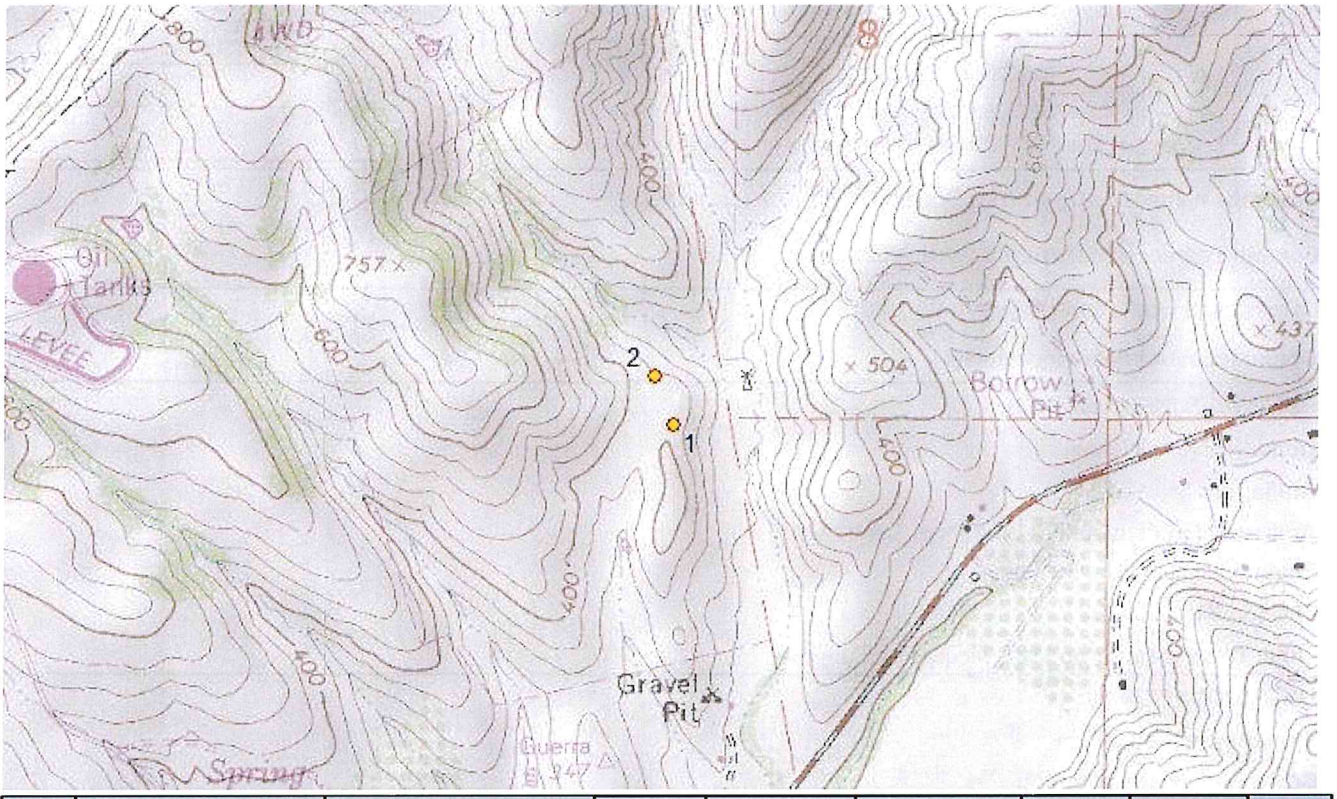
Immediate & surrounding land use: Cattle and agriculture

Visible disturbances:

Threats: Grazing

General comments:

MAP INFORMATION



ID	County	24K Quadrangle	Elev. (ft)	Latitude NAD83	Longitude NAD83	UTM E NAD83	UTM N NAD83	UTM Zone
	San Luis Obispo	Morro Bay North	376	35.41190	-120.81866	698064	3920909	10
1	**Public Land Survey**	**Feature Comment**						
	M T29S R11E 17	15 here						
ID	**County**	**24K Quadrangle**	**Elev. (ft)**	**Latitude NAD83**	**Longitude NAD83**	**UTM E NAD83**	**UTM N NAD83**	**UTM Zone**
	San Luis Obispo	Morro Bay North	370	35.41282	-120.81911	698021	3921010	10
2	**Public Land Survey**	**Feature Comment**						
	M T29S R11E 8	21 here						

The mapped feature is accurate within: 10 m

Source of mapped feature: GPS

Mapping notes:

Location/directions comments:

Attachment(s):

CNDDB Online Field Survey Form Report

California Natural Diversity Database
Department of Fish and Wildlife
1416 9th Street, Suite 1266
Sacramento, CA 95814
Fax: 916.324.0475
cnddb@wildlife.ca.gov
www.dfg.ca.gov/biogeodata/cnddb/

This data has been reported to the CNDDB, but may not have been evaluated by the CNDDB staff

Source code NES19F0004
Quad code 3512047
Occ. no.
EO index no.
Map index no.

Scientific name: *Dudleya blochmaniae ssp. blochmaniae*

Common name: Blochman's dudleya

Date of field work (mm-dd-yyyy): 06-19-2019

Comment about field work date(s):

OBSERVER INFORMATION

Observer: Kyle Nessen

Affiliation:

Address: 335 Plymouth St , Cambria, CA 93428

Email: kyle.nessen@gmail.com

Phone: (818) 522-8207

Other observers: Jason Dart, Jacqueline Tilligkeit

DETERMINATION

Keyed in: Jepson eFlora

Compared w/ specimen at:

Compared w/ image in:

By another person:

Other:

Identification explanation:

Identification confidence: Very confident

Species found: Yes **If not found, why not?**

Level of survey effort: Mapping effort conforms to our project area and more may be present beyond what is reported. I surveyed by meandering in serpentine outcrop.

Total number of individuals: 67

Collection? No **Collection number:**

Museum/Herbarium:

PLANT INFORMATION

Phenology:

vegetative	flowering	fruiting
	100 %	

SITE INFORMATION

Habitat description: Growing within serpentine rock outcrop

Slope: Land owner/manager: Private

Aspect:

Site condition + population viability: Good

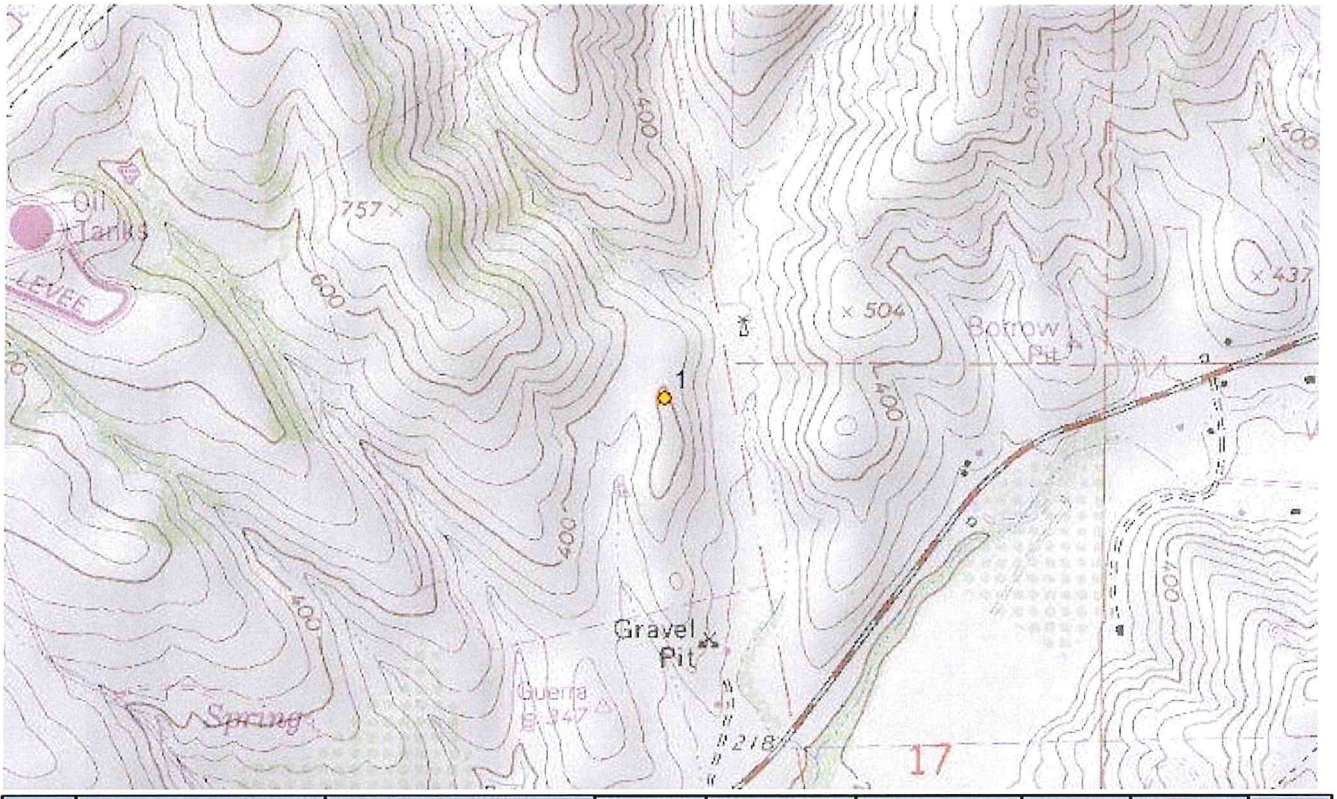
Immediate & surrounding land use: Cattle and agriculture

Visible disturbances:

Threats: Grazing

General comments:

MAP INFORMATION



ID	County	24K Quadrangle	Elev. (ft)	Latitude NAD83	Longitude NAD83	UTM E NAD83	UTM N NAD83	UTM Zone
	San Luis Obispo	Morro Bay North	407	35.41136	-120.81878	698054	3920849	10
1	**Public Land Survey**	**Feature Comment**						
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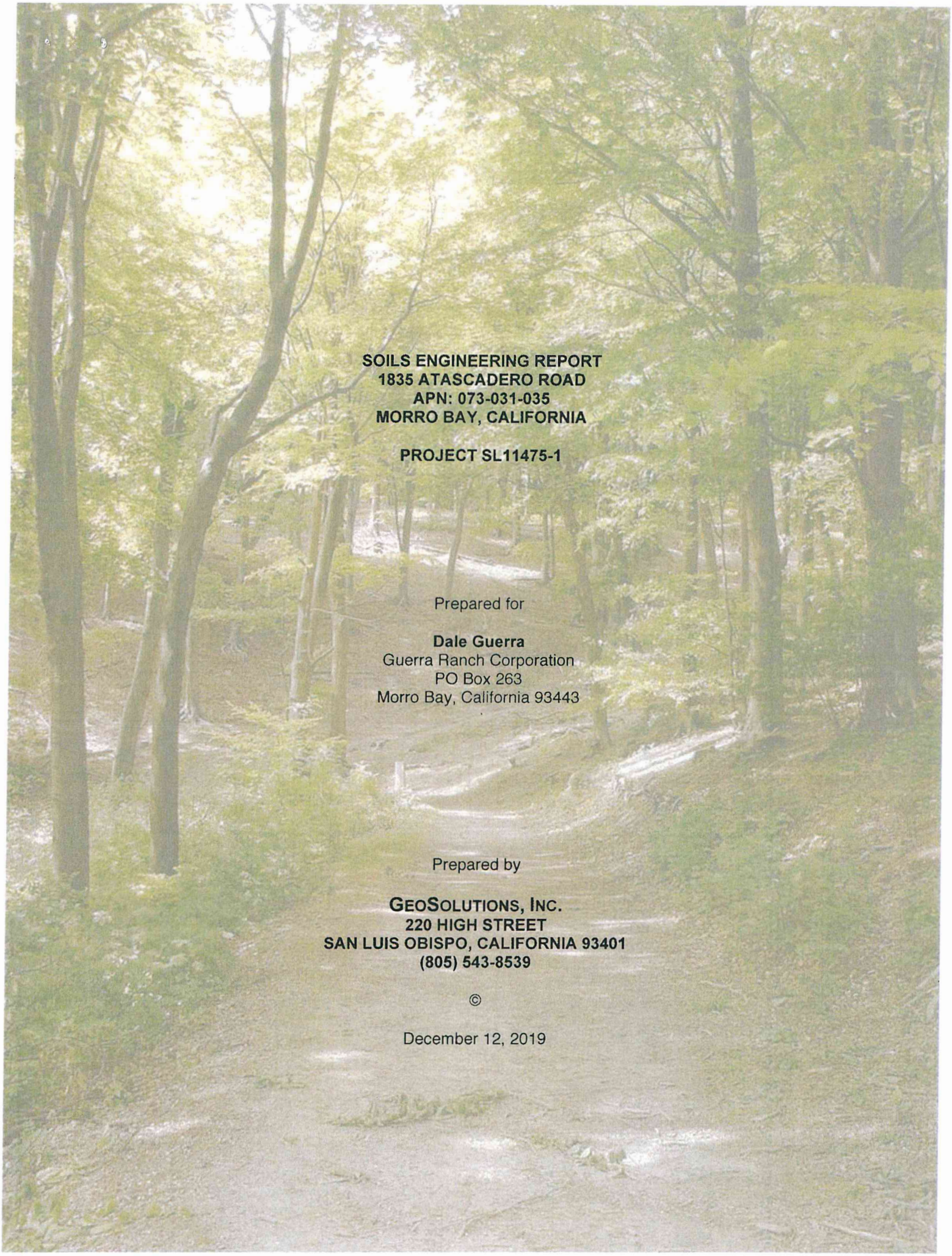
The mapped feature is accurate within: 10 m

Source of mapped feature: GPS

Mapping notes:

Location/directions comments:

Attachment(s):



SOILS ENGINEERING REPORT
1835 ATASCADERO ROAD
APN: 073-031-035
MORRO BAY, CALIFORNIA

PROJECT SL11475-1

Prepared for

Dale Guerra
Guerra Ranch Corporation
PO Box 263
Morro Bay, California 93443

Prepared by

GEOSOLUTIONS, INC.
220 HIGH STREET
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©

December 12, 2019

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SL11475-1

Client:
Dale Guerra
Guerra Ranch
Corporation
PO Box 263
Morro Bay, California
93443

Project name:
1835 Atascadero
Road
APN: 073-031-035
Morro Bay, California

SOILS ENGINEERING REPORT

Dear Mr. Guerra:

This Soils Engineering Report has been prepared for the proposed Guerra Ranch agricultural reservoir to be located at 1835 Atascadero Road, APN: 073-031-035 in Morro Bay, California. This report characterizes the sub-surface conditions at the site to provide the enclosed geotechnical recommendations for design in accordance with the City of Morro Bay, the 2016 California Building Code, and Natural Resource Conservation Service (NRCS) standards.

