COUNTY OF SAN MATEO, PLANNING AND BUILDING DEPARTMENT

NOTICE OF INTENT TO ADOPT
MITIGATED NEGATIVE DECLARATION

A notice, pursuant to the California Environmental Quality Act of 1970, as amended (Public Resources Code 21,000, et seq.), that the following project: *Domestic Well*, when adopted and implemented, will not have a significant impact on the environment.

FILE NO.: PLN 2018-00351

OWNER: La Honda Pescadero Unified School District

APPLICANT: County of San Mateo

ASSESSOR'S PARCEL NO.: 087-053-010

LOCATION: 350-360 Butano Cut Off, Pescadero

PROJECT DESCRIPTION

Drilling of a domestic well to determine the viability of a new well to serve the existing school and potential future fire station on the La Honda-Pescadero Unified School District property. Three well locations are identified as potential well sites but only one well will be constructed and certified. The parcel size is 28.61 acres, the project area (potential fire station area) is 76,000 sq. ft., and the project site is approximately 4 sq. ft. (construction area of each well). Wells are located in the southwest portion of the property between the existing parking lot and Butano Cut-Off within the project area.

FINDINGS AND BASIS FOR A NEGATIVE DECLARATION

The Current Planning Section has reviewed the initial study for the project and, based upon substantial evidence in the record, finds that:

1. The project will not adversely affect water or air quality or increase noise levels substantially.

2. The project will not have adverse impacts on the flora or fauna of the area.

3. The project will not degrade the aesthetic quality of the area.

4. The project will not have adverse impacts on traffic or land use.

5. In addition, the project will not:

    a. Create impacts which have the potential to degrade the quality of the environment.

    b. Create impacts which achieve short-term to the disadvantage of long-term environmental goals.

c. Create impacts for a project which are individually limited, but cumulatively considerable.

d. Create environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly.

The County of San Mateo has, therefore, determined that the environmental impact of the project is insignificant.

MITIGATION MEASURES included in the project to avoid potentially significant effects:

Mitigation Measure 1: The applicant shall require construction contractors to implement all the Bay Area Air Quality Management District's Basic Construction Mitigation Measures, listed below:

a. Water all active construction areas at least twice daily.

b. Apply water two times daily, or apply (non-toxic) soil stabilizers on all unpaved access roads, parking, and staging areas at construction sites. Also, hydroseed or apply non-toxic soil stabilizers to inactive construction areas.

c. Sweep adjacent public streets daily (preferably with water sweepers) if visible soil material is carried onto them.

d. Limit traffic speeds on unpaved roads within the project parcel to 15 miles per hour.

e. All construction equipment shall be maintained and properly tuned in accordance with manufacturer's specifications. All equipment shall be checked by a certified mechanic and determined to be running in proper condition prior to operation.

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

Mitigation Measure 2: The applicant shall implement the following basic construction measures at all times:

a. Idling times shall be minimized either by shutting equipment off when not in use or reducing the maximum idling time to 5 minutes (as required by the California Airborne Toxic Control Measures Title 13, Section 2485 of California Code of Regulations [CCR]).

b. All construction equipment shall be maintained and properly tuned in accordance with manufacturer's specifications.

Mitigation Measure 3: Preconstruction survey(s) shall be performed prior to the start of well drilling activities by a qualified biologist. If CRLF and SFGS are found within the project area, all work shall cease until the individual(s) have been allowed to leave the project area on their own. If the CRLF or SFGS individual(s) cannot passively leave the project area, work will cease and the U.S. Fish and Wildlife Service (USFWS) will be contacted to determine the appropriate course of action.

Mitigation Measure 4: If buried cultural materials are encountered during construction, work should stop in that area until a qualified archaeologist can evaluate the nature and significance of the find.

Mitigation Measure 5: Pursuant to San Mateo County Ordinance Code 4.68.050 *Mitigation of Disturbance at Well Site*, disturbance at a well site for the purposes of construction shall be limited to the minimum amount of disturbance necessary to gain access to drill the well. Drilling fluids and other drilling materials produced or used in connection with well construction shall not be allowed to discharge onto or into streets, waterways, sensitive habitats, or storm drains. Drilling fluids shall be properly managed and disposed of in accordance with applicable local, regional, and state requirements. Upon completion of the construction, the site shall be restored as near as possible to its original condition, and appropriate erosion control measures shall be implemented. Wells constructed during a period where winterization requirements are in effect, between October 1 and May 1, shall comply with County stormwater pollution prevention measures.

Mitigation Measure 6: During project construction, the applicant shall, pursuant to Chapter 4.100 of the San Mateo County Ordinance Code, minimize the transport and discharge of stormwater runoff from the construction site:

a. Stabilizing all denuded areas and maintaining erosion control measures continuously between October 1 and April 30. Stabilizing shall include both proactive measures, such as the placement of hay bales or coir netting, and passive measures, such as revegetating disturbed areas with plants propagated from seed collected in the immediate area.

b. Storing, handling, and disposing of construction materials and wastes properly, so as to prevent their contact with stormwater.

c. Controlling and preventing the discharge of all potential pollutants, including pavement cutting wastes, paints, concrete, petroleum products, chemicals, wash water or sediments, and non-stormwater discharges, to storm drains and watercourses.

d. Avoiding cleaning, fueling, or maintaining vehicles on-site, except in a designated area where wash water is contained and treated.

e. Delineating with field markers clearing limits, easements, setbacks, sensitive or critical areas, buffer zones, trees, and drainage courses.

f. Protecting adjacent properties and undisturbed areas from construction impacts using vegetative buffer strips, sediment barriers or filters, dikes, mulching, or other measures as appropriate.

g. Performing clearing and earth-moving activities only during dry weather.

h. Limiting and timing application of pesticides and fertilizers to prevent polluted runoff.

i. Limiting construction access routes and stabilizing designated access points.

j. Avoiding tracking dirt or other materials off-site; cleaning off-site paved areas and sidewalks using dry sweeping methods.

k. The contractor shall train and provide instruction to all employees and subcontractors regarding the construction Best Management Practices.

Mitigation Measure 7: Construction equipment for new development shall comply with best management practices from Bay Area Air Quality Management District guidance.

RESPONSIBLE AGENCY CONSULTATION

None

INITIAL STUDY

The San Mateo County Current Planning Section has reviewed the Environmental Evaluation of this project and has found that the probable environmental impacts are insignificant. A copy of the initial study is attached.

REVIEW PERIOD: November 28, 2018 to December 18, 2018

All comments regarding the correctness, completeness, or adequacy of this Negative Declaration must be received by the County Planning and Building Department, 455 County Center, Second Floor, Redwood City, no later than **5:00 p.m., December 18, 2018**.

CONTACT PERSON

Melissa Ross
Project Planner, 650/599-1559
mross@smcgov.org

Melissa Ross, Project Planner

MR:pac - MARCC0559_WPH.DOCX

County of San Mateo
Planning and Building Department

INITIAL STUDY
ENVIRONMENTAL EVALUATION CHECKLIST
(To Be Completed by Planning Department)

1. **Project Title:** Domestic Well

2. **County File Number:** PLN 2018-00351

3. **Lead Agency Name and Address:**
   County of San Mateo
   Planning and Building Department
   455 County Center, 2nd Floor
   Redwood City, CA 94063

4. **Contact Person and Phone Number:** Melissa Ross, Senior Planner, 650/599-1559

5. **Project Location:** 350-360 Butano Cut-Off, Pescadero

6. **Assessor's Parcel Number and Size of Parcel:** 087-053-010; 28.61 acres

7. **Project Sponsor's Name and Address:**
   County of San Mateo
   Project Development Unit
   1402 Maple Street
   Redwood City, CA 94063

8. **General Plan Designation:** General Plan: Institutional; Local Coastal Plan Designation Agriculture and Institutional

9. **Zoning:** Resource Management-Coastal Zone/Coastal Development (RM-CZ/CD)

10. **Description of the Project:** Drilling of a domestic well to determine the viability of a new well to serve the existing school and potential future fire station on the La Honda-Pescadero Unified School District property. Three well locations are identified as potential well sites but only one well will be constructed and certified. The parcel size is 28.61 acres, the project area (potential fire station) is 76,000 sq. ft., and the project site is approximately 4 sq. ft. (construction area of each well). Wells are located in the southwest portion of the property between the existing parking lot and Butano Cut-Off within the project area.

11. **Surrounding Land Uses and Setting:** The 28.61-acre parcel is located approximately 0.16-mile south of Pescadero Creek Road at the intersection of Cloverdale and Butano Cut-Off Roads. The parcel is relatively flat and is bounded on the east side by Pescadero Creek. Development on the site includes the existing Pescadero Middle and High School. An agricultural field is located along Cloverdale Road. The parcel is located in a rural area surrounded by agricultural fields, agriculturally related development, single-family residences, and located approximately 0.98-mile from the Town of Pescadero.

12. **Other Public Agencies Whose Approval is Required:** None

13. **Have California Native American tribes traditionally and culturally affiliated with the project area requested consultation pursuant to Public Resources Code Section 21080.3.1? If so, has consultation begun?:** This project is not subject to Assembly Bill 52, as the County of San Mateo has no records of requests for formal notification of proposed projects within the County from any traditionally or culturally affiliated California Native American Tribes. However, the County seeks to satisfy the Native American Heritage Commission's best practices and has referred this project to all tribes within San Mateo County. As of the date of this report, no tribes have contacted the County requesting formal consultation on this project.

ENVIRONMENTAL FACTORS POTENTIALLY AFFECTED

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

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

EVALUATION OF ENVIRONMENTAL IMPACTS

1. A brief explanation is required for all answers except "No Impact" answers that are adequately supported by the information sources a lead agency cites. A "No Impact" answer is adequately supported if the referenced information sources show that the impact simply does not apply to projects like the one involved (e.g., the project falls outside a fault rupture zone). A "No Impact" answer should be explained where it is based on project-specific factors as well as general standards (e.g., the project will not expose sensitive receptors to pollutants, based on a project-specific screening analysis).

2. All answers must take account of the whole action involved, including off-site as well as on-site, cumulative as well as project-level, indirect as well as direct, and construction as well as operational impacts.

3. Once the lead agency has determined that a particular physical impact may occur, then the checklist answers must indicate whether the impact is potentially significant, less than significant with mitigation, or less than significant. "Potentially Significant Impact" is appropriate if there is substantial evidence that an effect may be significant. If there are one or more "Potentially Significant Impact" entries when the determination is made, an EIR is required.

4. "Negative Declaration: Less Than Significant with Mitigation Incorporated" applies where the incorporation of mitigation measures has reduced an effect from "Potentially Significant Impact" to a "Less Than Significant Impact." The lead agency must describe the mitigation measures, and briefly explain how they reduce the effect to a less than significant level (mitigation measures from "Earlier Analyses," as described in 5. below, may be cross-referenced).