Thank you for the opportunity to have been of service in preparing this report. If you have any questions or require additional assistance, please feel free to contact the undersigned at (805) 543-8539.

Sincerely,
GeoSolutions, Inc.

REGISTERED PROFESSIONAL ENGINEER
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SOILS ENGINEERING REPORT
1835 ATASCADERO ROAD
APN: 073-031-035
MORRO BAY, CALIFORNIA

PROJECT SL11475-1

1.0 INTRODUCTION

This report presents the results of the geotechnical investigation for the proposed Guerra Ranch agricultural reservoir to be located at 1835 Atascadero Road, APN: 073-031-035 in Morro Bay, California. See Figure 1: Site Location Map for the general location of the project area. Figure 1: Site Location Map was obtained from the computer program GIS Surfrider 1.8 (Elfelt, 2016).

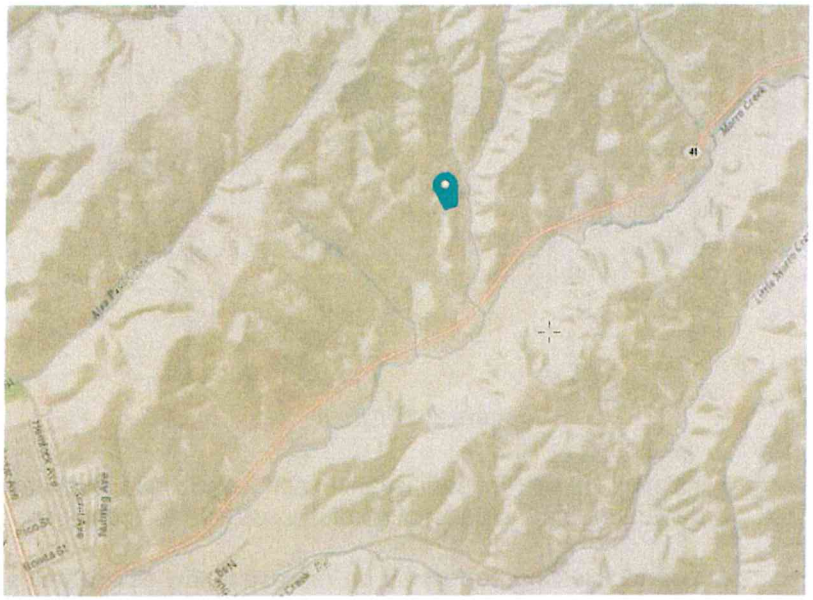


Figure 1: Site Location Map

1.1 Site Description

1835 Atascadero Road is located at 35.412260 degrees north latitude and 120.819018 degrees west longitude at a general elevation of 383 feet above mean sea level. The property is approximately rectangular in shape and 352 acres in size. The nearest intersection is where Atascadero Road intersects Highway 1 approximately to the southwest of the property. The project property will hereafter be referred to as the "Site." See Figure 2: Site Plan for the general layout of the Site.

The Site is situated in rolling terrain that drops to the southeast at an approximate gradient of 5 to 1 (horizontal to vertical). Surface drainage follows the topography to the southeast. Annual grasses currently vegetate the Site.

1.2 Project Description

The proposed irrigation reservoir is anticipated to have a dam height of less than 22 feet, internal slopes of approximately 2:1 and external slopes of approximately 3:1 (horizontal to vertical), with a geosynthetic liner on the surface.

2.0 PURPOSE AND SCOPE

The purpose of this study was to explore and evaluate the surface and sub-surface soil conditions at the Site and to develop geotechnical information and design criteria. The scope of this study includes the following items:

1. A literature review of available published and unpublished geotechnical data pertinent to the project site including geologic maps, and available on-line or in-house aerial photographs.

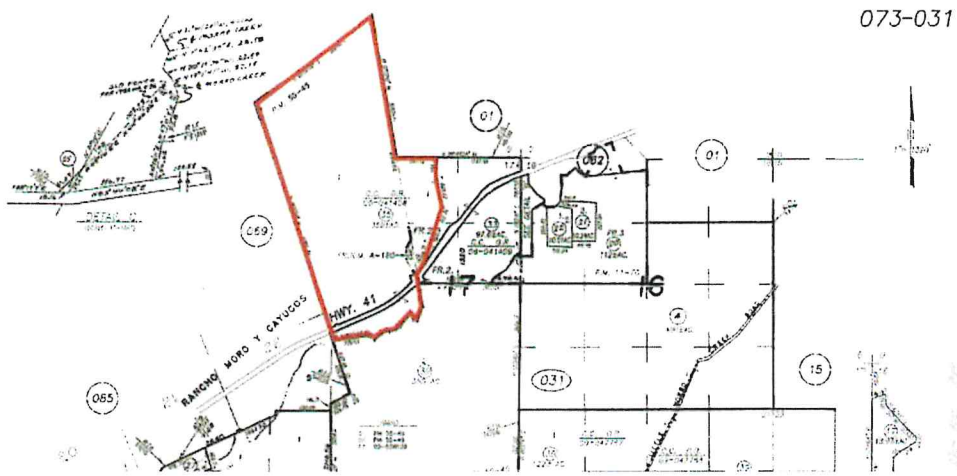


Figure 2: Site Plan

2. A field study consisting of site reconnaissance and subsurface exploration including exploratory borings in order to formulate a description of the sub-surface conditions at the Site.

3. Laboratory testing performed on representative soil samples that were collected during our field study.

4. Engineering analysis of the data gathered during our literature review, field study, and laboratory testing.

5. Development of recommendations for site preparation and grading as well as geotechnical design criteria for embankments, foundations, underground utilities, and drainage facilities.

3.0 FIELD AND LABORATORY INVESTIGATION

The field investigation was conducted on November 14, 2019 using a Mobile B-24 drill rig. Four six-inch diameter exploratory borings were advanced to a maximum depth of 25 feet below ground surface (bgs) at the approximate locations indicated on Figure 3: Google Earth Image. Sampling methods included the Standard Penetration Test utilizing a standard split-spoon sampler (SPT) without liners and a Modified California sampler (CA) with liners. The Mobile B-24 drill rig was equipped with a safety hammer, which has an efficiency of approximately 60 percent and was used to obtain test blow counts in the form of N-values.

Data gathered during the field investigation suggest that the soil materials at the Site consist of colluvial soil overlying competent formational material. The surface material at the Site generally consisted of very dark grayish brown to dark brown silty CLAY (CH) encountered in a dry to slightly moist and stiff to hard condition to approximately 3.5 to 5.5 feet bgs. The sub-surface materials consisted of red to brown CLAY (CL) with gravel encountered in a slightly moist and very stiff to hard condition, underlain by weathered bedrock material encountered in a dense to medium dense condition to termination of the borings at a maximum depth of 25 feet bgs.

Regional site geology was obtained from United States Geological Survey MapView internet application (USGS, 2013) which compiles existing geologic maps. Figure 4: Regional Geologic Map presents the geologic conditions in site vicinity as mapped on the *Geologic Map of the Morro Bay North Quadrangle* (Dibblee, 2006). The majority of all underlying weathered bedrock material at the Site was interpreted as Franciscan Rocks.

Groundwater was not encountered in any of the borings. It should be expected that groundwater elevations may vary seasonally and with irrigation practices.

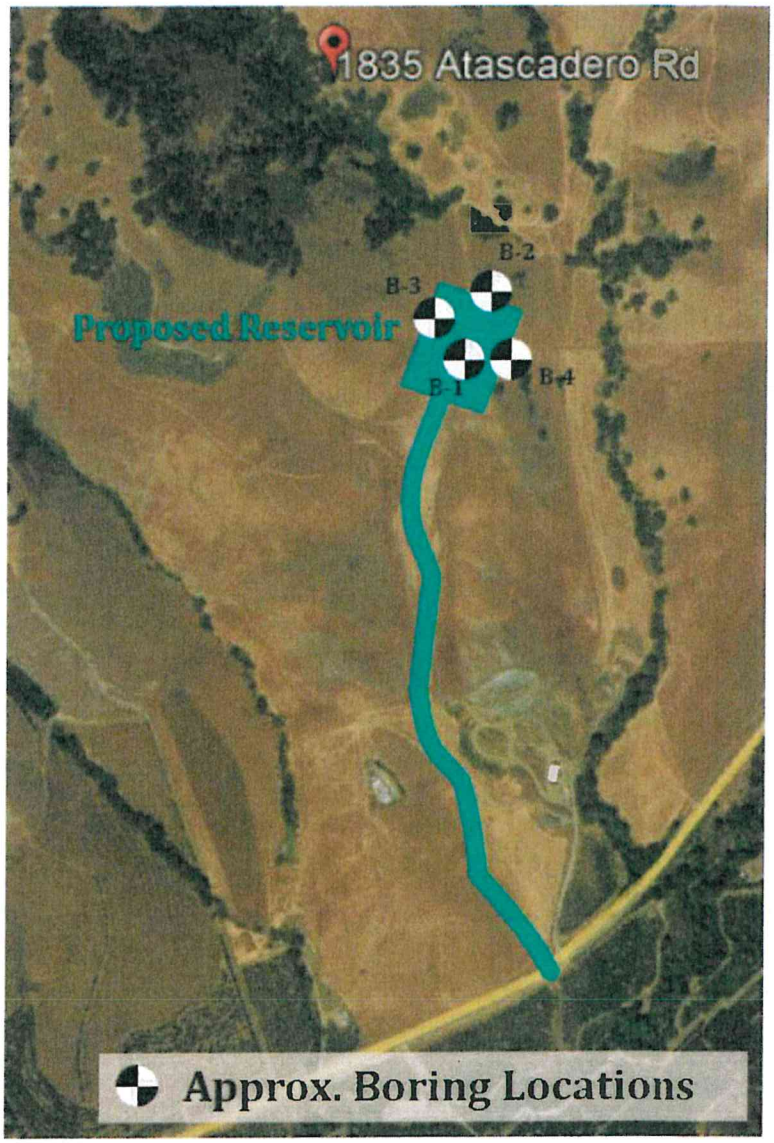


Figure 3: Google Earth Image

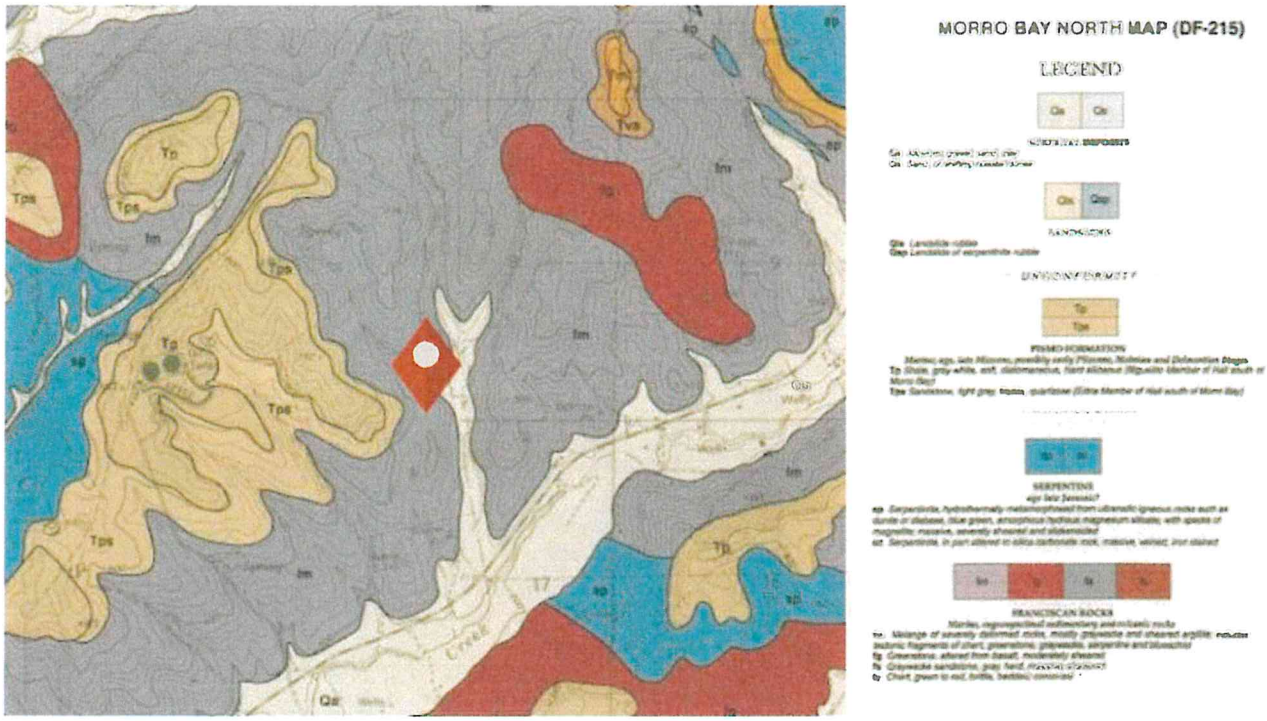


Figure 4: Regional Geologic Map

During the boring operations the soils encountered were continuously examined, visually classified, and sampled for general laboratory testing. A project engineer has reviewed a continuous log of the soils encountered at the time of field investigation. See **Appendix A** for the Boring Logs from the field investigation.

Laboratory tests were performed on soil samples that were obtained from the Site during the field investigation. The results of these tests are listed below in Table 1: Engineering Properties. Laboratory data reports and detailed explanations of the laboratory tests performed during this investigation are provided in **Appendix B**.

Table 1: Engineering Properties

Sample Name	Sample Description	USCS Specification	Expansion Index	Expansion Potential	Maximum Dry Density, γ_d (pcf)	Optimum Moisture (%)	Angle of Internal Friction, ϕ (deg.)	Cohesion, c (psf)	Plasticity Index	Fines Content (%)
A	Very Dark Grayish Brown Fat CLAY with Sand	CH	88	Med	113.3	15.0	-	-	36 High	72.6
B-1 @ 5 Ft	Dark Brown CLAY with Sand and Gravel	CH	-	-	-	-	41.3	567	37 High	-

4.0 SEISMIC DESIGN CONSIDERATIONS

Estimating the design ground motions at the Site depends on many factors including the distance from the Site to known active faults; the expected magnitude and rate of recurrence of seismic events produced on such faults; the source-to-site ground motion attenuation characteristics; and the Site soil profile characteristics. According to section 1613 of the 2016 CBC (CBSC, 2016), all structures and portions of structures should be designed to resist the effects of seismic loadings caused by earthquake ground motions in accordance with the *ASCE 7: Minimum Design Loads for Buildings and Other Structures*, hereafter referred to as ASCE7-10 (ASCE, 2013). The Site soil profile classification (Site Class) can be determined by the average soil properties in the upper 100 feet of the Site profile and the criteria provided in Table 20.3-1 of ASCE7-10.

Spectral response accelerations, peak ground accelerations, and site coefficients provided in this report were obtained using the computer-based Seismic Design Maps tool available from the Structural Engineers Association of California (SEAOC, 2018). This program utilizes the methods developed in ASCE 7-10 in conjunction with user-inputted Site location to calculate seismic design parameters and response spectra (both for period and displacement) for soil profile Site Classes A through E.

Site coordinates of **35.412260** degrees north latitude and **-120.819018** degrees east longitude were used in the web-based probabilistic seismic hazard analysis (SEAOC, 2018). Based on the results from the in-situ tests performed during the field investigation, the Site was defined as **Site Class D**, "Stiff Soil" profile per ASCE7-10, Chapter 20. Relevant seismic design parameters obtained from the program area summarized in Table 2: Seismic Design Parameters Refer to **Appendix C** for more information regarding the seismic hazard analysis performed for the project and detailed results.

Table 2: Seismic Design Parameters

Site Class	**Site Class D**, "Stiff Soil"
Seismic Design Category	**D**
1-Second Period Design Spectral Response Acceleration, S_{D1}	**0.434g**
Short-Period Design Spectral Response Acceleration, S_{DS}	**0.78g**
Site Specific MCE Peak Ground Acceleration, PGA_M	**0.459g**

5.0 LIQUEFACTION HAZARD ASSESSMENT

Liquefaction occurs when saturated cohesionless soils lose shear strength due to earthquake shaking. Ground motion from an earthquake may induce cyclic reversals of shear stresses of large amplitude. Lateral and vertical movement of the soil mass combined with the loss of bearing strength can result from this phenomenon. Liquefaction potential of soil deposits during earthquake activity depends on soil type, void ratio, groundwater conditions, the duration of shaking, and confining pressures on the potentially liquefiable soil unit. Fine, poorly graded loose sand, shallow groundwater, high intensity earthquakes, and long duration of ground shaking are the principal factors leading to liquefaction.

Based on the consistency and relative density of the in-situ soils the potential for seismic liquefaction of soils at the Site is low. Assuming that the recommendations of the Soils Engineering Report are implemented, the potential for seismically induced settlement and differential settlement at the Site is considered to be low.

6.0 NUMERICAL SLOPE STABILITY

A slope stability analysis was performed on the proposed fill slope for the proposed agricultural reservoir. The proposed reservoir is to be located in an existing natural drainage gully. Utilizing the results of laboratory testing performed on representative samples of soil materials from the slope area, the numerical slope stability analysis was performed utilizing SLOPE/W, a computer-modeling program by Geo-Slope International, Limited (Geo-Slope, 2002). SLOPE/W is a computer software program that uses limit equilibrium theory to compute the factor of safety of earth slopes. The engineering standard for permanent slopes is a factor of safety of 1.5 and 1.1 for pseudo-static (seismic) conditions. A factor of safety less than unity (1.0) is considered unstable.

The numerical slope stability analysis was conducted for the site utilizing subsurface information derived from exploratory borings. The slope stability analysis was conducted to ascertain stability of the subsurface materials. The elevations used to perform the analysis were produced by Cannon, dated September 19, 2019.

6.1 Slope/W Discussion

SLOPE/W was utilized to determine the critical factor of safety. SLOPE/W performs the stability analysis by passing a slip surface through the earth mass and dividing it into vertical slices. To compute the factor of safety, SLOPE/W utilizes the theory of limit equilibrium of forces and moments. The limit equilibrium method may be utilized to analyze circular and noncircular failure surfaces and assumes that:

1. The soil behaves as a Mohr-Coulomb material.
2. The factor of safety of the cohesive component of strength and the frictional component of strength are equal for all soils involved.
3. The factor of safety is the same for all slices.

The General Limit Equilibrium formulation and solution may be used to simulate most of the commonly used methods of slices. The characteristics of Spencer's method are identified as an "satisfies all conditions of equilibrium; applicable to any shape of slip surface; assumes that inclinations of side forces are the same for every slice; side force inclination is calculated in the process of solution so that all conditions of equilibrium are satisfied; accurate method; 3N equations and unknowns" (Duncan, 1996).

Each potential slip surface results in a different value for factor of safety. The smaller the factor of safety (the smaller the ratio of shear strength to shear stress required for equilibrium), the greater the potential for failure to occur by movement on that surface. Movement is most likely to occur on the slip surface with the minimum factor of safety. This is referred to as the critical slip surface. However, for movement to occur the ratio must be below 1.0.

6.2 Laboratory Test Results

Direct shear tests were performed on soil samples from the subsurface investigation. The purpose of this data was to determine the soil resistance to deformation (shear strength), interparticle attraction (cohesion), and resistance to inter-particle slip (angle of internal friction). Angle of internal friction and cohesion values were utilized from laboratory test results. As a conservative value, the soil properties for the fill/colluvium were utilized for the Franciscan Complex units. The boring logs present the location that samples were collected and laboratory results are attached at the end of this report.

Moisture density relation curves, developed in accordance with ASTM D1557, five-layer method, were performed on representative samples obtained from the slope area. The purpose of the relation curve is to determine the maximum density and optimum moisture contents, as well as evaluate the stability of the soils. The laboratory sheets depict the dry unit weight of soil and have been converted to the unit weight (γ) for use in the stability analysis.

Table 3: Factors of Safety Results

Section	Unit Weight (pcf)	Angle of Internal Friction (degrees)	Cohesion (psf)
Fill/Colluvium – Sample A	130.3	41	567
Franciscan Complex – Sample B	130.3	41	567

6.3 Discussion Of Modeling Conditions

Modeling conditions for the following slopes included:

Section B-B' - The reservoir slope included: 1) a proposed 2:1 (horizontal:vertical) interior pond slope to a maximum height of 41 feet; 2) consisting of fill underlaying Franciscan Complex units; and 3) no groundwater. Groundwater was not modeled due to a lack of groundwater observed within the subsurface investigation.

6.4 Static Slope Stability Analysis

Our analysis resulted in a range of values for factor of safety and their respective slip surfaces. The lowest factor of safety value corresponds to the critical slip surface. This critical slip surface does not necessarily result in the largest slip surface. The critical static factors of safety value is presented in Table 4. The potential critical slip surfaces for static conditions is presented on Figure 5.

Table 4: Factors of Safety Results

Section	Static Factor of Safety	Pseudo-Static Factor of Safety
B-B	3.23	2.37

The static stability analyses performed for the slope configurations as illustrated in Section B-B. The minimum engineering standard for static factors of safety is 1.5. **Section B-B resulted in critical static factor of safety value above the minimum standard, indicating that they reflect stable conditions.**

6.5 Pseudo-Static Slope Stability Analysis

As the slope may be affected by seismic events, a dynamic loading condition was applied to the slope model (pseudo-static conditions). As stated in *Guidelines for Evaluating and Mitigating Seismic Hazards in California* (CDMG, 1997), "In California, many state and local agencies, on the basis of local experience, require the use of a seismic coefficient of 0.15, and a minimum computed pseudo-static factor of safety of 1.0 to 1.2 for analysis of natural, cut, and fill slopes. Basic guidelines for making preliminary evaluations of embankments to ensure acceptable performance were: using a pseudo-static coefficient of 0.10 for magnitude 6.5 earthquakes and 0.15 for magnitude 8.25 earthquakes, with an acceptable factor of safety of the order of 1.15." Calculations for pseudo-static numerical analysis within these iterations utilized a seismic coefficient of 0.15 g.

The numerical slope stability analysis resulted in a range of values for factor of safety. The lowest factor of safety value corresponds to the critical slip surface. This critical slip surface does not necessarily result in the largest slip surface. The critical static factors of safety value is presented in Table 4. The potential critical slip surfaces for pseudo-static conditions is presented on Figure 6.

The pseudo-static (seismic) stability analyses performed for the slope configurations as illustrated in Section B-B. The minimum engineering standard for pseudo-static factors of safety is 1.1. **Section B-B resulted in critical static factor of safety value above the minimum standard, indicating that they reflect stable conditions.**

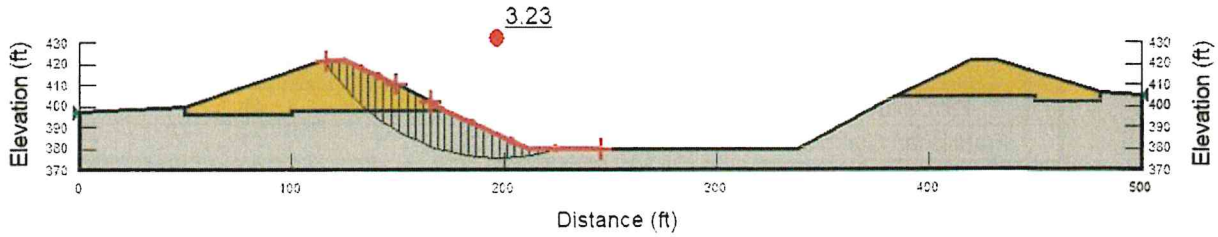


Figure 5: Section B-B (Static)

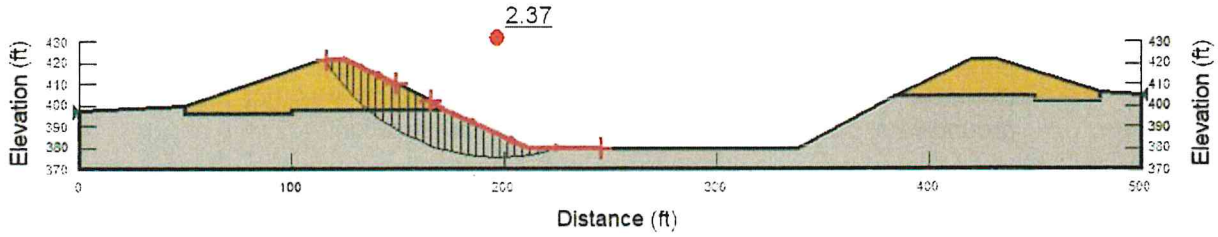


Figure 6: Section B-B (Pseudo-Static)

7.0 GENERAL SOIL-FOUNDATION DISCUSSION

It is anticipated that graded fill slopes will be constructed for the proposed irrigation pond utilizing native soils as engineered fill. Reprocessing of the upper two feet of existing soils will be required in proposed fill areas. Interior and exterior slopes are planned at a maximum configuration of 2 to 1 (horizontal to vertical). All foundations are to be excavated into uniform material to limit the potential for distress of the foundation systems due to differential settlement. If cuts steeper than allowed by State of California Construction Safety Orders for "Excavations, Trenches, Earthwork" are proposed, a numerical slope stability analysis may be necessary for temporary construction slopes.