5. Earlier analyses may be used where, pursuant to the tiering, program EIR, or other CEQA process, an effect has been adequately analyzed in an earlier EIR or negative declaration (Section 15063(c)(3)(D)). In this case, a brief discussion should identify the following:

   a. Earlier Analysis Used. Identify and state where they are available for review.

   b. Impacts Adequately Addressed. Identify which effects from the above checklist were within the scope of and adequately analyzed in an earlier document pursuant to applicable legal standards, and state whether such effects were addressed by mitigation measures based on the earlier analysis.

   c. Mitigation Measures. For effects that are "Less Than Significant with Mitigation Measures Incorporated," describe the mitigation measures which were incorporated or refined from the earlier document and the extent to which they address site-specific conditions for the project.

6. Lead agencies are encouraged to incorporate into the checklist references to information sources for potential impacts (e.g., general plans, zoning ordinances). Reference to a previously prepared or outside document should, where appropriate, include a reference to the page or pages where the statement is substantiated.

7. Supporting Information Sources. Sources used or individuals contacted should be cited in the discussion.

1. AESTHETICS. Would the project:				
	Potentially Significant Impacts	***Significant Unless Mitigated***	***Less Than Significant Impact***	***No Impact***
1.a. Have a significant adverse effect on a scenic vista, views from existing residential areas, public lands, water bodies, or roads?				X
Discussion: Construction of the domestic well will be located at grade level on a relatively flat parcel. Scenic views from the public roadway will not be adversely impacted. **Source:** Project Plans, Google Earth				

1.b.	Significantly damage or destroy scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?				X
Discussion: The parcel is not located within a state scenic highway. The location of the well will not impact existing trees within the property. No rock outcroppings are present within the parcel nor are any designated historic buildings. **Source:** Project Plans, Planning GIS Planning Map Viewer Scenic Corridors Layer, National Park Service National Register of Historic Places, Google Earth					
1.c.	Significantly degrade the existing visual character or quality of the site and its surroundings, including significant change in topography or ground surface relief features, and/or development on a ridgeline?				X
Discussion: Access and construction of the well does not require significant modifications to the topography and will not be located on a ridgeline. Access to the project site is via the existing driveway and adjacent parking lot. **Source:** Project Plans, Google Earth					
1.d.	Create a new source of significant light or glare that would adversely affect day or nighttime views in the area?				X
Discussion: No lighting is proposed. **Source:** Project Scope					
1.e.	Be adjacent to a designated Scenic Highway or within a State or County Scenic Corridor?				X
Discussion: The project site is located within the Pescadero Creek Road and Cloverdale Road County Scenic Corridors. Given the ground level height of the well and existing access, no impact is expected to the scenic corridors. **Source:** Project Plans, Planning GIS Planning Map Viewer Scenic Corridors Layer, Google Earth					
1.f.	If within a Design Review District, conflict with applicable General Plan or Zoning Ordinance provisions?				X
Discussion: Not located within a Design Review district. **Source:** Project Location					
1.g.	Visually intrude into an area having natural scenic qualities?				X

Discussion: The parcel is located within the rural surroundings of the Pescadero area. Typically found within the vicinity of the project are agricultural fields and related development, vegetated watercourses, a mix of steep hillsides and flatlands, and low-density residential development. Construction of the well will not impact the rural scenic qualities found in the vicinity of the project due to its ground level construction and minimal vegetation removal associated with construction.

Source: Project Plans, Google Earth

2. AGRICULTURAL AND FOREST RESOURCES. In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997) prepared by the California Department of Conservation as an optional model to use in assessing impacts on agriculture and farmland. In determining whether impacts to forest resources, including timberland, are significant environmental effects, lead agencies may refer to information compiled by the California Department of Forestry and Fire Protection regarding the State's inventory of forestland, including the Forest and Range Assessment Project and the Forest Legacy Assessment Project; and forest carbon measurement methodology provided in Forest Protocols adopted by the California Air Resources Board. Would the project:

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

Discussion: Project is not located outside the Coastal Zone.

Source: Project Location

2.b.	Conflict with existing zoning for agricultural use, an existing Open Space Easement, or a Williamson Act contract?			X	

Discussion: The parcel is not encumbered by a Williamson Act contract or Open Space Easement. The parcel is zoned Resource Management-Coastal Zone, and though not zoned "agriculture," agricultural uses are permitted in this zoning district. The northwest portion of the property, just north of the "area of work" identified on the site plan, is farmed and will continue to be farmed. The location of the well sites are not located within the active agricultural field and are allowed uses in the RM-CZ Zoning District subject to permit approval.

Source: Planning Department GIS

2.c.	Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland to non-agricultural use or conversion of forestland to non-forest use?			X	

Discussion: According to the Department of Conservation Farmland Mapping and Monitoring Program California Important Farmland Finder (2016 Interactive GIS), the parcel is classified into three categories: Prime Farmland, Urban and Built-Up Land, and Grazing Land.

If the project area were to be irrigated, the land would be designated as Prime Farmland, which is defined as: *Irrigated land with the best combination of physical and chemical features able to sustain long term production of agricultural crops. This land has the soil quality, growing season, and moisture supply needed to produce sustained high yields. Land must have been used for production of irrigated crops at some time during the four years prior to the mapping date.*

According to aerial photos, the area of the proposed well site was farmed in the previous 4 years (May 2012) of the Department of Conservation map dated 2016. Since 2013, the land has been left fallow.

Construction of the well will convert approximately 4 sq. ft. of the 76,000 sq. ft. project area and will be located outside of the active agricultural field to the northwest.

Given the small footprint of the domestic well, the Prime Farmland conversion is less than significant.

Source: Department of Conservation Farmland Mapping and Monitoring Program California Important Farmland Finder (2016 Interactive GIS), Google Earth

2.d.	For lands within the Coastal Zone, convert or divide lands identified as Class I or Class II Agriculture Soils and Class III Soils rated good or very good for artichokes or Brussels sprouts?			X	

Discussion: Soils in the proposed well site areas have an Irrigated Land Capability Classification rating of Class I as identified on the Natural Resources Conservation Service Web Soil Survey. Land capability classification takes into consideration landscape location, slope of the field, depth, texture, and reaction of the soil. Classes I through IV are rated by NRCS as arable land with Class I soils as having few limitations that restrict their use. The project area is identified on the San Mateo County General Plan Productive Soil Resources Soils with Agricultural Capability for Irrigated Rowcrops and Soil Dependent Floriculture, which includes artichokes or Brussels sprouts. Conversion of these soils will occur as result of this project; however, construction of a well is limited to 4 sq. ft. which is the minimum necessary to establish the domestic water source.

Source: Natural Resources Conservation Service Web Soil Survey, General Plan Productive Soils Resources Soils with Agricultural Capability Map

2.e.	Result in damage to soil capability or loss of agricultural land?			X	

Discussion: Approximately 4 sq. ft. of agricultural land will be converted for construction of the well and concrete pad. This area is minimal compared to the approximate 7.48 acres of land designated

Agriculture (project area and active agricultural field).

Source: Project Plans

2.f.	Conflict with existing zoning for, or cause rezoning of, forestland (as defined in Public Resources Code Section 12220(g)), timberland (as defined by Public Resources Code Section 4526), or timberland zoned Timberland Production (as defined by Government Code Section 51104(g))? *Note to reader: This question seeks to address the economic impact of converting forestland to a non-timber harvesting use.*				X

Discussion: Construction of the well does not conflict with the current Resource Management-Coastal Zone/Coastal Development zoning district nor are trees present on the parcel meeting the definition of forest land (land that supports 10% native tree cover of any species and that allows for management of one or more forest resources) or timberland (land capable of growing a crop of trees of a commercial species used to produce lumber and other forest products). The current land use is such that these forest uses would not be compatible with the existing school and agricultural field.

Source: Project Site

3. AIR QUALITY. Where available, the significance criteria established by the applicable air quality management or air pollution control district may be relied upon to make the following determinations. Would the project:

		Potentially Significant Impacts	***Significant Unless Mitigated***	***Less Than Significant Impact***	***No Impact***
3.a.	Conflict with or obstruct implementation of the applicable air quality plan?		X		

Discussion: The Bay Area Air Quality Management District (District) 2017 Clean Air Plan (CAP) is the applicable plan for San Mateo County. The District outlines Criteria Air Pollutants and Precursors for Construction-Related Impacts in its CEQA Guidelines for use by Lead Agencies in preliminarily identifying whether such pollutants and/or precursors will exceed the District's Thresholds of Significance (Screening Criteria). The Screening Criteria references Table 3-1 of the District's CEQA Guidelines which identifies land use types of a large scale (e.g., office parks, hospitals, warehouses, manufacturing). These uses are beyond the current project scope. The Screening Criteria also provides for the inclusion of basic construction mitigation measures to reduce potential impacts to less than significant levels. As mitigated, the project will not conflict or obstruct implementation of the 2017 CAP.

Mitigation Measure 1: The applicant shall require construction contractors to implement all the Bay Area Air Quality Management District's Basic Construction Mitigation Measures, listed below:

a. Water all active construction areas at least twice daily.

b. Apply water two times daily, or apply (non-toxic) soil stabilizers on all unpaved access roads,

parking, and staging areas at construction sites. Also, hydroseed or apply non-toxic soil stabilizers to inactive construction areas.

c. Sweep adjacent public streets daily (preferably with water sweepers) if visible soil material is carried onto them.

d. Limit traffic speeds on unpaved roads within the project parcel to 15 miles per hour.

e. All construction equipment shall be maintained and properly tuned in accordance with manufacturer's specifications. All equipment shall be checked by a certified mechanic and determined to be running in proper condition prior to operation.

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

Source: Bay Area Air Quality Management District 2017 Clean Air Plan, Bay Area Air Quality Management District CEQA Guidelines May 2017

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

Discussion: The Bay Area Air Quality Management District (District) monitors and regulates air pollution within the nine counties surrounding the San Francisco Bay. According to the District Facility Data Map, no regulated facilities are present within the project vicinity nor is the Pescadero area identified as an Impacted Community (areas with high concentration of air pollution and populations most vulnerable to air pollution's health impacts). The State has met (attainment) of the U.S. Environmental Protection Agency standards for carbon monoxide, nitrogen dioxide, sulfur dioxide, and sulfates. However, the State status for particulate matter (PM10) and particulate matter-fine (PM2.5) is non-attainment.

Drilling for the each well includes one two-axle bobtail dump truck pulling a portable mud system on a two-axle trailer, one 4,000 gallon water truck, one three-axel drilling rig (69,000 lbs), one pickup truck pulling a mini excavator, and four pickup trucks (inclusive of the one pickup truck pulling the mini excavator). Each well drilling is anticipated to occur over a four day period. All equipment will remain on site during the drilling with exception to the four pickup trucks that will arrive and leave once per day. No operational emissions are expected. To ensure potential significant impacts are minimized, the following mitigation measure is recommended.

Mitigation Measure 2: The applicant shall implement the following basic construction measures at all times:

a. Idling times shall be minimized either by shutting equipment off when not in use or reducing the maximum idling time to 5 minutes (as required by the California Airborne Toxic Control Measures Title 13, Section 2485 of California Code of Regulations [CCR]).

b. All construction equipment shall be maintained and properly tuned in accordance with manufacturer's specifications.