8.0 CONCLUSIONS AND RECOMMENDATIONS

The Site is suitable for the proposed development provided the recommendations presented in this report are incorporated into the project plans and specifications.

The primary geotechnical concerns at the Site are:

1. The potential for differential settlement occurring between foundations supported on two soil materials having different settlement characteristics, such as native soil and engineered fill. Therefore, it is important that all of the foundations are founded in equally competent uniform material in accordance with this report.

8.1 Preparation of Embankment Areas

1. It is anticipated that graded slopes will be developed for the proposed irrigation reservoirs utilizing native soils as engineered fill. Due to proposed maximum fill depths of approximately 20 feet, all fill soils should be compacted to a minimum relative density of 95 percent (ASTM D1557-07) to minimize the potential for settlement.

2. Prior to the placement of fill in areas to receive fill, the native material should be over-excavated at least 24 inches below existing grade or to competent material; whichever is greatest. The limits of over-excavation should extend at a minimum, to the toe of all proposed fill slopes. The exposed surface should be scarified to a depth of 6 inches, moisture conditioned to 3 to 5 percent over optimum moisture content, and compacted to

a minimum relative density of 95 percent (ASTM D1557-07). The over-excavated material should then be processed as engineered fill in maximum 8-inch lift thicknesses.

3. Exposed cut surfaces within the reservoir should be scarified an additional 12 inches, moisture conditioned to approximately 3 to 5 percent over optimum moisture and compacted to a minimum relative density of 95 percent.

4. **The top width of the proposed irrigation reservoir should be a minimum of 12 feet.**

5. Where fill areas are constructed on slopes greater than 10-to-1 (horizontal-to-vertical), we recommend that benches be cut every four (vertical) feet as fill is placed. Each bench shall be a minimum of 10 feet wide with a minimum of two percent gradient into the slope. If fill areas are constructed on slopes greater than 5-to-1, we recommend that the toe of all areas to receive fill be keyed a minimum of 24 inches into underlying dense material. Sub-drains shall be placed in the keyway and benches as required. See **Appendix D**, Detail A, Key and Bench with Backdrain for details on key and bench construction.

8.2 Conventional Foundations

1. Conventional continuous and spread footings with grade beams may be used for support of proposed structures associated with development of the proposed irrigation reservoir.

2. Minimum footing and grade beam sizes and depths in engineered fill should conform to the following table, as observed and approved by a representative of GeoSolutions, Inc.

Table 5: Minimum Footing and Grade Beam Recommendations

	Perimeter Footings	Grade Beams
Minimum Width	12 inches (one story)	12 inches
Embedment Depth	30 inches	18 inches
Minimum Reinforcing*	6 #5 bars (3 top / 3 bottom)	4 #5 bars (2 top / 2 bottom)
Spacing	-	16 feet on-center each way
* Steel should be held in place by stirrups at appropriate spacing to ensure proper positioning of the steel (see WRI Design of Slab-on-Ground Foundations and ACI 318, Section 26.6.6 – Placing Reinforcement).		

3. Minimum reinforcing for footings should conform to the recommendations provided in Table 5: Minimum Footing and Grade Beam Recommendations which meets the specifications of Section 1808.6 of the 2016 California Building Code for the soil conditions at the Site. Reinforcing steel should be held in place by stirrups at appropriate spacing to ensure proper positioning of the steel in accordance with WRI Design of Slab-on-Ground Foundations, and ACI 318, Section 26.6.6 – Placing Reinforcement.

4. A representative of this firm should observe and approve all foundation excavations for required embedment depth prior to the placement of reinforcing steel and/or concrete. Concrete should be placed only in excavations that are free of loose, soft soil and debris and that have been maintained in a moist condition with no desiccation cracks present.

5. An allowable dead plus live load bearing pressure of **1,500 psf** may be used for the design of footings founded in engineered fill.

6. Allowable bearing capacities may be increased by one-third when transient loads such as wind and/or seismicity are included.

7. A total settlement of less than 1 inch and a differential settlement of less than 1 inch in 30 feet are anticipated.

8. Lateral forces on structures may be resisted by passive pressure acting against the sides of shallow footings and/or friction between the engineered fill and the bottom of the footings. For resistance to lateral loads, a friction factor of **0.30** may be utilized for sliding resistance at the base of footings extending a minimum of 30 inches into engineered fill. A passive pressure of **250-pcf** equivalent fluid weight may be used against the side of shallow footings in engineered fill. If friction and passive pressures are combined to resist lateral forces acting on shallow footings, the lesser value should be reduced by 50 percent.

9. Foundation excavations should be observed and approved by a representative of this firm prior to the placement of formwork, reinforcing steel, and/or concrete.

10. Foundation design should conform to the requirements of Chapter 18 of the latest edition of the CBC (CBSC, 2016).

11. The base of all grade beams and footings should be level and stepped as required to accommodate any change in grade while still maintaining the minimum required footing embedment and slope setback distance.

8.3 Slab-On-Grade Construction

1. Concrete slabs-on-grade and flatwork should not be placed directly on unprepared native materials. Preparation of sub-grade to receive concrete slabs-on-grade and flatwork should be processed as discussed in the preceding sections of this report. Concrete slabs should be placed only over sub-grade that is free of loose, soft soil and debris and that has been maintained in a moist condition with no desiccation cracks present.

2. Concrete slabs-on-grade should be in conformance with the recommendations provided in Table 6: Minimum Slab Recommendations. Reinforcing should be placed on-center both ways at or slightly above the center of the structural section. Reinforcing bars should have a minimum clear cover of 1.5 inches. Where lapping of the slab steel is required, laps in adjacent bars should be staggered a minimum of every five feet (see WRI Design of Slab-on-Ground Foundations, Steel Placement). The recommended reinforcement may be used for anticipated uniform floor loads not exceeding 200 psf. If floor loads greater than 200 psf are anticipated, a Structural Engineer should evaluate the slab design.

Table 6: Minimum Slab Recommendations

Minimum Thickness	5 inches
Reinforcing*	#4 bars at 16 inches on-center each way
* Where lapping of the slab steel is required, laps in adjacent bars should be staggered a minimum of every five feet (see WRI/CSRI-81 recommendations for Steel Placement, Section 2).	

3. Concrete for all slabs should be placed at a maximum slump of less than 5 inches. Excessive water content is the major cause of concrete cracking. If fibers are used to aid in the control of cracking, a water-reducing admixture may be added to the concrete to increase slump while maintaining a water/cement ratio, which will limit excessive shrinkage. Control joints should be constructed as required to control cracking.

4. Where concrete slabs-on-grade are to be constructed for interior conditioned spaces, the slabs should be underlain by a minimum of four inches of clean free-draining material, such as a ¾ inch coarse aggregate mix, to serve as a cushion and a capillary break. Where moisture susceptible storage or floor coverings are anticipated, a 15-mil Stego Wrap membrane (or equivalent installed per manufacturer's specifications) should be placed between the free-draining material and the slab to minimize moisture condensation under the floor covering. See Figure 7: Sub-Slab Detail for the placement of under-slab drainage material. It is suggested, but not required, that a two-inch thick sand layer be placed on top of the membrane to assist in the curing of the concrete, increasing the depth of the under-slab material to a total of six inches. The sand should be lightly moistened prior to placing concrete.

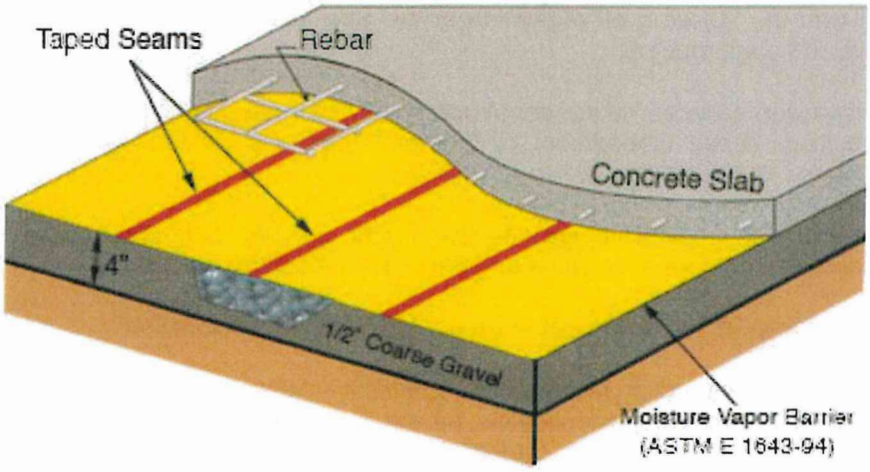


Figure 7: Sub-Slab Detail

5. It should be noted that for a vapor barrier installation to conform to manufacturer's specifications, sealing of penetrations, joints and edges of the vapor barrier membrane are typically required. As required by the California Building Code, joints in the vapor barrier should be lapped a minimum of 6 inches. If the installation is not performed in accordance with the manufacturer's specifications, there is an increased potential for water vapor to affect the concrete slabs and floor coverings.

6. The most effective method of reducing the potential for moisture vapor transmission through concrete slabs-on-grade would be to place the concrete directly on the surface of the vapor barrier membrane. However, this method requires a concrete mix design specific to this application with low water-cement ratio in addition to special concrete finishing and curing practices, to minimize the potential for concrete cracks and surface defects. The contractor should be familiar with current techniques to finish slabs poured directly onto the vapor barrier membrane.

7. Moisture condensation under floor coverings has become critical due to the use of water-soluble adhesives. Therefore, it is suggested that moisture sensitive slabs not be constructed during inclement weather conditions.

9.0 ADDITIONAL GEOTECHNICAL SERVICES

The recommendations contained in this report are based on a limited number of borings and on the continuity of the sub-surface conditions encountered. GeoSolutions, Inc. assumes that it will be retained to provide additional services during future phases of the proposed project. These services would be provided by GeoSolutions, Inc. as required by City of Morro Bay the 2016 CBC, and/or industry standard practices. These services would be in addition to those included in this report and would include, but are not limited to, the following services:

1. Consultation during plan development.

2. Plan review of grading and foundation documents prior to construction and a report certifying that the reviewed plans are in conformance with our geotechnical recommendations.

3. Consultation during selection and placement of a laterally-reinforcing biaxial geogrid product.

4. Construction inspections and testing, as required, during all grading and excavating operations beginning with the stripping of vegetation at the Site, at which time a site meeting or pre-job meeting would be appropriate.

5. Special inspection services during construction of reinforced concrete, structural masonry, high strength bolting, epoxy embedment of threaded rods and reinforcing steel, and welding of structural steel.

6. Preparation of construction reports certifying that building pad preparation and foundation excavations are in conformance with our geotechnical recommendations.

7. Preparation of special inspection reports as required during construction.

8. In addition to the construction inspections listed above, section 1705.6 of the 2016 CBC (CBSC, 2016) requires the following inspections by the Soils Engineer for controlled fill thicknesses greater than 12 inches as shown in Table 7: Required Verification and Inspections of Soils:

Table 7: Required Verification and Inspections of Soils

Verification and Inspection Task	Continuous During Task Listed	Periodically During Task Listed
1. Verify materials below footings are adequate to achieve the design bearing capacity.	-	X
2. Verify excavations are extended to proper depth and have reached proper material.	-	X
3. Perform classification and testing of controlled fill materials.	-	X
4. Verify use of proper materials, densities and lift thicknesses during placement and compaction of controlled fill.	X	-
5. Prior to placement of controlled fill, observe sub-grade and verify that site has been prepared properly.	-	X

10.0 LIMITATIONS AND UNIFORMITY OF CONDITIONS

1. The recommendations of this report are based upon the assumption that the soil conditions do not deviate from those disclosed during our study. Should any variations or undesirable conditions be encountered during the development of the Site, GeoSolutions, Inc. should be notified immediately and GeoSolutions, Inc. will provide supplemental recommendations as dictated by the field conditions.

2. This report is issued with the understanding that it is the responsibility of the owner or his/her representative to ensure that the information and recommendations contained herein are brought to the attention of the architect and engineer for the project, and incorporated into the project plans and specifications. The owner or his/her representative is responsible to ensure that the necessary steps are taken to see that the contractor and subcontractors carry out such recommendations in the field.

3. As of the present date, the findings of this report are valid for the property studied. With the passage of time, changes in the conditions of a property can occur whether they are due to natural processes or to the works of man on this or adjacent properties. Therefore, this report should not be relied upon after a period of 3 years without our review nor should it be used or is it applicable for any properties other than those studied. However many events such as floods, earthquakes, grading of the adjacent properties and building and municipal code changes could render sections of this report invalid in less than 3 years.

\\192.168.0.5\s\SL11000-SL11499\SL11475-1 - 1835 Atascadero Road\Engineering\SL11475-1 - 1835 Atascadero Rd SER.doc

REFERENCES

REFERENCES

American Concrete Institute (ACI). Building Code Requirements for Structural Concrete (318-08), Chapter 7, Section 7.5, Placing Reinforcement, ACI Committee 318, 2008.

American Society of Civil Engineers (ASCE). *Minimum Design Loads for Buildings and Other Structures,* ASCE Standard 7-10, ASCE, Reston, VA, 2013.

California Building Standards Commission (CBSC). (2016). 2016 California Building Code, California Code of Regulations, Title 24. Part 2, Vol. 2.

County of Luis Obispo. Assessor's Map Book: 073, Page 31. November 18, 2001. <http://www.sbcvote.com/assessor/AssessorParcelMap.aspx>.

Dibblee, Thomas W., Jr.. *Geologic Map of the Morro Bay North North Quadrangle.* Dibblee Geologic Center Map Number DF-215. Santa Barbara Museum of Natural History: April 2006.

Elfelt. *GIS Surfer 1.8.* Vers.1.8.0 Computer software. Elfelt, 2016.

Lew, M., Sitar, N., Al Atik, L., Paourzanjani, M., and Hudson, M. "Seismic Earth pressure on Deep Building Basements," SEAOC 2010 Convention Proceedings, 2010.

State of California. Department of Industrial Relations. *California Code of Regulations.* 2001 Edition. Title 8. Chapter 4: Division of Industrial Safety. Subchapter 4, Construction Safety Orders. Article 6: Excavations. http://www.dir.ca.gov/title8/sub4.html.

State of California, Department of Transportation. *Standard Specifications.* State of California Department of Transportation Central Publication Distribution Unit: July 1999.

Structural Engineers Association of California (SEAOC), *Seismic Design Maps*, accessed December 10, 2019. <https://seismicmaps.org/>.

United States Geological Survey. *MapView – Geologic Maps of the Nation.* Internet Application. USGS, accessed December 10, 2019. <http://ngmdb.usgs.gov/maps/MapView/>.

Wire Reinforcement Institute, Design of Slab-on-Ground Foundations, A Design, Construction $ Inspection Aid for Consulting Engineers, TF 700-R-03 Update, dated 2003.

APPENDIX A

Field Investigation

Soil Classification Chart

Boring Logs

FIELD INVESTIGATION

The field investigation was conducted November 14, 2019 using a Mobile B-24 drill rig. The surface and sub-surface conditions were studied by advancing four exploratory borings. This exploration was conducted in accordance with presently accepted geotechnical engineering procedures consistent with the scope of the services authorized to GeoSolutions, Inc.

The Mobile B-24 drill rig with a six-inch diameter solid-stem continuous flight auger advanced four exploratory borings near the approximate locations indicated on Figure 3: Google Earth Image. The drilling and field observation was performed under the direction of the project engineer. A representative of GeoSolutions, Inc. maintained a log of the soil conditions and obtained soil samples suitable for laboratory testing. The soils were classified in accordance with the Unified Soil Classification System. See the Soil Classification Chart in this appendix.

Standard Penetration Tests with a two-inch outside diameter standard split tube sampler (SPT) without liners (ASTM D1586) and a three-inch outside diameter Modified California (CA) split tube sampler with liners (ASTM D3550) were performed to obtain field indication of the in-situ density of the soil and to allow visual observation of at least a portion of the soil column. Soil samples obtained with the split spoon sampler are retained for further observation and testing. The split spoon samples are driven by a 140-pound hammer free falling 30 inches. The sampler is initially seated six inches to penetrate any loose cuttings and is then driven an additional 12 inches with the results recorded in the boring logs as N-values, which area the number of blows per foot required to advance the sample the final 12 inches.

The CA sampler is a larger diameter sampler than the standard (SPT) sampler with a two-inch outside diameter and provides additional material for normal geotechnical testing such as in-situ shear and consolidation testing. Either sampler may be used in the field investigation, but the N-values obtained from using the CA sampler will be greater than that of the SPT. The N-values for samples collected using the CA can be roughly correlated to SPT N-values using a conversion factor that may vary from about 0.5 to 0.7. A commonly used conversion factor is 0.67 ($^2/_3$). More information about standardized samplers can be found in ASTM D1586 and ASTM D3550.

Disturbed bulk samples are obtained from cuttings developed during boring operations. The bulk samples are selected for classification and testing purposes and may represent a mixture of soils within the noted depths. Recovered samples are placed in transport containers and returned to the laboratory for further classification and testing.

Logs of the borings showing the approximate depths and descriptions of the encountered soils, applicable geologic structures, recorded N-values, and the results of laboratory tests are presented in this appendix. The logs represent the interpretation of field logs and field tests as well as the interpolation of soil conditions between samples. The results of laboratory observations and tests are also included in the boring logs. The stratification lines recorded in the boring logs represent the approximate boundaries between the surface soil types. However, the actual transition between soil types may be gradual or varied.

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS		LABORATORY CLASSIFICATION CRITERIA		GROUP SYMBOLS	PRIMARY DIVISIONS
COARSE GRAINED SOILS More than 50% retained on No. 200 sieve	GRAVELS More than 50% of coarse fraction retainined on No. 4 (4.75mm) sieve	Clean gravels (less than 5% fines*)	C_U greater than 4 and C_Z between 1 and 3	GW	Well-graded gravels and gravel-sand mixtures, little or no fines
			Not meeting both criteria for GW	GP	Poorly graded gravels and gravel-sand mixtures, little or no fines
		Gravel with fines (more than 12% fines*)	Atterberg limits plot below "A" line or plasticity index less than 4	GM	Silty gravels, gravel-sand-silt mixtures
			Atterberg limits plot below "A" line and plasticity index greater than 7	GC	Clayey gravels, gravel-sand-clay mixtures
	SANDS More than 50% of coarse fraction passes No. 4 (4.75mm) sieve	Clean sand (less than 5% fines*)	C_U greater than 6 and C_Z between 1 and 3	SW	Well graded sands, gravely sands, little or no fines
			Not meeting both criteria for SW	SP	Poorly graded sands and gravelly and sands, little or no fines
		Sand with fines (more than 12% fines*)	Atterberg limits plot below "A" line or plasticity index less than 4	SM	Silty sands, sand-silt mixtures
			Atterberg limits plot above "A" line and plasticity index greater than 7	SC	Clayey sands, sand-clay mixtures
FINE GRAINED SOILS 50% or more passes No. 200 sieve	SILTS AND CLAYS (liquid limit less than 50)	Inorganic soil	PI < 4 or plots below "A"-line	ML	Inorganic silts, very fine sands, rock flour, silty or clayey fine sands
		Inorganic soil	PI > 7 and plots on or above "A" line**	CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
		Organic Soil	LL (oven dried)/LL (not dried) < 0.75	OL	Organic silts and organic silty clays of low plasticity
	SILTS AND CLAYS (liquid limit 50 or more)	Inorganic soil	Plots below "A" line	MH	Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts
		Inorganic soil	Plots on or above "A" line	CH	Inorganic clays of high plasticity, fat clays
		Organic Soil	LL (oven dried)/LL (not dried) < 0.75	OH	Organic silts and organic clays of high plasticity
Peat	Highly Organic	Primarily organic matter, dark in color, and organic odor		PT	Peat, muck and other highly organic soils

*Fines are those soil particles that pass the No. 200 sieve. For gravels and sands with between 5 and 12% fines, use of dual symbols is required (i.e. GW-GM, GW-GC, GP-GM, or GP-GC).

**If the plasticity index is between 4 and 7 and it plots above the "A" line, then dual symbols (i.e. CL-ML) are required.

the "A" line, then dual symbols (i.e. CL-ML) are required

CONSISTENCY

CLAYS AND PLASTIC SILTS	STRENGTH TON/SQ.FT ++	BLOWS/ FOOT +
VERY SOFT	0 - 1/4	0 - 2
SOFT	1/4 - 1/2	2 - 4
FIRM	1/2 - 1	4 - 8
STIFF	1 - 2	8 - 16
VERY STIFF	2 - 4	16 - 32
HARD	Over 4	Over 32

RELATIVE DENSITY

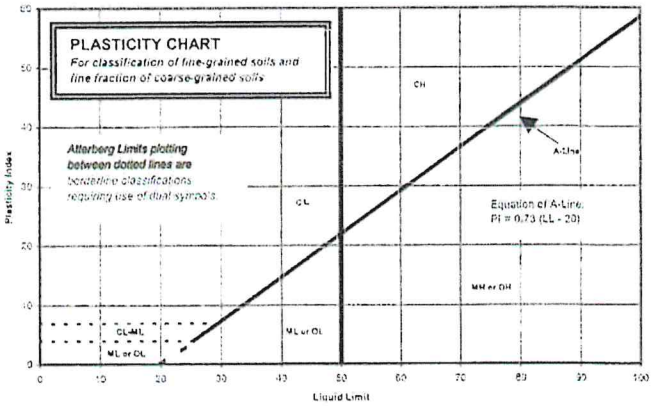
SANDS, GRAVELS AND NON-PLASTIC SILTS	BLOWS/ FOOT +
VERY LOOSE	0 - 4
LOOSE	4 - 10
MEDIUM DENSE	10 - 30
DENSE	30 - 50
VERY DENSE	Over 50

+ Number of blows of a 140-pound hammer falling 30-inches to drive a 2-inch O.D. (1-3/8-inch I.D.) split spoon (ASTM D1586).

++ Unconfined compressive strength in tons/sq.ft. as **determined by laboratory testing or approximated by the standard penetration test (ASTM D1586), pocket** penetrometer, torvane, or visual observation.

CLASSIFICATIONS BASED ON PERCENTAGE OF FINES

Less than 5%, Pass No. 200 (75mm)sieve)	GW, GP, SW, SP
More than 12% Pass N. 200 (75 mm) sieve	GM, GC, SM, SC
5%-12% Pass No. 200 (75 mm) sieve	Borderline Classification requiring use of dual symbols



Drilling Notes:

1. **Sampling and blow counts**
   a. **California Modified – number** of blows per foot of a 140 pound hammer falling 30 inches
   b. Standard Penetration Test – number of blows per 12 inches of a 140 pound hammer falling 30 inches

Types of Samples:
X – Sample
SPT - Standard Penetration
CA - California Modified
N - Nuclear Gauge
PO – **Pocket Penetrometer (tons/sq.ft.)**

GEO

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Phone: 805-966-2200

BORING LOG

BORING NO. B-1
JOB NO. SL11475-1

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	1835 Atascadero Rd	DRILL RIG:	Mobile B-24
DRILLING LOCATION:	See Figure 3	HOLE DIAMETER:	6 Inches
DATE DRILLED:	November 11, 2019	SAMPLING METHOD:	SPT and CA
LOGGED BY:	JK	APPROX. ELEVATION:	Not Recorded

Depth of Groundwater: **Not Encountered** Boring Terminated: **25 Feet**

DEPTH	LITHOLOGY	USCS	SOIL DESCRIPTION	SAMPLE ID	SAMPLERS TYPE	BLOWS/ 12 IN	N 1/60	MOISTURE CONTENT (%)	FINES CONTENT (%)	PLASTICITY INDEX (PI)	EXPANSION INDEX (EI)	OPTIMUM WATER CONTENT (%)	MAXIMUM DRY DENSITY (pcf)	COHESION, C (psf)	FRICTION ANGLE, (degrees)
0–4		CH	FAT CLAY WITH SAND: very dark grayish brown, dry	A					72.6	36	88	15.0	113.3		
			hard	CA		58	52			37				567	41.3
4–24		CL	CLAY: red brown, with gravel, stiff, slightly moist, weathered KJfm, meta volcanic, very dense	B											
			hard	SPT		37	50	19.1							
				SPT		20	22	20.0							
			very stiff	SPT		28	23	19.8							
24–25			KJFM: melange					15.4							

Depth scale: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30

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BORING LOG

BORING NO. B-2
JOB NO. SL11475-1

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	1835 Atascadero Rd	DRILL RIG:	Mobile B-24
DRILLING LOCATION:	See Figure 3	HOLE DIAMETER:	6 Inches
DATE DRILLED:	November 11, 2019	SAMPLING METHOD:	SPT
LOGGED BY:	JK	APPROX. ELEVATION:	Not Recorded