Source: Bay Area Air Quality Management District

3.c.	Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable Federal or State ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)?		X		
Discussion: The State is a non-attainment area for PM10 and PM2.5. Construction equipment may minimally contribute on a temporary basis to PM 10 and PM 2.5 levels. However, implementation of Mitigation Measures 1 and 2 will ensure potential impacts are reduced to less than significant levels. No operational emissions are expected. **Source:** Bay Area Air Quality Management District					
3.d.	Expose sensitive receptors to significant pollutant concentrations, as defined by BAAQMD?			X	
Discussion: Sensitive receptors include, but are not limited to, hospitals, schools, daycare facilities, elderly housing and convalescent facilities. Well drilling will occur on the subject property that also serves the Pescadero Middle and High School. Pollutants are limited to that of construction vehicles and drilling activities and are not expected to continue once well construction is completed. Well drilling is expected to occur during the mid-winter school break (February 18 – February 22) to minimize potential impacts to students and staff at the school. **Source:** Bay Area Air Quality Management District					
3.e.	Create objectionable odors affecting a significant number of people?			X	
Discussion: No objectionable odors are expected at the conclusion of well drilling. Odors resulting from construction vehicles may occur during well drilling (e.g., gasoline and diesel-fueled construction equipment) however these odors would be temporary in nature. Drilling is expected to occur during the mid-winter school break to minimize potential impacts to students and staff. **Source:** Project Scope					
3.f.	Generate pollutants (hydrocarbon, thermal odor, dust or smoke particulates, radiation, etc.) that will violate existing standards of air quality on-site or in the surrounding area?		X		
Discussion: Minor construction related pollutants are anticipated to result from the construction vehicles and well drilling activities, refer to discussion under Question 3.b. for detailed construction vehicle discussion. Implementation of Mitigation Measures 1 and 2 will ensure potential impacts are reduced to less than significant levels. No operational emissions are expected. **Source:** Project Scope					

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

Discussion: A Preliminary Biological Assessment was conducted in March 2017 for a potential fire station to be located on the subject property. Though it has not been determined if the fire station will be located on this parcel, the assessment is applicable to the current well project.

A drainage ditch (wetland) is located approximately 420 feet from the project site along the west property line (Cloverdale Road). Pescadero Creek is located over 870 feet from the project area and separated from the project area by development (e.g., driveways, buildings). Special-status plant and animal species were identified within the drainage ditch, as discussed below.

Special-Status Plant Species

Vegetation within the drainage ditch, which runs outside of the west property line, consists predominately of cattails, horsetail, blackberry, and wild radish. Sensitive plant species known to occur in the vicinity of the project site include Choris' popcorn-flower and coastal marsh milk vetch. A site survey conducted during the blooming period (June 2016) for Choris' popcorn-flower and coastal marsh milk vetch did not result in either species being detected. Although coastal milk vetch has not been documented within a 1/2-mile radius of the project site, there is potential suitable habitat within the drainage ditch. The biological assessment concluded that the site contains low quality habitat for special-status species. Given the distance of the well sites to the drainage ditch it is not anticipated that this project will result in significant adverse impacts to protected plants species.

Special-Status Animal Species

California Red-Legged Frog (CRLF). CRLF typically inhabit marshes, ponds, and slow-moving streams with well-developed riparian canopy. Breeding habitat occur in aquatic habitats including pools and backwaters within streams and creeks, ponds, marshes, among others. CRLF have been observed in the Cloverdale drainage ditch and are expected to occur within the project area.

San Francisco Garter Snake (SFGS). This semi-aquatic species is often found hunting in ponds, slow moving streams, and ephemeral wetlands occupied by their prey, Pacific chorus frog and CFLF. SFGS have been documented in the vicinity of the project and it is likely that this species could occur within the project area.

San Francisco Dusky-Footed Woodrat (SFDW). SFDW is expected to occur in the coastal scrub habitat on the west side of Cloverdale Road and within riparian habitat along Pescadero Creek. The California Natural Diversity Database (CNDDB) records do not identify SFDW within a 1/2-mile radius of the project area and suitable habitat/nest was observed over 800 feet from the project area. SFDW are expected to occur within the vicinity of the project area however, impacts to this species are not anticipated.

Western Pond Turtle (WPT). WPT habitat occurs near permanent or semi-permanent water sources including ponds, lakes, streams, and irrigation ditches, among others. There a no CNDDB records for WPT within two miles of the project site and no WPT were observed during the site survey. Impacts to WPT are not anticipated.

Saltmarsh Common Yellowthroat. No known CNDDB occurrences within 1/2-mile radius were identified and no suitable habitat is present within the project area. Impacts to this species are not anticipated.

White-Tailed Kite. No known CNDDB occurrences within 1/2-mile radius were identified; however, this species has been observed by County staff in the vicinity of Pescadero Creek. Given the distance of the creek to the well locations, impacts to this species are not anticipated.

Yellow Warbler. The yellow warbler is a seasonal resident of California during the months of April through October and breeds in the coastal riparian woodlands and wetlands. No occurrences within 1/2-mile radius were identified in the CNDDB. Suitable habitat may be present within the Pescadero Creek riparian habitat; however, the species was not observed within the project area. It is unlikely that this species will be impacted.

Due to the potential for CRLF and SFGS special-status species to occur in the project area, the following mitigation measure is recommended.

Mitigation Measure 3: Preconstruction survey(s) shall be performed prior to the start of well drilling activities by a qualified biologist. If CRLF and SFGS are found within the project area, all work shall cease until the individual(s) have been allowed to leave the project area on their own. If the CRLF or SFGS individual(s) cannot passively leave the project area, work will cease and the U.S. Fish and Wildlife Service (USFWS) will be contacted to determine the appropriate course of action.

Source: Biological Assessment

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

Discussion: Refer to Question 4.a.

Source: Biological Assessment

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

Discussion: No work is proposed adjacent to or within the identified riparian habitat in the drainage ditch along Cloverdale Road or within or adjacent to Pescadero Creek to the north east of the parcel.

Source: Biological Assessment, Project Scope, Google Earth

4.d.	Interfere significantly with the movement		X		

	of any native resident or migratory fish or wildlife species or with established native resident migratory wildlife corridors, or impede the use of native wildlife nursery sites?				
Discussion: No wildlife corridor was identified in the Biological Assessment; however, special-status species may utilize the project site area. Refer to Question 4.a. for mitigation. **Source:** Biological Assessment					
4.e.	Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance (including the County Heritage and Significant Tree Ordinances)?				X
Discussion: No trees located in the project area. **Source:** Project Plans					
4.f.	Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Conservation Community Plan, other approved local, regional, or State habitat conservation plan?				X
Discussion: Project site is not located in an area with an adopted conservation plan. **Source:** Project Location					
4.g.	Be located inside or within 200 feet of a marine or wildlife reserve?				X
Discussion: No located within or adjacent to such an area. **Source:** Project Location					
4.h.	Result in loss of oak woodlands or other non-timber woodlands?				X
Discussion: No oak woodlands or other non-timber woodlands are present on the parcel. **Source:** Project Plans					

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

Discussion: A referral of the project to the California Historical Resources Information System Northwest Information Center (NWIC) did not identify any record of previous cultural resources studies for the project area. NWIC recommended that a qualified archaeologist conduct archival and field study of the unsurveyed project area to identify cultural resources. A second recommendation was also made to the County to contact local Native American tribes regarding traditional, cultural, and religious heritage values. Discussion on the Native American recommendation can be found under Section 17 of this document.

As recommended, a Cultural Resources Survey was completed in November 2018 by Dr. Daniel Shoup, RPA. A paper study of past cultural resources in the vicinity of the parcel was conducted as was a field study. Percolation testing for a potential future septic system was being performed at the time the cultural resources field study was conducted, thus the archaeologist had access to open trenches were soil visibility was fair to very good. As stated in the report, all open areas were inspected for cultural evidence such as historic structures, artifacts, and features; and indicators of prehistoric archaeological deposits like midden soil, flaked lithics, groundstone, and shell. No artifacts or features over 45 years of age were noted during the trench inspection for the survey nor were any indicators of archaeological deposits observed in the seven test percolation trenches, which were all excavated at the western edge of the project area. No archaeological resources appear to be present on the project area, which is of low sensitivity for buried prehistoric resources. The proposed project does not appear to have the potential to affect historical resources as defined at 14 CCR § 15064.5. The following mitigation measure is recommended in the unlikely instance that cultural materials are encountered during construction.

Mitigation Measure 4: If buried cultural materials are encountered during construction, work should stop in that area until a qualified archaeologist can evaluate the nature and significance of the find.

Source: Cultural Resources Survey Report, November 2018

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

Discussion: Refer to Question 5.a. for discussion and mitigation.

Source: Cultural Resources Survey Report, November 2018

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

Discussion: According to the United States Geological Survey Geologic Maps map viewer, the project area is identified as having younger (outer) alluvial fan deposits (Holocene) which consists of unconsolidated fine sand, silt, and clayey silt (Qyfo); this unit type is not uncommon for the area. Thus no significant impacts to unique resources or features are anticipated.

Source: United States Geological Survey Geologic Maps National Geologic Map Database Map Viewer

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

Discussion: Refer to Question 5.a. for discussion and mitigation.

Source: Cultural Resources Survey Report, November 2018

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

Discussion: A Fault Evaluation Report (July 2016), prepared by ENGEO, was completed for a potential fire station located on this parcel within the project area. The project area is identified within the Alquist-Priolo Earthquake Fault Hazard Map for the Franklin Point Quadrangle (1982). A review of the United States Geological Survey San Gregorio fault zone Quaternary Fault and Fold Database (QFFD) was also included in the report due to the mapped San Gregorio fault located west of Cloverdale Road. Site exploration of the site was conducted by ENGEO and consisted of two trench excavations, one in the project area and the second trench in the adjacent parking lot. Combined trenching totaled approximately 650 linear feet and to depths ranging from approximately 8.5 to 13.5 feet.

Artificial fill was encountered within 1 to 2 feet of thickness, including soils disturbed as a result of tilling. No evidence of faulting, folding or warping was observed in the exposed trench soils.