Depth of Groundwater: **Not Encountered** Boring Terminated: **15 Feet**

DEPTH	LITHOLOGY	USCS	SOIL DESCRIPTION	SAMPLE ID	SAMPLERS TYPE	BLOWS/ 12 IN	N 1/60	MOISTURE CONTENT (%)	FINES CONTENT (%)	PLASTICITY INDEX (PI)	EXPANSION INDEX (EI)	OPTIMUM WATER CONTENT (%)	MAXIMUM DRY DENSITY (pcf)	COHESION, C (psf)	FRICTION ANGLE, (degrees)
0		CH	SILTY CLAY: dark brown, with minor rounded gravels, slightly moist												
1															
2															
3															
4			very stiff												
5				SPT		25	33	21.0							
6		CL	CLAY WITH SILT: red, brown, stiff, slightly moist												
7															
8															
9															
10			very dense	SPT		27	36	25.3							
11															
12															
13			KJFM: franciscan complex, very weatherered, meta volcanic, dense												
14															
15				SPT		32	32								
16															
17															
18															
19															
20															

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BORING LOG

BORING NO. B-3
JOB NO. SL11475-1

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	1835 Atascadero Rd	DRILL RIG:	Mobile B-24
DRILLING LOCATION:	See Figure 3	HOLE DIAMETER:	6 Inches
DATE DRILLED:	November 11, 2019	SAMPLING METHOD:	SPT
LOGGED BY:	JK	APPROX. ELEVATION:	Not Recorded

Depth of Groundwater: **Not Encountered** Boring Terminated: **10 Feet**

DEPTH	LITHOLOGY	USCS	SOIL DESCRIPTION	SAMPLE ID	SAMPLERS TYPE	BLOWS/ 12 IN	N 1/60	MOISTURE CONTENT (%)	FINES CONTENT (%)	PLASTICITY INDEX (PI)	EXPANSION INDEX (EI)	OPTIMUM WATER CONTENT (%)	MAXIMUM DRY DENSITY (pcf)	COHESION, C (psf)	FRICTION ANGLE, (degrees)
0		CH	SILTY CLAY: dark brown, dry, colluvium												
4		CL	SILTY CLAY: red, brown, with gravel, very dense, colluvium	SPT		28	37	13.1							
7			KJFM: franciscan complex, weatherered rock, meta volcanic dense	SPT		22	24	26.9							

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Phone: 805-966-2200

BORING LOG

BORING NO. B-4
JOB NO. SL11475-1

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	1835 Atascadero Rd	DRILL RIG:	Mobile B-24
DRILLING LOCATION:	See Figure 3	HOLE DIAMETER:	6 Inches
DATE DRILLED:	November 11, 2019	SAMPLING METHOD:	SPT
LOGGED BY:	JK	APPROX. ELEVATION:	Not Recorded

Depth of Groundwater: **Not Encountered** Boring Terminated: **10 Feet**

DEPTH	LITHOLOGY	USCS	SOIL DESCRIPTION	SAMPLE ID	SAMPLERS TYPE	BLOWS/ 12 IN	N 1/60	MOISTURE CONTENT (%)	FINES CONTENT (%)	PLASTICITY INDEX (PI)	EXPANSION INDEX (EI)	OPTIMUM WATER CONTENT (%)	MAXIMUM DRY DENSITY (pcf)	COHESION, C (psf)	FRICTION ANGLE, (degrees)
0		CH	SILTY CLAY: dark brown, with gravels, stiff, dry, colluvium												
1															
2															
3															
4			very dense												
5				SPT		27	36	13.3							
6		CL	KJFM: franciscan complex, weatherered rock, meta volcanic												
7															
8															
9			medium dense												
10				SPT		22	24	16.7							
11															
12															
13															
14															
15															
16															
17															
18															
19															
20															

APPENDIX B

Laboratory Testing

Soil Test Reports

GEO

LABORATORY TESTING

This appendix includes a discussion of the test procedures and the laboratory test results performed as part of this investigation. The purpose of the laboratory testing is to assess the engineering properties of the soil materials at the Site. The laboratory tests are performed using the currently accepted test methods, when applicable, of the American Society for Testing and Materials (ASTM).

Undisturbed and disturbed bulk samples used in the laboratory tests are obtained from various locations during the course of the field exploration, as discussed in **Appendix A** of this report. Each sample is identified by sample letter and depth. The Unified Soils Classification System is used to classify soils according to their engineering properties. The various laboratory tests performed are described below:

Expansion Index of Soils (ASTM D4829) is conducted in accordance with the ASTM test method and the California Building Code Standard, and are performed on representative bulk and undisturbed soil samples. The purpose of this test is to evaluate expansion potential of the site soils due to fluctuations in moisture content. The sample specimens are placed in a consolidometer, surcharged under a 144-psf vertical confining pressure, and then inundated with water. The amount of expansion is recorded over a 24-hour period with a dial indicator. The expansion index is calculated by determining the difference between final and initial height of the specimen divided by the initial height.

Laboratory Compaction Characteristics of Soil Using Modified Effort (ASTM D1557) is performed to determine the relationship between the moisture content and density of soils and soil-aggregate mixtures when compacted in a standard size mold with a 10-lbf hammer from a height of 18 inches. The test is performed on a representative bulk sample of bearing soil near the estimated footing depth. The procedure is repeated on the same soil sample at various moisture contents sufficient to establish a relationship between the maximum dry unit weight and the optimum water content for the soil. The data, when plotted, represents a curvilinear relationship known as the moisture density relations curve. The values of optimum water content and modified maximum dry unit weight can be determined from the plotted curve.

Liquid Limit, Plastic Limit, and Plasticity Index of Soils (ASTM D4318) are the water contents at certain limiting or critical stages in cohesive soil behavior. The liquid limit (LL or W_L) is the lower limit of viscous flow, the plastic limit (PL or W_P) is the lower limit of the plastic stage of clay and plastic index (PI or I_P) is a range of water content where the soil is plastic. The Atterberg Limits are performed on samples that have been screened to remove any material retained on a No. 40 sieve. The liquid limit is determined by performing trials in which a portion of the sample is spread in a brass cup, divided in two by a grooving tool, and then allowed to flow together from the shocks caused by repeatedly dropping the cup in a standard mechanical device. To determine the Plastic Limit a small portion of plastic soil is alternately pressed together and rolled into a 1/8-inch diameter thread. This process is continued until the water content of the sample is reduced to a point at which the thread crumbles and can no longer be pressed together and re-rolled. The water content of the soil at this point is reported as the plastic limit. The plasticity index is calculated as the difference between the liquid limit and the plastic limit.

Direct Shear Tests of Soils Under Consolidated Drained Conditions (ASTM D3080) is performed on undisturbed and remolded samples representative of the foundation material. The samples are loaded with a predetermined normal stress and submerged in water until saturation is achieved. The samples are then sheared horizontally at a controlled strain rate allowing partial drainage. The shear stress on the sample is recorded at regular strain intervals. This test determines the resistance to deformation, which is shear strength, inter-particle attraction or cohesion c, and resistance to interparticle slip called the angle of internal friction ϕ.

Particle Size Analysis of Soils (ASTM D422) is used to determine the particle-size distribution of fine and coarse aggregates. In the test method the sample is separated through a series of sieves of progressively smaller openings for determination of particle size distribution. The total percentage passing each sieve is reported and used to determine the distribution of fine and coarse aggregates in the sample.

Density of Soil in Place by the Drive-Cylinder Method (ASTM D2937) and **Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass** (ASTM D2216) are used to obtain values of in-place water content and in-place density. Undisturbed samples, brought from the field to the laboratory, are weighed, the volume is calculated, and they are placed in the oven to dry. Once the samples have been dried, they are weighed again to determine the water content, and the in-place density is then calculated. The moisture density tests allow the water content and in-place densities to be obtained at required depths.

GeoSolutions, Inc.	SOILS REPORT	(805) 543-8539

Project:	Guerra Ranch			Date Tested:	November 20, 2019
Client:				Project #:	SL11475-1
Sample:	A	Depth:	1.0 to 3.0 Feet	Lab #:	11432
Location:	B-1			Sample Date:	November 14, 2019
				Sampled By:	JK

Soil Classification
ASTM D2487, D2488

Result:	Very Dark Grayish Brown Fat CLAY with Sand
Specification:	CH

Sieve Analysis
ASTM D422

Sieve Size	Percent Passing	Project Specifications
3"		
2"		
1 1/2"		
1"		
3/4"		
No. 4	94	
No. 8	90	
No. 16	87	
No. 30	85	
No. 50	82	
No. 100	78	
No. 200	72.6	

Sand Equivalent Cal 217

1		SE
2		
3		
4		

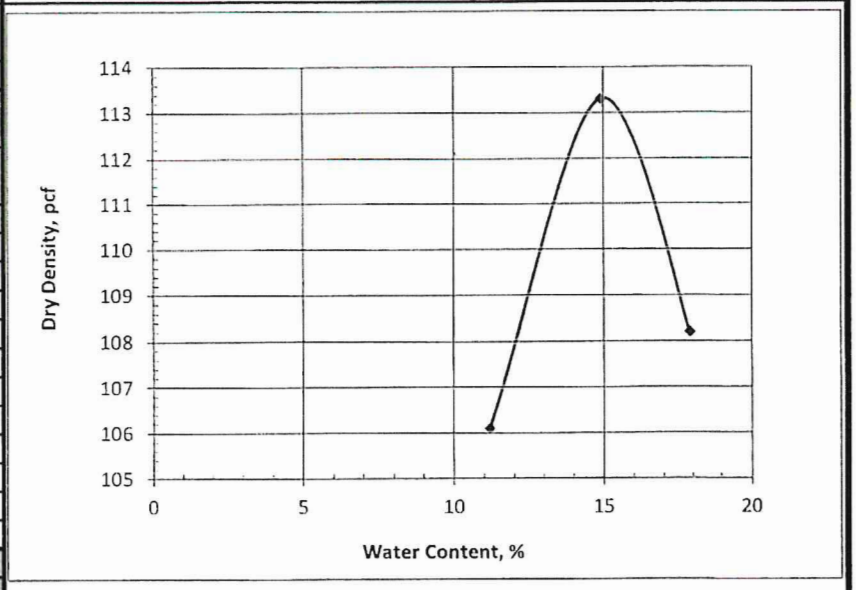
Plasticity Index
ASTM D4318

Liquid Limit:	57
Plastic Limit:	21
Plasticity Index:	**36**

Expansion Index
ASTM D4829

Expansion Index:	**88**
Expansion Potential:	Medium
Initial Saturation, %:	50

Laboratory Maximum Density
ASTM D1557



Mold ID	n/a	Mold Diameter, ins.	4.00
No. of Layers	5	Weight of Rammer, lbs.	10.00
No. of Blows	25		

Estimated Specific Gravity for 100% Saturation Curve = 2.54

Trial #	1	2	3	4
Water Content:	11.2	14.9	17.9	
Dry Density:	106.1	113.3	108.2	

Maximum Dry Density, pcf:	**113.3**
Optimum Water Content, %:	**15.0**

Moisture-Density ASTM D2937, **Moisture Content** ASTM D2216

Sample	Depth (ft)	Water Content (%)	Dry Density (pcf)	Relative Density	Sample Description
B-1	10.0	19.1			Very Dark Brown CLAY with Sand
B-1	15.0	20.0			Dark Yellowish Brown CLAY with Sand
B-1	20.0	19.8			Dark Yellowish Brown CLAY with Sand
B-1	25.0	15.4			Dark Yellowish Brown Sandy CLAY
B-2	5.0	21.0			Very Dark Brown CLAY with Sand
B-2	10.0	25.3			Dark Brown CLAY with Sand
B-3	5.0	13.1			Very Dark Brown Sandy CLAY
B-3	10.0	26.9			Dark Brown CLAY with Sand
B-4	5.0	13.3			Dark Brown Sandy CLAY
B-4	10.0	16.7			Dark Yellowihs Brown Sandy CLAY

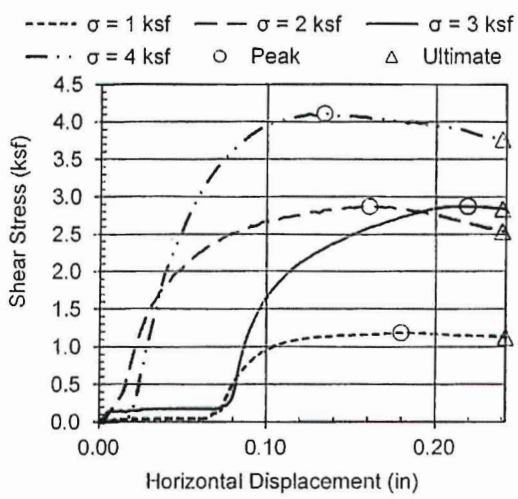
Report By: Aaron Eichman

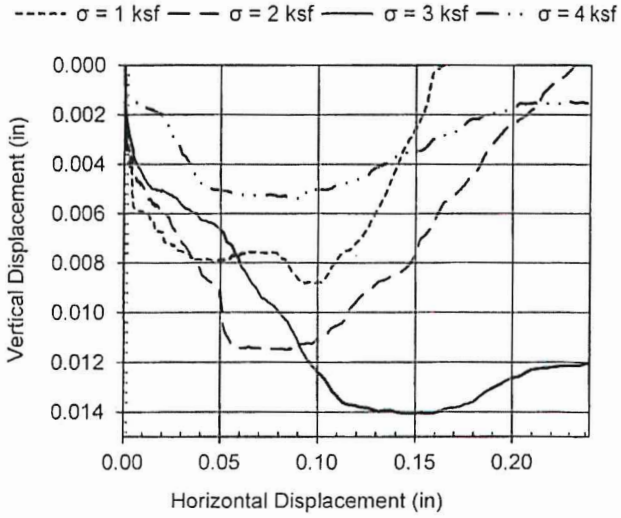
GeoSolutions, Inc. | **DIRECT SHEAR TEST SUMMARY REPORT (ASTM D3080)** | **(805) 543-8539**

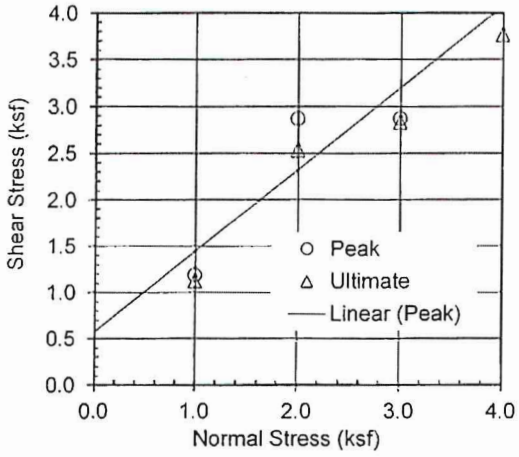
Project:	Guerra Ranch		Project No.: SL11475-1
Client:			Date Tested: 11/26/2019
Sample No.:	B-1 @ 5'	Depth: 5.0 Feet	Lab No.: 11432
Location:	B-1		Checked By: AE

MATERIAL DESCRIPTION	LL	PL	PI	% passing No. 200	Gs *	Sample Type
Dark Brown CLAY with Sand and Gravel	nm	nm	nm	nm	2.7	in-situ (rings)

* Gs = assumed; nm = not measured







Angle of Internal Friction, ϕ_{peak} (degrees):	41.3
Cohesion, C_{peak} (psf)	567

Initial Conditions	Specimen No. 1	2	3	4
Dry Density	112.1	114.5	113.2	119.5
Water Content (%)	15.3	15.3	15.3	15.3
Diameter (in)	2.42	2.42	2.42	2.42
Sample Height (in)	1.00	1.00	1.00	1.00

Test Data	Specimen No. 1	2	3	4
Normal Stress (ksf)	1.00	2.00	3.00	4.00
Peak Shear Stress (ksf)	1.19	2.87	2.87	4.11
Horiz. Displacement at Peak Shear (in)	0.18	0.16	0.22	0.13
Ultimate Shear Stress (ksf)	1.12	2.54	2.83	3.77
Horiz. Displ. at Ult. Shear (in)	0.24	0.24	0.24	0.24
Rate of Deformation (in/min)	0.004	0.004	0.004	0.004

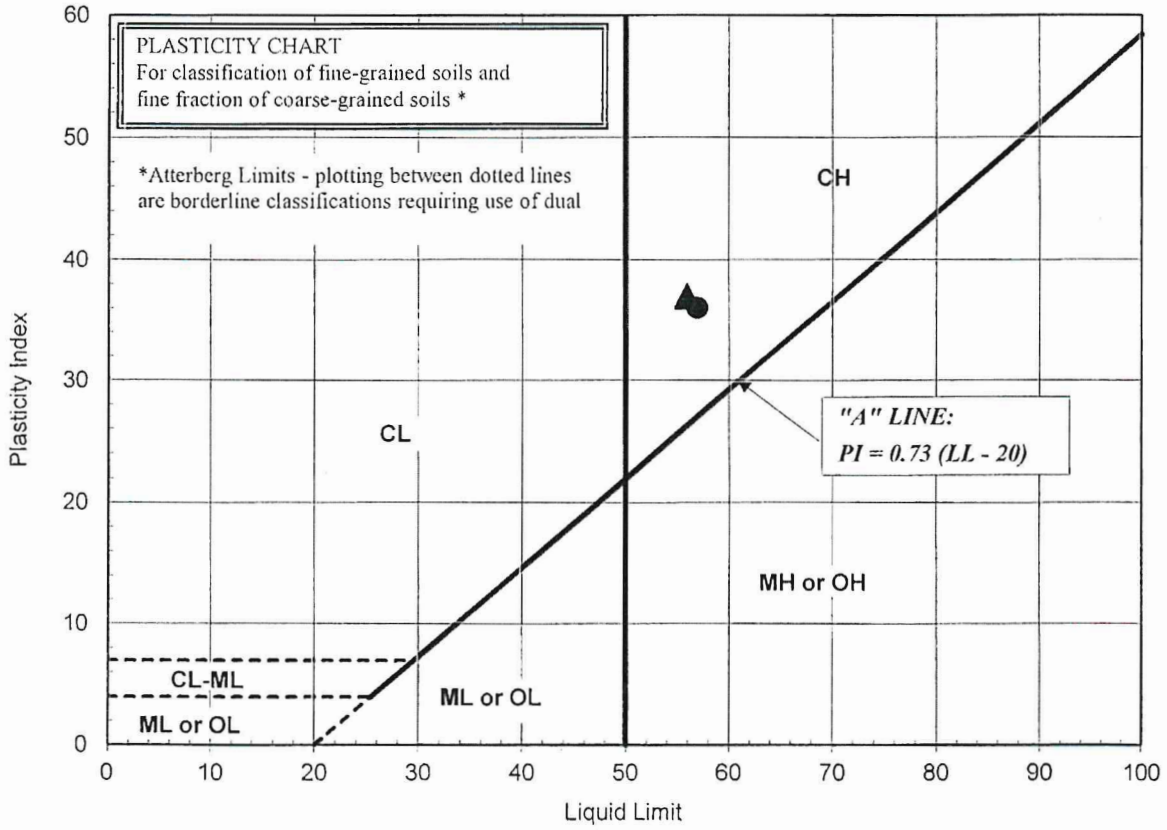
Remarks:

GeoSolutions, Inc.

PLASTICITY INDEX TEST SUMMARY REPORT (ASTM D4318)

(805) 543-8539

Project:	Guerra Ranch		
Sample(s):	A and B	Date:	11/22/2019
Project #:	SL11475-1	Checked by:	AE



LEGEND symbol	location	depth	CLASSIFICATION	TEST RESULTS Liquid Limit (LL)	Plastic Limit (PL)	Plasticity Index (PI)
●	B-1	1-3'	Very Dark Grayish Brown Fat CLAY with Sand	57	21	36
▲	B-1	5-8'	Dark Brown Fat CLAY	56	19	37

Remarks:

Testing was performed in accordance with ASTM D4318

NP - material tested is nonplastic (liquid or plastic limit tests could not be performed)

Report By: Aaron Eichman

APPENDIX C

Seismic Hazard Analysis

Design Map Summary (SEAOC, 2018)

SEISMIC HAZARD ANALYSIS

According to section 1613 of the 2016 CBC (CBSC, 2016), all structures and portions of structures should be designed to resist the effects of seismic loadings caused by earthquake ground motions in accordance with the *ASCE 7: Minimum Design Loads for Buildings and Other Structures*, hereafter referred to as ASCE7-10 (ASCE, 2013). Estimating the design ground motions at the Site depends on many factors including the distance from the Site to known active faults; the expected magnitude and rate of recurrence of seismic events produced on such faults; the source-to-site ground motion attenuation characteristics; and the Site soil profile characteristics. As per section 1613.3.2 of the 2016 CBC, the Site soil profile classification is determined by the average soil properties in the upper 100 feet of the Site profile and can be determined based on the criteria provided in Table 20.3-1 of ASCE7-10.

ASCE7-10 provides recommendations for estimating site-specific ground motion parameters for seismic design considering a Risk-targeted Maximum Considered Earthquake (MCE_R) in order to determine *design spectral response accelerations* and a Maximum Considered Earthquake Geometric Mean (MCE_G) in order to determine probabilistic geometric mean *peak ground accelerations*.

Spectral accelerations from the MCE_R are based on a 5% damped acceleration response spectrum and a 1% exceedance in 50 years (4975-year return period). *Maximum* short period (S_s) and 1-second period (S_1) spectral accelerations are interpolated from the MCE_R-based ground motion parameter maps for bedrock, provided in ASCE7-10. These spectral accelerations are then multiplied by site-specific coefficients (F_a, F_v), based on the Site soil profile classification and the maximum spectral accelerations determined for bedrock, to yield the *maximum* short period (S_{MS}) and 1-second period (S_{M1}) spectral response accelerations at the Site. According to section 11.2 of ASCE7-10 and section 1613 of the 2016 CBC, buildings and structures should be specifically proportioned to resist *design* earthquake ground motions. Section 1613.3.4 of the 2016 CBC indicates the site-specific *design* spectral response accelerations for short (S_{DS}) and 1-second (S_{D1}) periods can be taken as two-thirds of *maximum* ($S_{DS} = 2/3*S_{MS}$ and $S_{D1} = 2/3*S_{M1}$).

Per ASCE7-10, Section 21.5, the probabilistic maximum mean peak ground acceleration (PGA) corresponding to the MCE_G can be computed assuming a 2% probability of exceedance in 50 years (2475-year return period) and is initially determined from mapped ground accelerations for bedrock conditions. The site-specific peak ground acceleration (PGA_M) is then determined by multiplying the PGA by the site-specific coefficient F_h (where F_h is a function of Site Class and PGA).

Spectral response accelerations, peak ground accelerations, and site coefficients provided in this report were obtained using the web-based Seismic Design Maps tool available from the Structural Engineers Association of California (SEAOC, 2018). This program utilizes the methods developed in ASCE 7-10 in conjunction with user-inputted Site location to calculate seismic design parameters and response spectra (both for period and displacement) for soil profile Site Classifications A through E. Output from the web-based program are included in this Appendix.

OSHPD

1835 Atascadero Rd

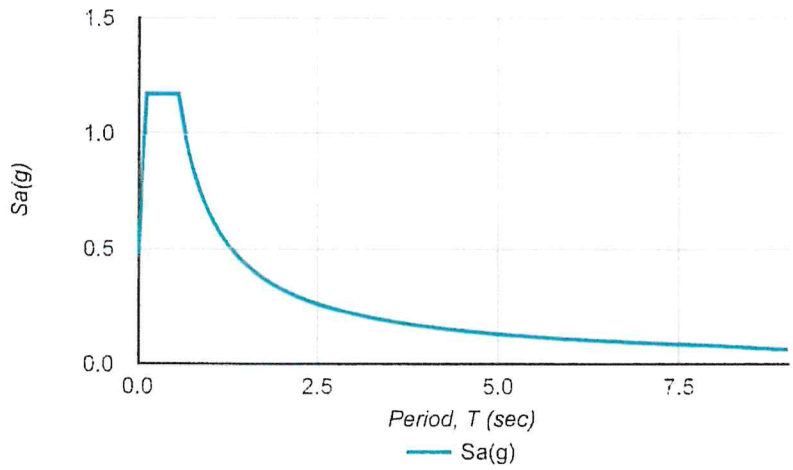
Latitude, Longitude: 35.412260, -120.819018

Date	12/10/2019, 10:25:32 AM
Design Code Reference Document	ASCE7-10
Risk Category	II
Site Class	D - Stiff Soil

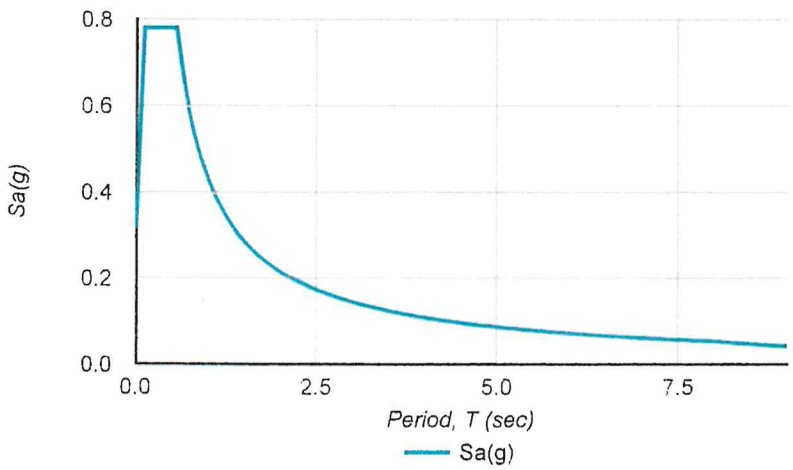
Type	Value	Description
S_S	1.106	MCE_R ground motion. (for 0.2 second period)
S_1	0.41	MCE_R ground motion. (for 1.0s period)
S_{MS}	1.17	Site-modified spectral acceleration value
S_{M1}	0.651	Site-modified spectral acceleration value
S_{DS}	0.78	Numeric seismic design value at 0.2 second SA
S_{D1}	0.434	Numeric seismic design value at 1.0 second SA

Type	Value	Description
SDC	D	Seismic design category
F_a	1.057	Site amplification factor at 0.2 second
F_v	1.59	Site amplification factor at 1.0 second
PGA	0.428	MCE_G peak ground acceleration
F_{PGA}	1.072	Site amplification factor at PGA
PGA_M	0.459	Site modified peak ground acceleration
T_L	8	Long-period transition period in seconds
SsRT	1.106	Probabilistic risk-targeted ground motion. (0.2 second)
SsUH	1.132	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
SsD	1.5	Factored deterministic acceleration value. (0.2 second)
S1RT	0.41	Probabilistic risk-targeted ground motion. (1.0 second)
S1UH	0.413	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
S1D	0.6	Factored deterministic acceleration value. (1.0 second)
PGAd	0.5	Factored deterministic acceleration value. (Peak Ground Acceleration)
C_{RS}	0.977	Mapped value of the risk coefficient at short periods
C_{R1}	0.992	Mapped value of the risk coefficient at a period of 1 s

MCER Response Spectrum



Design Response Spectrum



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APPENDIX D

Preliminary Grading Specifications

Key and Bench with Backdrain

PRELIMINARY GRADING SPECIFICATIONS

A. General

1. These preliminary specifications have been prepared for the subject site; GeoSolutions, Inc. should be consulted prior to the commencement of site work associated with site development to ensure compliance with these specifications.