The Report concluded that none of the fault traces depicted on the Alquist-Priolo Zone map or the QFFD are shown to pass through the project area. Thus, no impact is anticipated from construction of the well. **Source:** ENGEO Fault Evaluation Report (July 2016)				
ii. Strong seismic ground shaking?			X	
Discussion: The Modified Mercalli Intensity (MMI) estimates the intensity of shaking from an earthquake at a specific location or over a specific area by considering its effect on people, objects, and buildings per The Association of Bay Area Governments (ABAG). MMI intensity levels identify the extent of damage a building may experience during an earthquake. A 7 MMI is considered strong, 8 MMI Very Strong, and 9 MMI is Violent. The project site is located in the mapped San Andreas 7 MMI Strong and San Gregorio MMI 9 Violent. The project proposal does not include construction of any buildings or habitable structures, thus minimizing impacts to building and people. Construction of the well will be in accordance with Environmental Health Services requirements. **Source:** Association of Bay Area Governments Resilience Program Shaking Scenarios				
iii. Seismic-related ground failure, including liquefaction and differential settling?			X	
Discussion: Liquefaction susceptibility mapping estimates the amount of shaking needed to trigger liquefaction. ABAG mapping places the project site within a mapped High Susceptibility for liquefaction. Construction of the well will be in accordance with Environmental Health Services requirements. **Source:** Association of Bay Area Governments Resilience Program Liquefaction Susceptibility				
iv. Landslides?				X
Discussion: A review of the project for located within mapped landslide areas included the following sources: Association of Bay Area Governments Resilience Program Landslide GIS, San Mateo County General Plan Natural Hazards Map, and the United States Geological Survey Landslide Susceptibility in San Mateo County (1972). *ABAG*. The project site is not located in a mapped Existing Landslide Distribution, Earthquake Induced Landslide Study Zone, or Rainfall Induced Landslide Area. ABAG defines the landslide areas as: (1) Existing Landslide Distribution – the distribution of landslides evident in the landscape (e.g., slumps, translational slides) that have occurred in the past, (2) Rainfall induced landslides – are principal areas that are likely to produce debris flows (mudslides), and (3) Earthquake induced landslides – areas where site specific studies are required prior to new construction. *San Mateo County General Plan*. The project site is not located in a mapped Area of High Landslide Susceptibility as identified on the General Plan Natural Hazards Map. *United States Geological Survey (USGS)*. The project site is located in Map Unit I, which is defined as areas least susceptible to landsliding. Construction of a well within the project will not be located on mapped landslide areas nor will the well itself expose people or structures to landslides. **Source:** Association of Bay Area Governments Resilience Program Landslide Geographic Information System, General Plan Natural Hazards Map, USGS Landslide Susceptiblity in San Mateo County Map (1972)				

v. Coastal cliff/bluff instability or erosion? *Note to reader: This question is looking at instability under current conditions. Future, potential instability is looked at in Section 7 (Climate Change).*				X
Discussion: The project is not located along a coastal cliff or bluff. **Source:** Project Location				
6.b. Result in significant soil erosion or the loss of topsoil?		X		

Discussion: Well drilling is anticipated during the mid-winter school break to minimize impacts to students and staff. Well locations can be accessed from the adjacent paved driveway. The following mitigation measures are recommended to reduce potential impacts to less than significant levels.

Mitigation Measure 5: Pursuant to San Mateo County Ordinance Code 4.68.050 *Mitigation of Disturbance at Well Site*, disturbance at a well site for the purposes of construction shall be limited to the minimum amount of disturbance necessary to gain access to drill the well. Drilling fluids and other drilling materials produced or used in connection with well construction shall not be allowed to discharge onto or into streets, waterways, sensitive habitats, or storm drains. Drilling fluids shall be properly managed and disposed of in accordance with applicable local, regional, and state requirements. Upon completion of the construction, the site shall be restored as near as possible to its original condition, and appropriate erosion control measures shall be implemented. Wells constructed during a period where winterization requirements are in effect, between October 1 and May 1, shall comply with County stormwater pollution prevention measures.

Mitigation Measure 6: During project construction, the applicant shall, pursuant to Chapter 4.100 of the San Mateo County Ordinance Code, minimize the transport and discharge of stormwater runoff from the construction site:

a. Stabilizing all denuded areas and maintaining erosion control measures continuously between October 1 and April 30. Stabilizing shall include both proactive measures, such as the placement of hay bales or coir netting, and passive measures, such as revegetating disturbed areas with plants propagated from seed collected in the immediate area.

b. Storing, handling, and disposing of construction materials and wastes properly, so as to prevent their contact with stormwater.

c. Controlling and preventing the discharge of all potential pollutants, including pavement cutting wastes, paints, concrete, petroleum products, chemicals, wash water or sediments, and non-stormwater discharges, to storm drains and watercourses.

d. Avoiding cleaning, fueling, or maintaining vehicles on-site, except in a designated area where wash water is contained and treated.

e. Delineating with field markers clearing limits, easements, setbacks, sensitive or critical areas, buffer zones, trees, and drainage courses.

f. Protecting adjacent properties and undisturbed areas from construction impacts using vegetative buffer strips, sediment barriers or filters, dikes, mulching, or other measures as appropriate.

g. Performing clearing and earth-moving activities only during dry weather.

h. Limiting and timing application of pesticides and fertilizers to prevent polluted runoff.

i. Limiting construction access routes and stabilizing designated access points.

j. Avoiding tracking dirt or other materials off-site; cleaning off-site paved areas and sidewalks using dry sweeping methods.

k. The contractor shall train and provide instruction to all employees and subcontractors regarding the construction Best Management Practices.

Source: Project Scope

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

Discussion: According to the United States Geological Survey Geologic Maps map viewer, the project area is identified as having younger (outer) alluvial fan deposits (Holocene) which consist of unconsolidated fine sand, silt, and clayey silt (Qyfo); this unit type is not uncommon for the area. It is not expected that this project would result in unstable soils, both on- and off-site.

Source: United States Geological Survey Geologic Maps National Geologic Map Database Map Viewer

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

Discussion: Construction of the well is subject to the issuance of a well drilling permit by Environmental Health Services. This project scope is limited to the well only and does not include construction of habitable structures.

Source: Project Scope

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

Discussion: The project does not include construction or use of a septic or other disposal system.

Source: Project Scope

7. **CLIMATE CHANGE**. Would the project:					
		Potentially Significant Impacts	***Significant Unless Mitigated***	***Less Than Significant Impact***	***No Impact***
7.a.	Generate greenhouse gas (GHG) emissions (including methane), either directly or indirectly, that may have a significant impact on the environment?		X		
Discussion: The San Mateo County Energy Efficiency Climate Action Plan Development Checklist identifies measures for construction equipment for new development to comply with best management practices from Bay Area Air Quality Management District guidance. Implementation of the following will reduce GHG emissions to less than significant levels. **Mitigation Measure 7:** Construction equipment for new development shall comply with best management practices from Bay Area Air Quality Management District guidance. **Source:** San Mateo County Energy Efficiency Climate Action Plan					
7.b.	Conflict with an applicable plan (including a local climate action plan), policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases?		X		
Discussion: The San Mateo County Energy Efficiency Climate Action Plan Development Checklist identifies measures for construction equipment for new development to comply with best management practices from Bay Area Air Quality Management District guidance. Implementation of Mitigation Measure 7 will reduce GHG emissions to less than significant levels. **Source:** San Mateo County Energy Efficiency Climate Action Plan					
7.c.	Result in the loss of forestland or conversion of forestland to non-forest use, such that it would release signifi-cant amounts of GHG emissions, or significantly reduce GHG sequestering?				X
Discussion: Project does not include the removal of any trees. **Source:** Project Location and Scope					
7.d.	Expose new or existing structures and/or infrastructure (e.g., leach fields) to accelerated coastal cliff/bluff erosion due to rising sea levels?				X
Discussion: Project site is not located adjacent to a coastal cliff or bluff. **Source:** Project Location					

7.e.	Expose people or structures to a significant risk of loss, injury or death involving sea level rise?				X
Discussion: The project sites are located over 2.7 miles from the Pacific Ocean and 1.6 miles from Pescadero Marsh. The project will not expose people or structures to significant risk of loss, injury, or death resulting from sea level rise. **Source:** Project Scope					
7.f.	Place structures within an anticipated 100-year flood hazard area as mapped on a Federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?				X
Discussion: The project sites are located in Zone X (area of minimal flooding) as identified on FEMA Flood Insurance Rate Maps. **Source:** FEMA FIRM Panel 06081C0451E, Effective October 16, 2012					
7.g.	Place within an anticipated 100-year flood hazard area structures that would impede or redirect flood flows?				X
Discussion: The project site is located in Zone X (area of minimal flooding) as identified on FEMA Flood Insurance Rate Maps. **Source:** FEMA FIRM Panel 06081C0451E, Effective October 16, 2012					

8.	**HAZARDS AND HAZARDOUS MATERIALS**. Would the project:				
		Potentially Significant Impacts	***Significant Unless Mitigated***	***Less Than Significant Impact***	***No Impact***
8.a.	Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials (e.g., pesticides, herbicides, other toxic substances, or radioactive material)?				X
Discussion: No use or transport of such materials. **Source:** Project Scope					

8.b.	Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?				X
Discussion: No use of hazardous materials proposed. **Source:** Project Scope					
8.c.	Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?				X
Discussion: The project sites are located on a school property however, no hazardous emissions, materials, substances, or waste is proposed. **Source:** Project Scope					
8.d.	Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?				X
Discussion: No hazardous sites or facilities were identified within the parcel vicinity. **Source:** California Department of Toxic Substances Control EnvironStor					
8.e.	For a project located within an airport land use plan or, where such a plan has not been adopted, within 2 miles of a public airport or public use airport, result in a safety hazard for people residing or working in the project area?				X
Discussion: The parcel is not located within an airport land use plan area or within 2 miles of a public airport. **Source:** Project Location					
8.f.	For a project within the vicinity of a private airstrip, result in a safety hazard for people residing or working in the project area?				X
Discussion: The parcel is not located within the vicinity of a private airstrip. **Source:** Project Location					

8.g.	Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?				X
Discussion: Pescadero High School is a San Mateo County Office of Emergency Services designated evacuation shelter. Construction of the well will not interfere with the use of the parcel as a designated evacuation site nor will the project impede access to the tsunami evacuation route. **Source:** Project Location					
8.h.	Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?				X
Discussion: The parcel is not located in a moderate, high, or very high fire severity area. **Source:** Planning GIS Planning Map Viewer SRA-LRA Layer					
8.i.	Place housing within an existing 100-year flood hazard area as mapped on a Federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?				X
Discussion: No housing is proposed. **Source:** Project Scope					
8.j.	Place within an existing 100-year flood hazard area structures that would impede or redirect flood flows?				X
Discussion: The project sites are located in Zone X (area of minimal flooding) as identified on FEMA Flood Insurance Rate Maps. **Source:** FEMA FIRM Panel 06081C0451E, Effective October 16, 2012					
8.k.	Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?				X
Discussion: Project site is non-habitatable structure and is not located within a mapped dam failure inundation area. **Source:** Project Location and Scope, San Mateo County General Plan Natural Hazards Map					
8.l.	Inundation by seiche, tsunami, or mudflow?				X

Discussion: The parcel is not located in such mapped areas.

Source: San Mateo County Geotechnical Hazard Synthesis Map, San Mateo County General Plan Natural Hazards Map

9. HYDROLOGY AND WATER QUALITY. Would the project:				
	Potentially Significant Impacts	***Significant Unless Mitigated***	***Less Than Significant Impact***	***No Impact***
9.a. Violate any water quality standards or waste discharge requirements (consider water quality parameters such as temperature, dissolved oxygen, turbidity and other typical stormwater pollutants (e.g., heavy metals, pathogens, petroleum derivatives, synthetic organics, sediment, nutrients, oxygen-demanding substances, and trash))?		X		
Discussion: No work will be carried out within a watercourse; however, there is the potential for waste water as part of the drilling to occur. Implementation of Mitigation Measure 5 will reduce potential impacts to less than significant levels. **Source:** Project Scope, Project Location.				
9.b. Significantly deplete groundwater supplies or interfere significantly with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?				X
Discussion: The project scope is limited to the construction a domestic well to determine available water quantity and quality to serve the school and potential future fire station on this site. Connection of the well for use is not included in this project scope. **Source:** Project Scope				
9.c. Significantly alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner that would result in significant erosion or siltation on- or off-site?			X	

Discussion: Minor alteration of the project site area is expected for construction of the well and 4 sq. ft. pad. No watercourses are adjacent to the project site. No significant alteration of the existing drainage is anticipated. **Source:** Project Location and Scope					
9.d.	Significantly alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or significantly increase the rate or amount of surface runoff in a manner that would result in flooding on- or off-site?				X
Discussion: Construction of a small concrete pad associated with the well will not significantly alter drainage patterns such that flooding would result on- or off-site. **Source:** Project Scope					
9.e.	Create or contribute runoff water that would exceed the capacity of existing or planned stormwater drainage systems or provide significant additional sources of polluted runoff?				X
Discussion: The surrounding rural area is not improved with storm drainage systems. Construction of the well and concrete pad will not significantly increase stormwater runoff. **Source:** Project Scope					
9.f.	Significantly degrade surface or ground-water water quality?				X
Discussion: Well construction is regulated by County Environmental Health Services. The County's Well Ordinance identifies requirements for the design and construction of wells in order to exclude contamination (e.g., sanitary seal). A well permit granted by Environmental Health Services is required prior to well drilling and will ensure that well construction and operation will not degrade ground water water quality. **Source:** Project scope, San Mateo County Ordinance Code Chapter 4.68 *Wells*					
9.g.	Result in increased impervious surfaces and associated increased runoff?			X	
Discussion: Minor increase in impervious surface construction is required as part of the well construction. A small 4 sq. ft. concrete pad will be installed to surround the well. This minimal concrete pad will not significantly increase runoff. **Source:** Project scope, San Mateo County Ordinance Code Chapter 4.68 *Wells*					

10. LAND USE AND PLANNING. Would the project:				
	Potentially Significant Impacts	***Significant Unless Mitigated***	***Less Than Significant Impact***	***No Impact***
10.a. Physically divide an established community?				X
Discussion: Project will not physically divide an established community. **Source:** Project Scope				
10.b. Conflict with any applicable land use plan, policy or regulation of an agency with jurisdiction over the project (including, but not limited to, the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?				X
Discussion: Domestic wells are allowed uses subject to permitting. **Source:** San Mateo County General Plan, Local Coastal Program, and Zoning Regulations				
10.c. Conflict with any applicable habitat conservation plan or natural community conservation plan?				X
Discussion: No conservation plans have been adopted for this area. **Source:** Project location, San Mateo County General Plan, San Mateo County Local Coastal Program, San Mateo County Parks Department				
10.d. Result in the congregating of more than 50 people on a regular basis?				X
Discussion: Project will not result in the congregation of more than 50 people on a regular basis. **Source:** Project Scope				
10.e. Result in the introduction of activities not currently found within the community?				X
Discussion: Domestic wells are common within rural areas of the County. **Source:** Project Location				

10.f.	Serve to encourage off-site development of presently undeveloped areas or increase development intensity of already developed areas (examples include the introduction of new or expanded public utilities, new industry, commercial facilities or recreation activities)?			X	
Discussion: Well construction is limited to determining the quality and quantity of available water. No use of the well is proposed with this project. **Source:** Project Scope					
10.g.	Create a significant new demand for housing?				X
Discussion: Well construction only. **Source:** Project Scope					

11.	**MINERAL RESOURCES**. Would the project:				
		Potentially Significant Impacts	***Significant Unless Mitigated***	***Less Than Significant Impact***	***No Impact***
11.a.	Result in the loss of availability of a known mineral resource that would be of value to the region or the residents of the State?				X
Discussion: No known mineral resources are located on the parcel. **Source:** Project location, General Plan Mineral Resources Map					
11.b.	Result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan?				X
Discussion: No mapped mineral resource recovery sites located on the parcel. **Source:** Project location, General Plan Mineral Resources Map					

12. NOISE. Would the project result in:				
	Potentially Significant Impacts	***Significant Unless Mitigated***	***Less Than Significant Impact***	***No Impact***
12.a. Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?			X	
Discussion: Some construction-related noise is anticipated during well drilling. Well drilling is expected to occur during the mid-winter school break (February 18 – February 22) to minimize potential impacts to students and staff at the school. **Source:** Project Scope				
12.b. Exposure of persons to or generation of excessive ground-borne vibration or ground-borne noise levels?			X	
Discussion: Some construction-related vibration is anticipated during well drilling. Well drilling is expected to occur during the mid-winter school break (February 18 – February 22) to minimize potential impacts to students and staff at the school. **Source:** Project Scope				
12.c. A significant permanent increase in ambient noise levels in the project vicinity above levels existing without the project?				X
Discussion: No permanent increase in noise levels resulting from the project; well does not generate noise. **Source:** Project Scope				
12.d. A significant temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?			X	
Discussion: Temporary construction-related noise is anticipated which may result from construction vehicles and well drilling though are not considered significant give the temporary nature. Well drilling activities are expected to occur over a five day period for each well drilled (one well to be drilled at a time). Total expected drilling is one to three weeks. **Source:** Project Scope				

12.e. For a project located within an airport land use plan or, where such a plan has not been adopted, within 2 miles of a public airport or public use airport, exposure to people residing or working in the project area to excessive noise levels?				X
Discussion: The project area is located over 19 miles south of Half Moon Bay Airport and over 19 miles west of San Carlos airport. **Source:** Project location, Google Earth				
12.f. For a project within the vicinity of a private airstrip, exposure to people residing or working in the project area to excessive noise levels?				X
Discussion: No private airstrips are located within the project area vicinity. **Source:** Project Location, Google Earth				

13. POPULATION AND HOUSING. Would the project:				
	Potentially Significant Impacts	***Significant Unless Mitigated***	***Less Than Significant Impact***	***No Impact***
13.a. Induce significant population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?				X
Discussion: No new homes or businesses are proposed with this project. Connection of the well to any uses is not included in this project scope. **Source:** Project Scope				
13.b. Displace existing housing **(including low- or moderate-income housing)**, in an area that is substantially deficient in housing, necessitating the construction of replacement housing elsewhere?				X
Discussion: No housing is located on the parcel. **Source:** Project Location				

14.	**PUBLIC SERVICES**. Would the project result in significant adverse physical impacts associated with the provision of new or physically altered government facilities, the need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:				
		Potentially Significant Impacts	***Significant Unless Mitigated***	***Less Than Significant Impact***	***No Impact***
14.a.	Fire protection?				X
14.b.	Police protection?				X
14.c.	Schools?				X
14.d.	Parks?				X
14.e.	Other public facilities or utilities (e.g., hospitals, or electrical/natural gas supply systems)?				X
Discussion: No adverse impacts to the above public services resulting from well construction. **Source:** Project Scope					

15.	**RECREATION**. Would the project:				
		Potentially Significant Impacts	***Significant Unless Mitigated***	***Less Than Significant Impact***	***No Impact***
15.a.	Increase the use of existing neighborhood or regional parks or other recreational facilities such that significant physical deterioration of the facility would occur or be accelerated?				X
Discussion: No neighborhood or regional parks are located in the parcel vicinity. **Source:** Project Location					
15.b.	Include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?				X

Discussion: No new recreational facilities are proposed nor are existing recreational facilities proposed for expansion.

Source: Project Scope

16. TRANSPORTATION/TRAFFIC. Would the project:					
		Potentially Significant Impacts	***Significant Unless Mitigated***	***Less Than Significant Impact***	***No Impact***
16.a.	Conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including, but not limited to, intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit?				X
Discussion: As discussed in Section 3.b, minor vehicle trips are expected. **Source:** Project Scope					
16.b.	Conflict with an applicable congestion management program, including, but not limited to, level of service standards and travel demand measures, or other standards established by the County congestion management agency for designated roads or highways?				X
Discussion: According to the 2015 Congestion Management Program for San Mateo County (and Final Draft 2018 Program), Pescadero Creek Road is not a monitored route, however, roadways leading to Pescadero Creek Road, namely Highway 1, are monitored. Minor vehicle trips consisting of four well drilling related vehicles (e.g., dump truck, water truck, drilling rig, and mini excavator) arriving on day 1 and to remain on-site in addition to four pickup trucks arriving and leaving once per day are anticipated over the course of the well drilling. Given the number of vehicles and trips, it is not likely that the project will conflict with the 2015 Congestion Management Program. **Source:** City/County Association of Governments of San Mateo County 2015 Congestion Management Program for San Mateo County, Project Scope					
16.c.	Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in significant safety risks?				X

Discussion: Well construction will not impact air traffic patterns or traffic. **Source:** Project Scope				
16.d. Significantly increase hazards to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?			X	
Discussion: The well locations are proposed in the dirt field south of the parking lot which is not in a path of travel for either vehicles or pedestrians. **Source:** Project Plans				
16.e. Result in inadequate emergency access?				X
Discussion: This project will not result in inadequate emergency access. **Source:** Project Scope				
16.f. Conflict with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities?				X
Discussion: Well construction will not conflict with such plans. **Source:** Project Scope				
16.g. Cause noticeable increase in pedestrian traffic or a change in pedestrian patterns?				X
Discussion: Well construction will not occur along/within pedestrian paths. **Source:** Project Scope				
16.h. Result in inadequate parking capacity?				X
Discussion: Well construction will not increase the need for parking nor will it reduce the existing on-site parking. **Source:** Project Location, Project Scope				

17. TRIBAL CULTURAL RESOURCES. Would the project:				
	Potentially Significant Impacts	***Significant Unless Mitigated***	***Less Than Significant Impact***	***No Impact***
17.a. Cause a substantial adverse change in the significance of a tribal cultural resource, defined in Public Resources Code Section 21074 as either a site, feature, place or cultural landscape that is geographically defined in terms of the size and scope of the landscape, sacred place, or object with cultural value to a California Native American tribe, and that is:				X
i. Listed or eligible for listing in the California Register of Historical Resources, or in a local register of historical resources as defined in Public Resources Code section 5020.1(k)				
Discussion: A Sacred Lands File and Native American Contacts List Request was sent to the Native American Heritage Commission on September 10, 2018. A record search of the Native American Heritage Commission Sacred Lands File was completed and the results were negative. Although the project is not subject to Assembly Bill 52 (Tribal Consultation), as the County has no records of written requests for formal notification of proposed projects within the County from any traditionally or culturally affiliated California Native American tribes, the County seeks to satisfy the Native American Heritage Commission's best practices to consult with California Native American tribes that are traditionally and culturally affiliated with the geographic area of the proposed project to avoid inadvertent impacts on tribal cultural resources. On September 20, 2018, a letter was mailed via certified mail to the tribes identified by the Native American Heritage Commission. To date, no request for consultation was received. **Source:** Native American Heritage Commission				
ii. A resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in Subdivision (c) of Public Resources Code Section 5024.1. (In applying the criteria set forth in Subdivision (c) of Public Resource Code Section 5024.1, the lead agency shall consider the significance of the resource to a California Native American tribe.)				X

Discussion: No resources were identified within the project area as a result of the Cultural Resources Survey.