2. GeoSolutions, Inc. should be notified at least 72 hours prior to site clearing or grading operations on the property in order to observe the stripping of surface materials and to coordinate the work with the grading contractor in the field.

3. These grading specifications may be modified and/or superseded by recommendations contained in the text of this report and/or subsequent reports.

4. If disputes arise out of the interpretation of these grading specifications, the Soils Engineer shall provide the governing interpretation.

B. Obligation of Parties

1. The Soils Engineer should provide observation and testing services and should make evaluations to advise the client on geotechnical matters. The Soils Engineer should report the findings and recommendations to the client or the authorized representative.

2. The client should be chiefly responsible for all aspects of the project. The client or authorized representative has the responsibility of reviewing the findings and recommendations of the Soils Engineer. During grading the client or the authorized representative should remain on-site or should remain reasonably accessible to all concerned parties in order to make decisions necessary to maintain the flow of the project.

3. The contractor is responsible for the safety of the project and satisfactory completion of all grading and other operations on construction projects, including, but not limited to, earthwork in accordance with project plans, specifications, and controlling agency requirements.

C. Site Preparation

1. The client, prior to any site preparation or grading, should arrange and attend a meeting which includes the grading contractor, the design Structural Engineer, the Soils Engineer, representatives of the local building department, as well as any other concerned parties. All parties should be given at least 72 hours notice.

2. All surface and sub-surface deleterious materials should be removed from the proposed building and pavement areas and disposed of off-site or as approved by the Soils Engineer. This includes, but is not limited to, any debris, organic materials, construction spoils, buried utility line, septic systems, building materials, and any other surface and subsurface structures within the proposed building areas. Trees designated for removal on the construction plans should be removed and their primary root systems grubbed under the observations of a representative of GeoSolutions, Inc. Voids left from site clearing should be cleaned and backfilled as recommended for structural fill.

3. Once the Site has been cleared, the exposed ground surface should be stripped to remove surface vegetation and organic soil. A representative of GeoSolutions, Inc. should determine the required depth of stripping at the time of work being completed. Strippings may either be disposed of off-site or stockpiled for future use in landscape areas, if approved by the landscape architect.

D. Site Protection

1. Protection of the Site during the period of grading and construction should be the responsibility of the contractor.

2. The contractor should be responsible for the stability of all temporary excavations.

3. During periods of rainfall, plastic sheeting should be kept reasonably accessible to prevent unprotected slopes from becoming saturated. Where necessary during periods of rainfall, the contractor should install check-dams, de-silting basins, sand bags, or other devices or methods necessary to control erosion and provide safe conditions.

E. Excavations

1. Materials that are unsuitable should be excavated under the observation and recommendations of the Soils Engineer. Unsuitable materials include, but may not be limited to: 1) dry, loose, soft, wet, organic, or compressible natural soils; 2) fractured, weathered, or soft bedrock; 3) non-engineered fill; 4) other deleterious materials; and 5) materials identified by the Soils Engineer or Engineering Geologist.

2. Unless otherwise recommended by the Soils Engineer and approved by the local building official, permanent cut slopes should not be steeper than 2:1 (horizontal to vertical). Final slope configurations should conform to section 1804 of the 2016 California Building Code unless specifically modified by the Soil Engineer/Engineering Geologist.

3. The Soil Engineer/Engineer Geologist should review cut slopes during excavations. The contractor should notify the Soils Engineer/Engineer Geologist prior to beginning slope excavations.

F. Structural Fill

1. Structural fill should not contain rocks larger than 3 inches in greatest dimension, and should have no more than 15 percent larger than 2.5 inches in greatest dimension.

2. Imported fill should be free of organic and other deleterious material and should have very low expansion potential, with a plasticity index of 12 or less. Before delivery to the Site, a sample of the proposed import should be tested in our laboratory to determine its suitability for use as structural fill.

G. Compacted Fill

1. Structural fill using approved import or native should be placed in horizontal layers, each approximately 8 inches in thickness before compaction. On-site inorganic soil or approved imported fill should be conditioned with water to produce a soil water content near optimum moisture and compacted to a minimum relative density of 90 percent based on ASTM D1557-12_{e1}.

2. Fill slopes should not be constructed at gradients greater than 2-to-1 (horizontal to vertical). The contractor should notify the Soils Engineer/Engineer Geologist prior to beginning slope excavations.

3. If fill areas are constructed on slopes greater than 10-to-1 (horizontal to vertical), we recommend that benches be cut every 4 feet as fill is placed. Each bench shall be a minimum of 10 feet wide with a minimum of 2 percent gradient into the slope.

4. If fill areas are constructed on slopes greater than 5-to-1, we recommend that the toe of all areas to receive fill be keyed a minimum of 24 inches into underlying dense material. Key depths are to be observed and approved by a representative of GeoSolutions, Inc. Sub-drains shall be placed in the keyway and benches as required.

H. Drainage

1. During grading, a representative of GeoSolutions, Inc. should evaluate the need for a sub-drain or back-drain system. Areas of observed seepage should be provided with sub-surface drains to release the hydrostatic pressures. Sub-surface drainage facilities may include gravel blankets, rock filled trenches or Multi-Flow systems or equal. The drain system should discharge in a non-erosive manner into an approved drainage area.

2. All final grades should be provided with a positive drainage gradient away from foundations. Final grades should provide for rapid removal of surface water runoff. Ponding of water should not be allowed on building pads or adjacent to foundations. Final grading should be the responsibility of the contractor, general Civil Engineer, or architect.

3. The ground immediately adjacent to the foundation shall be sloped away from the building at a slope of not less than one unit vertical in 20 units horizontal (5 percent slope) for a minimum distance of 10 feet (3048 mm) measured perpendicular to the face of the wall perc Section 1804.4 of the 2016 CBC.

4. Concentrated surface water runoff within or immediately adjacent to the Site should be conveyed in pipes or in lined channels to discharge areas that are relatively level or that are adequately protected against erosion.

5. Water from roof downspouts should be conveyed in solid pipes that discharge in controlled drainage localities. Surface drainage gradients should be planned to prevent ponding and promote drainage of surface water away from building foundations, edges of pavements and sidewalks. For soil areas we recommend that a minimum of 2 percent gradient be maintained.

6. Attention should be paid by the contractor to erosion protection of soil surfaces adjacent to the edges of roads, curbs and sidewalks, and in other areas where hard edges of structures may cause concentrated flow of surface water runoff. Erosion resistant matting such as Miramat, or other similar products, may be considered for lining drainage channels.

7. Sub-drains should be placed in established drainage courses and potential seepage areas. The location of sub-drains should be determined after a review of the grading plan. The sub-drain outlets should extend into suitable facilities or connect to the proposed storm drain system or existing drainage control facilities. The outlet pipe should consist of a non-perforated pipe the same diameter as the perforated pipe.

I. Maintenance

1. Maintenance of slopes is important to their long-term performance. Precautions that can be taken include planting with appropriate drought-resistant vegetation as recommended by a landscape architect, and not over-irrigating, a primary source of surficial failures.

2. Property owners should be made aware that over-watering of slopes is detrimental to long term stability of slopes.

J. Underground Facilities Construction

1. The attention of contractors, particularly the underground contractors, should be drawn to the State of California Construction Safety Orders for "Excavations, Trenches, Earthwork." Trenches or excavations greater than 5 feet in depth should be shored or sloped back in accordance with OSHA Regulations prior to entry.

2. Bedding is defined as material placed in a trench up to 1 foot above a utility pipe and backfill is all material placed in the trench above the bedding. Unless concrete bedding is required around utility pipes, free-draining sand should be used as bedding. Sand to be used as bedding should be tested in our laboratory to verify its suitability and to measure its compaction characteristics. Sand bedding should be compacted by mechanical means to achieve at least 90 percent relative density based on ASTM D1557-12_{e1}.

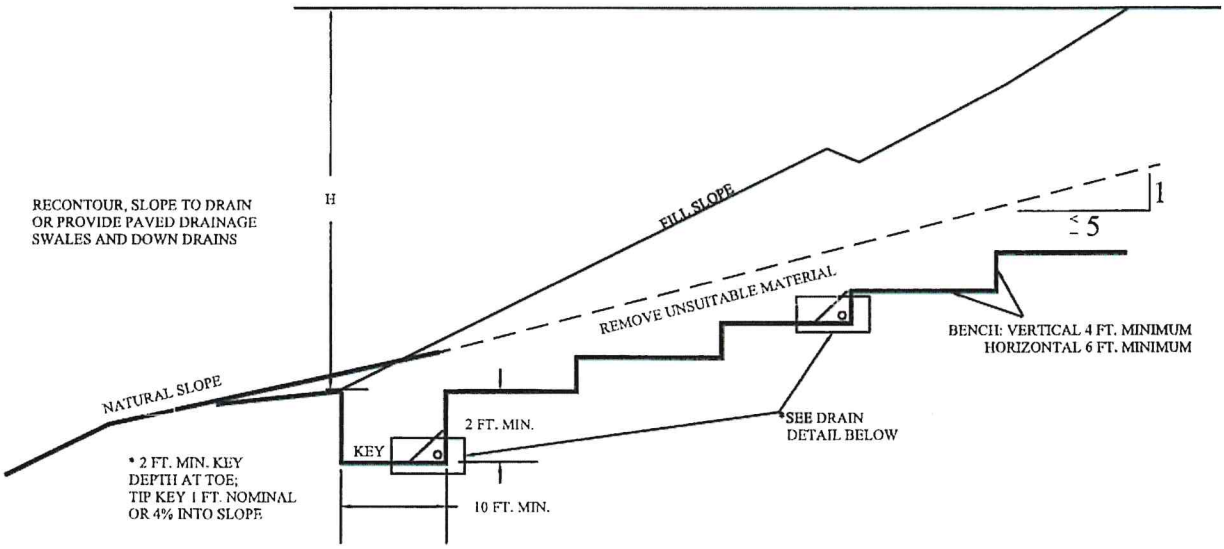
3. On-site inorganic soils, or approved import, may be used as utility trench backfill. Proper compaction of trench backfill will be necessary under and adjacent to structural fill, building foundations, concrete slabs, and vehicle pavements. In these areas, backfill should be conditioned with water (or allowed to dry), to produce a soil water content of about 2 to 3 percent above the optimum value and placed in horizontal layers, each not exceeding 8 inches in thickness before compaction. Each layer should be compacted to at least 90 percent relative density based on ASTM D1557-12_{e1}. The top lift of trench backfill under vehicle pavements should be compacted to the requirements given in report under Preparation of Paved Areas for vehicle pavement sub-grades. Trench walls must be kept moist prior to and during backfill placement.

K. Completion of Work

1. After the completion of work, a report should be prepared by the Soils Engineer retained to provide such services. The report should including locations and elevations of field density tests, summaries of field and laboratory tests, other substantiating data, and comments on any changes made during grading and their effect on the recommendations made in the approved Soils Engineering Report.

2. Soils Engineers shall submit a statement that, to the best of their knowledge, the work within their area of responsibilities is in accordance with the approved soils engineering report and applicable provisions within Chapter 18 of the 2016 CBC.

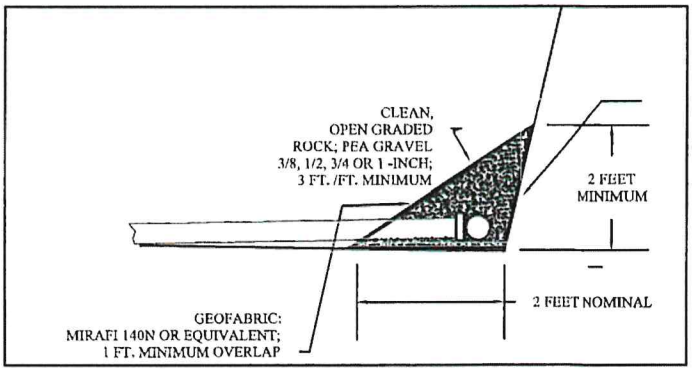
FILL OVER SLOPE



NOTES:

*BACKDRAIN AS RECOMMENDED BY GEOTECHNICAL PER DETAIL.

DRAIN DETAIL



NTS

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San Luis Obispo, CA 93401
(805) 543-8539 Fax: (805) 543-2171

KEY AND BENCH WITH BACKDRAIN

DETAIL
A