Source: Cultural Resources Survey

18. UTILITIES AND SERVICE SYSTEMS. Would the project:				
	Potentially Significant Impacts	***Significant Unless Mitigated***	***Less Than Significant Impact***	***No Impact***
18.a. Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?				X
Discussion: Project does not include nor necessitate wastewater treatment. **Source:** Project Scope				
18.b. Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?			X	
Discussion: The proposed domestic well to determine water quality and quantity to serve the existing school and a potential future fire station. This project does not include installation of a water treatment facility. If raw water quality testing reveals a need for water treatment, a separate environmental review and permitting will be required. **Source:** Project Scope				
18.c. Require or result in the construction of new stormwater drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?				X
Discussion: No new stormwater drainage facilities are required or proposed. **Source:** Project Scope				
18.d. Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?				X
Discussion: No expansion of the school or other development is proposed under this project. **Source:** Project Scope				

18.e.	Result in a determination by the waste-water treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?				X
Discussion: No wastewater treatment providers exist in the area; all wastewater is treated via on-site septic systems. This project does not require wastewater treatment. **Source:** Project Scope					
18.f.	Be served by a landfill with insufficient permitted capacity to accommodate the project's solid waste disposal needs?				X
Discussion: No solid waste will be generated by this project. **Source:** Project Scope					
18.g.	Comply with Federal, State, and local statutes and regulations related to solid waste?				X
Discussion: No solid waste will be generated by this project. **Source:** Project Scope					
18.h.	Be sited, oriented, and/or designed to minimize energy consumption, including transportation energy; incorporate water conservation and solid waste reduction measures; and incorporate solar or other alternative energy sources?				X
Discussion: This project does not include energizing of the well. Well construction is to determine water quality and quantity viability only. **Source:** Project Scope					
18.i.	Generate any demands that will cause a public facility or utility to reach or exceed its capacity?				X
Discussion: No public utilities serve the parcel. Well construction will not impact existing public facilities. **Source:** Project Location					

19. MANDATORY FINDINGS OF SIGNIFICANCE.				
	Potentially Significant Impacts	***Significant Unless Mitigated***	***Less Than Significant Impact***	***No Impact***
19.a. Does the project have the potential to degrade the quality of the environment, significantly reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?		X		
Discussion: Without implementation of the identified mitigation measures, the project could impact on air quality, biological resources, cultural resources, and climate. Implementation of the recommended mitigation measures will ensure that potential adverse impacts are reduced to less than significant levels. **Source:** Project Scope				
19.b. Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects.)			X	
Discussion: Staff is unaware of any approved or pending projects on this parcel or near the project site. The location of a potential future fire station on this property, should the well project result in adequate water quality and quantity to serve the station and the school, will be subject to a separate CEQA review and permitting. **Source:** Project Scope				
19.c. Does the project have environmental effects which will cause significant adverse effects on human beings, either directly or indirectly?			X	
Discussion: Given the limited project scope, timing of well drilling, and implementation of mitigation measures, the project will not result in significant impacts. **Source:** Project Scope				

RESPONSIBLE AGENCIES. Check what agency has permit authority or other approval for the project.

AGENCY	YES	NO	TYPE OF APPROVAL
U.S. Army Corps of Engineers (CE)			
State Water Resources Control Board			
Regional Water Quality Control Board			
State Department of Public Health			
San Francisco Bay Conservation and Development Commission (BCDC)			
U.S. Environmental Protection Agency (EPA)			
County Airport Land Use Commission (ALUC)			
Caltrans			
Bay Area Air Quality Management District			
U.S. Fish and Wildlife Service			
Coastal Commission	X		Appeals jurisdiction
City			
Sewer/Water District:			
Other: County Environmental Health Services	X		Well Drilling Permit

MITIGATION MEASURES

	Yes	No
Mitigation measures have been proposed in project application.	X	
Other mitigation measures are needed.	X	

The following measures are included in the project plans or proposals pursuant to Section 15070(b)(1) of the State CEQA Guidelines:

Mitigation Measure 1: The applicant shall require construction contractors to implement all the Bay Area Air Quality Management District's Basic Construction Mitigation Measures, listed below:

a. Water all active construction areas at least twice daily.

b. Apply water two times daily, or apply (non-toxic) soil stabilizers on all unpaved access roads, parking, and staging areas at construction sites. Also, hydroseed or apply non-toxic soil stabilizers to inactive construction areas.

c. Sweep adjacent public streets daily (preferably with water sweepers) if visible soil material is carried onto them.

d. Limit traffic speeds on unpaved roads within the project parcel to 15 miles per hour.

e. All construction equipment shall be maintained and properly tuned in accordance with manufacturer's specifications. All equipment shall be checked by a certified mechanic and determined to be running in proper condition prior to operation.

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

Mitigation Measure 2: The applicant shall implement the following basic construction measures at all times:

a. Idling times shall be minimized either by shutting equipment off when not in use or reducing the maximum idling time to 5 minutes (as required by the California Airborne Toxic Control Measures Title 13, Section 2485 of California Code of Regulations [CCR]).

b. All construction equipment shall be maintained and properly tuned in accordance with manufacturer's specifications.

Mitigation Measure 3: Preconstruction survey(s) shall be performed prior to the start of well drilling activities by a qualified biologist. If CRLF and SFGS are found within the project area, all work shall cease until the individual(s) have been allowed to leave the project area on their own. If the CRLF or SFGS individual(s) cannot passively leave the project area, work will cease and the U.S. Fish and Wildlife Service (USFWS) will be contacted to determine the appropriate course of action.

Mitigation Measure 4: If buried cultural materials are encountered during construction, work should stop in that area until a qualified archaeologist can evaluate the nature and significance of the find.

Mitigation Measure 5: Pursuant to San Mateo County Ordinance Code 4.68.050 *Mitigation of Disturbance at Well Site*, disturbance at a well site for the purposes of construction shall be limited to the minimum amount of disturbance necessary to gain access to drill the well. Drilling fluids and other drilling materials produced or used in connection with well construction shall not be allowed to discharge onto or into streets, waterways, sensitive habitats, or storm drains. Drilling fluids shall be properly managed and disposed of in accordance with applicable local, regional, and state requirements. Upon completion of the construction, the site shall be restored as near as possible to its original condition, and appropriate erosion control measures shall be implemented. Wells constructed during a period where winterization requirements are in effect, between October 1 and May 1, shall comply with County stormwater pollution prevention measures.

Mitigation Measure 6: During project construction, the applicant shall, pursuant to Chapter 4.100 of the San Mateo County Ordinance Code, minimize the transport and discharge of stormwater runoff from the construction site:

a. Stabilizing all denuded areas and maintaining erosion control measures continuously between October 1 and April 30. Stabilizing shall include both proactive measures, such as the placement of hay bales or coir netting, and passive measures, such as revegetating disturbed areas with plants propagated from seed collected in the immediate area.

b. Storing, handling, and disposing of construction materials and wastes properly, so as to prevent their contact with stormwater.

c. Controlling and preventing the discharge of all potential pollutants, including pavement cutting wastes, paints, concrete, petroleum products, chemicals, wash water or sediments, and non-stormwater discharges, to storm drains and watercourses.

d. Avoiding cleaning, fueling, or maintaining vehicles on-site, except in a designated area where wash water is contained and treated.

e. Delineating with field markers clearing limits, easements, setbacks, sensitive or critical areas, buffer zones, trees, and drainage courses.

f. Protecting adjacent properties and undisturbed areas from construction impacts using vegetative buffer strips, sediment barriers or filters, dikes, mulching, or other measures as appropriate.

g. Performing clearing and earth-moving activities only during dry weather.

h. Limiting and timing application of pesticides and fertilizers to prevent polluted runoff.

i. Limiting construction access routes and stabilizing designated access points.

j. Avoiding tracking dirt or other materials off-site; cleaning off-site paved areas and sidewalks using dry sweeping methods.

k. The contractor shall train and provide instruction to all employees and subcontractors regarding the construction Best Management Practices.

Mitigation Measure 7: Construction equipment for new development shall comply with best management practices from Bay Area Air Quality Management District guidance.

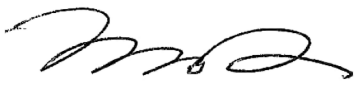
DETERMINATION (to be completed by the Lead Agency).

On the basis of this initial evaluation:

_____ I find the proposed project COULD NOT have a significant effect on the environment, and a NEGATIVE DECLARATION will be prepared by the Planning Department.

X I find that although the proposed project could have a significant effect on the environment, there WILL NOT be a significant effect in this case because of the mitigation measures in the discussion have been included as part of the proposed project. A MITIGATED NEGATIVE DECLARATION will be prepared.

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

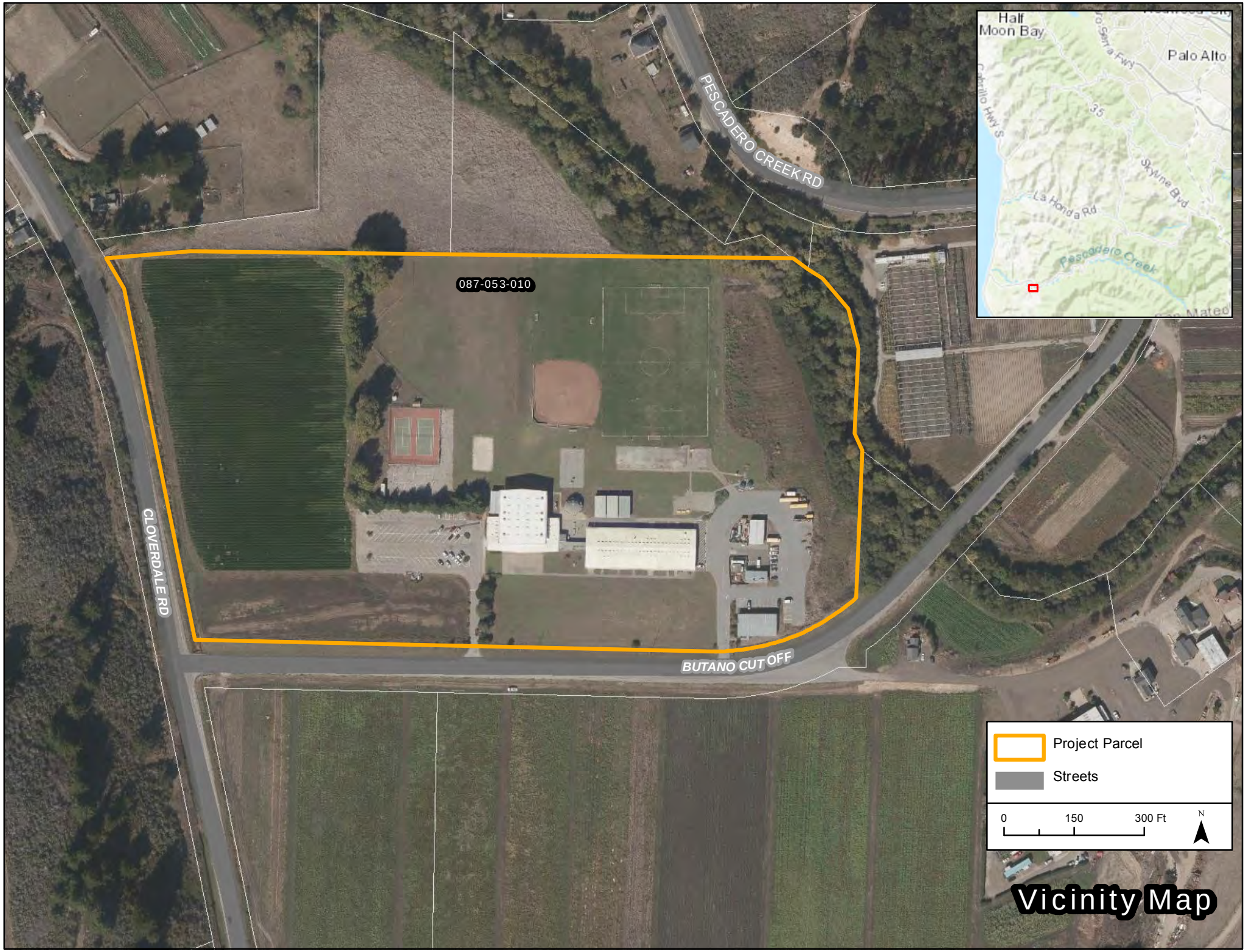


(Signature)

11/27/2018 — Date

Senior Planner — (Title)

MR:pac - MARCC0558_WPH.DOCX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087-053-010
CLOVERDALE RD
BUTANO CUT OFF
Half Moon Bay
Palo Alto
Project Parcel
Streets
0
150
300 Ft
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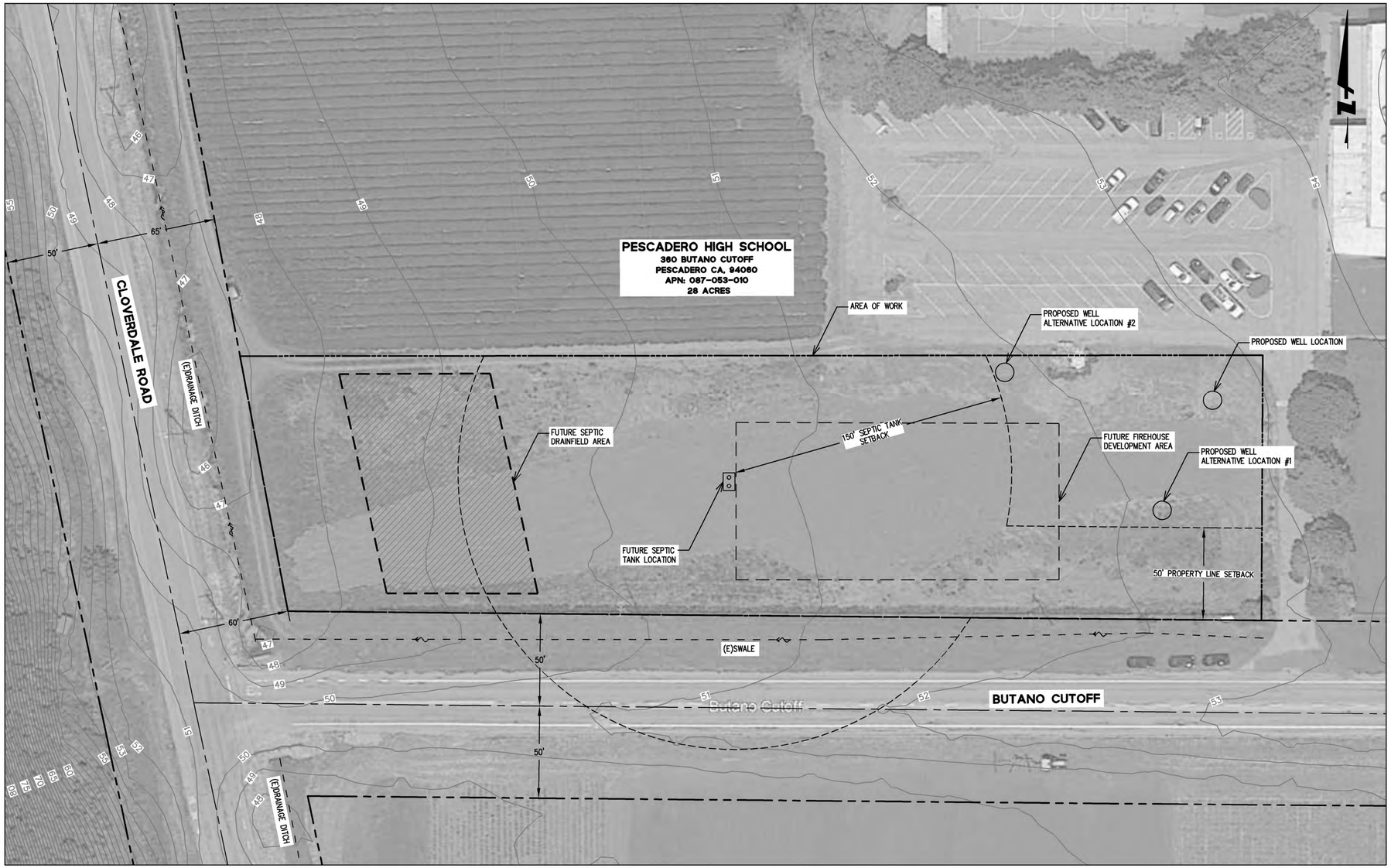
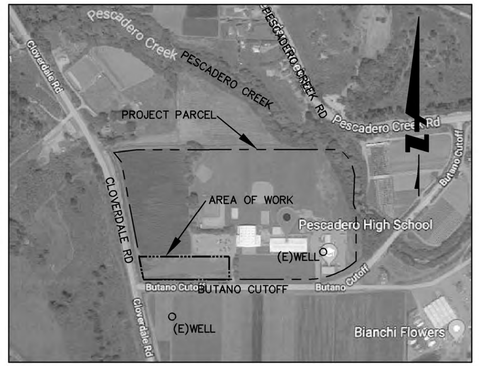
Vicinity Map





LOCATION MAP

N.T.S.

LEGEND:

- BOUNDARY
- AREA OF WORK
- CENTERLINE
- FLOWLINE
- DEVELOPMENT AREA
- SETBACK

ABBREVIATIONS:

(E)	EXISTING
RD	ROAD

DOMESTIC WATER WELL NOTES:

DOMESTIC WATER WELL SPECIFICATIONS:
- DEPTH TO BE DRILLED: 120 FEET
- DEPTH OF PROPOSED ANNULAR SEAL: 80 FEET
- SIZE OF OUTER CASING: 5 INCHES
- TYPE OF CASING: CERTA LOCK SDR 17 PVC

0 30 60

GRAPHIC SCALE

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REVIEW ONLY NOT FOR CONSTRUCTION

No.	Revisions	Date

Date 09/13/2018
Scale 1" = 30'
Design DJL
Drawn DJP
Approved RH
Job No 20180894-10

Drawing Number:
C-1
OF

DRAWING NAME: K:\2018\180894_Pescadero_Firehouse\ENG\pfthsheets.dwg
PLOT DATE: 09-13-18 PLOTTED BY: polt

March 16, 2017

Pescadero Fire Station Siting Analysis- Biological Assessment

Introduction

The purpose of this report is to present the results of the biological assessment of a proposed location in Pescadero, California that is being considered for the construction of a new County Fire Station (Figure 1). The site is located at the corner of Cloverdale Road and Butano Cut-off at the existing Pescadero High School, approximately 1.25 miles southeast of the town of Pescadero and 3.0 miles east of Highway 1, in unincorporated San Mateo County (Figure 2).

The proposed fire station site will be approximately 40,000 square feet and is intended to replace the existing fire station located at the intersection of Pescadero Creek Road and Bean Hollow Road in Pescadero. In preparation for field assessment of the proposed location, a background literature review of past studies such as special-status species recovery plans and previously prepared biological assessments for County of San Mateo (County) projects in the vicinity was conducted. On June 10, 2016, County Department of Public Works (DPW) biologist Theresa Engle conducted a biological survey at proposed site to determine existing habitat types and the potential for presence of special-status species, including California red-legged frog (CRLF; *Rana draytonii*), San Francisco garter snake (SFGS; *Thamnophis sirtalis tetrataenia*), San Francisco dusky-footed woodrat (SFDW; *Neotoma fuscipes annectens)*, western pond turtle (WPT*; Actinemys marmorata*), San Francisco common yellowthroat (*Geothlypis trichas sinuosa*), white-tailed kite (*Elanus leucurus)*, yellow warbler (*Dendroica petechial)*, choris' popcorn flower (*Plagiobothrys chorisianus var. chorisianus)* and coastal marsh milk vetch (*Astragalus pycnostachyus* var. *pycnostachyus*). The survey area included the proposed 40,000 square foot project footprint and an approximate 250-foot buffer (Figures 3 and 4).

Description of the Project Location

The surrounding land use at the site consists of Pescadero High school to the north and east and disturbed soils to the west and south (Photos 1-6). The proposed site is developed and contains a paved parking lot bordered by ornamental trees. At the time of the site visit, disturbed soils lay between the paved parking lot and Butano Cut-off to the south; to the west of the site, active agricultural crop rows of rosemary were observed (Figure 5). A drainage ditch is present approximately 50 feet west of the proposed site along the east side of Cloverdale Road, and is predominately vegetated with cattails, horsetail, blackberry, and wild radish. Pescadero Creek and associated riparian habitat lies approximately 1,000 feet to the northeast of the site (Figure 3). A portion of the site falls within the FEMA 100-year flood zone (Figure 6). The adjacent Colverdale ditch has been known to flood in the past, further hydrological studies are recommended to better understand the potential impacts on the project site. (i.e. flooding)

Methodology

The results of the site survey were analyzed for potential impacts to biological resources including special-status plant and animal species from the construction of the new station. Special-status species are those that have been designated as endangered, threatened, or species of concern by Federal or State regulatory agencies. The analysis consisted of a review of Federal and State species-specific data and available documents, conducting a field survey of the site, and evaluating the likelihood of special-status species occurrences in the study area. A review of special-status species with the potential to occur in the vicinity of the site was conducted using a combination of Federal and State Agency databases. A list of federally listed plant and animal species known to, or with the potential to occur within the Project vicinity (San Gregorio quadrangle) was generated using the Sacramento United States Fish and Wildlife Service (USFWS) website (USFWS, 2016). The California Native Plant Society (CNPS) was queried to generate a list of plants listed as rare or endangered (CNPS, 2016). In addition, the California Natural Diversity Database (CNDDB, 2017), administered by the California Department of Fish and Wildlife (CDFW), was queried to determine if there were any documented occurrences of the special-status plant or animal species from the USFWS and CNPS lists within the Project vicinity (CDFW, 2016). These lists are included as attachments. Marine species and species that do not typically occur within the plant communities and habitats that currently exist in the study areas were excluded. The query results were further analyzed and mapped to determine if any special-status species occurrences have been documented within ½ mile of the site (Figure 4).

Based on the analysis described above, it was determined the following species have the potential to occur in the vicinity of the proposed site: CRLF, SFGS, SFDW, WPT, San Francisco common yellowthroat, white-tailed kite, yellow warbler, choris' popcorn flower, and coastal marsh milk vetch. During the June 10, 2016 site survey, the study areas were traversed by foot to identify if suitable habitat for any of these species was present in the study area.

Results

California red-legged frog (CRLF)

CRLF is listed as threatened under the Federal Endangered Species Act and is a State species of special concern (SSC). CRLF typically inhabit marshes, ponds, and slow moving streams with a well-developed riparian canopy (USFWS, 2002). They require aquatic breeding areas often embedded within a matrix of riparian and upland dispersal habitats. Breeding sites for CRLF occur in aquatic habitats including pools and backwaters within streams and creeks, ponds, marshes, springs, sag ponds, dune ponds and lagoons. Additionally, CRLF frequently breed in artificial impoundments such as stock ponds (USFWS, 2002). CRLF typically breed during winter and spring in marshes and ponds with emergent vegetation for egg attachment. The aquatic features used for breeding must retain water for a long enough period for larval development which typically ranges between 2.5 to 5 months, depending on temperature (CDFW, 2009). Aquatic non-breeding habitat includes riparian corridors with slow moving creeks or streams. Upland habitat includes natural areas surrounding aquatic habitats that can be used by CRLF for foraging, dispersal, and predator avoidance. Dispersal habitat includes upland and riparian habitat

typically within one mile of occupied breeding sites. Based on suitable aquatic breeding, aquatic non-breeding, upland and dispersal habitat and CRLF documented occurrences within the study area; it is likely that CRLF could occur at the proposed project site.

There is a documented CRLF road mortality in CNDDB within a ½ mile of the proposed project location (CNDDB, 2017, Figure 4). Additionally, multiple CRLF have been observed by County staff in the drainage ditch adjacent to Cloverdale Road, located 50 feet from the proposed project site. Three CRLF were also observed approximately 1.5 miles south of the proposed project along Cloverdale Road (County staff observation). It is anticipated that CRLF use the drainage ditch adjacent to Cloverdale Road as foraging, dispersal, and possibly breeding habitat during the wet season. Numerous small mammal burrows were observed within the study area that could be used by CRLF as upland habitat during summer months. As a result, CRLF are expected to occur within the study area and in the absence of appropriate avoidance and minimization measures could be impacted by construction and operation of a new fire station. The site does not occur within critical habitat for CRLF (USFWS, 2010).

San Francisco Garter Snake (SFGS)

The SFGS is listed as endangered species under the Federal and California endangered species acts. CDFW lists the species as fully protected. This semi-aquatic species is often found hunting in ponds, slow moving streams, and ephemeral wetlands occupied by their primary prey, Pacific chorus frogs and CRLF. SFGS primarily breed in spring, but can also breed during fall. Peak mating and foraging activity takes place from spring through late summer/early fall. SFGS utilize upland areas such as grassland/shrub habitat, particularly abandoned rodent burrows, for overwintering (USFWS, 1985). SFGS require seasonal or permanent water bodies and upland habitat for survival. SFGS preferred habitat is densely vegetated aquatic habitat near an open hillside where they can bask in the sun, forage, and find cover in small mammal burrows. Based on suitable aquatic and upland habitat for SFGS, documented occurrences of SFGS within ½ mile of the study area, and documented breeding sites for CRLF, a preferred prey of SFGS, located within one mile of the study area, it is likely that this species could occur within the proposed project site.

SFGS occurrences are considered sensitive information, but there is a known population in Pescadero Marsh from which dispersal to aquatic habitat in the vicinity can occur. Previous biological surveys by McGinnis and more recent limited trapping by Swaim Biological, Inc. have documented the presence of SFGS in numerous locations within one mile of the sites (McGinnis 1984, SBI, 2014). There is a documented SFGS occurrence in ponds on private land within a ½ mile of the proposed site (CNDDB, 2017; Figure 4). In addition, a deceased SFGS that had been run over was recently observed on Cloverdale Road approximately 2 miles south of the proposed project site (County staff observation). SFGS are likely to use the drainage ditch adjacent to Cloverdale Road, approximately 50 feet from the proposed project site, for foraging and dispersal habitat. In addition, SFGS are likely to utilize small mammal burrows in the surrounding agricultural lands and upland coastal scrub area as foraging and hibernating habitat. As a result, SFGS are expected to occur within the study area and in the absence of appropriate avoidance and minimization measures could be impacted by the construction and operation of a new fire station.

San Francisco Dusky-footed Woodrat (SFDW)

The SFDW, a subspecies of the dusky-footed woodrat, is a medium-sized rodent listed as a California Species of Special Concern (SSC) by the CDFW. Woodrats are mostly nocturnal and occupy stick houses up to eight feet tall. Their nests occur within the stick houses, and their breeding season extends from December to September (Zeiner, D.C. et. al., 1988-1990). SFDW is widely distributed in San Mateo County and is expected to occur in the coastal scrub and riparian habitats within the vicinity of the proposed site.

There are no CNDDB records for SFDW within a ½ mile radius of the proposed site (CNDDB, 2017; Figure 4). However, there is suitable habitat for SFDW and an SFDW nest was observed approximately 800 feet west of the site in the riparian habitat adjacent to the drainage ditch along Cloverdale Road. Suitable riparian habitat also occurs approximately 1,000 feet to the northeast along Pescadero Creek. As a result, SFDW are expected to occur in the vicinity. However, impacts to this species from the construction and operation of a new fire station are not anticipated.

Western Pond Turtle (WPT)

WPT is listed as a California SSC by the CDFW. WPT occur in a variety of habitats near permanent or semi-permanent water sources including ponds, lakes, streams, irrigation ditches and permanent pools along intermittent streams. WPT require basking sites such as partially submerged logs, rocks, or mats of floating vegetation. WPT dive underwater from basking sites to avoid humans and predators. WPT breeding season extends from March through August. Females tend to seek out open areas with sparse, low vegetation (annual grasses and herbs), low slope angle, and dry hard soil for nest sites (Zeiner, et. al., 1990). WPT could utilize the aquatic habitats in the vicinity of the sites for foraging, basking, and mating. There are no CNDDB records for WPT in the San Gregorio USGS quadrangle (CNDDB, 2017).

There are no CNDDB records for WPT within two miles of the proposed site (CNDDB, 2017; Figure 4). WPT could potentially utilize ponds on private property approximately ½ mile southwest of the site as foraging, breeding, and basking habitat. WPT were not observed during a site survey on June 10, 2016. Consequently, impacts to WPT from construction and operation of a new fire station are not anticipated.

Saltmarsh Common Yellowthroat

The saltmarsh common yellowthroat is listed as a California SSC by the CDFW. Saltmarsh common yellowthroats typically breed in freshwater marsh, brackish marsh, and wooded swamp habitat and winter in salt marsh habitat (Cornell, 2016). The CNDDB does not contain any known occurrences of saltmarsh common yellowthroat within a ½ mile radius of the proposed site (CNDDB, 2017; Figure 4). There is no suitable habitat present within the study area, and saltmarsh common yellowthroats were

not observed during the June 10, 2016 site assessment. Consequently, impacts to saltmarsh common yellowthroats from the construction and operation of a new fire station are not anticipated.

White-Tailed Kite

The white-tailed kite is listed as a Fully Protected Species by the CDFW. The white-tailed kite ranges over large areas and forages on small rodents within annual grasslands, open woodlands, and cultivated fields (Cornell, 2016).

The CNDDB does not contain any known occurrences of white-tailed kites within a ½ mile radius of the proposed site (CNDDB, 2017; Figure 4). However, white-tailed kites have been previously observed in the Pescadero vicinity by County staff. White-tailed kites could forage in the agricultural land immediately adjacent to the study area and potential nesting habitat occurs in the riparian habitat along Pescadero Creek approximately 1,000 feet northeast of the site. However, impacts to white-tailed kite from the construction and operation of a new fire station are not anticipated.

Yellow Warbler

The yellow warbler is listed as a California SSC by the CDFW. The yellow warbler is a seasonal resident of California, typically April through October, and breeds in coastal riparian woodlands and wetlands (Cornell, 2016).

The CNDDB does not report any occurrences of yellow warblers within a ½ mile radius of the proposed site (CNDDB, 2017; Figure 4). Suitable habitat for yellow warblers may be present approximately 1,000 feet northeast of the site in riparian habitat along Pescadero Creek. However, yellow warblers were not observed during the site survey on June 10, 2016, and impacts to yellow warblers from the construction and operation of a new fire station are not anticipated.

Choris' Popcorn-Flower

The CNPS lists Choris's popcorn-flower as a 1B species, meaning that it is rare, threatened, or endangered in California and elsewhere. Choris's popcorn-flower is typically found in chaparral, coastal scrub, and coastal prairie habitat (CNPS, 2016).

Suitable habitat for Choris' popcorn-flower may exist approximately 50 feet from the proposed site along the banks of the drainage ditch adjacent to Cloverdale Road, and outside of the study area within adjacent coastal scrub habitat. The site was surveyed on June 10, 2016, during the appropriate blooming period for this species and Choris's popcorn-flower was not detected. It is unlikely that this species will be impacted by the construction and operation of a new fire station.

Coastal Marsh Milk Vetch

The CNPS lists coastal marsh milk-vetch as a 1B species, meaning that it is rare, threatened, or endangered in California and elsewhere. Coastal marsh milk-vetch is typically found within coastal salt

marshes, swamps, streamsides, coastal dunes, and coastal scrub habitat (CNPS, 2008). Coastal marsh milk vetch is commonly found in wetland and marsh areas, or in coastal scrub habitats adjacent to those areas (Calflora, 2016).

Coastal marsh milk-vetch has not been documented within a ½ mile radius of the proposed site (CNDDB, 2017; Figure 4). There is potential suitable habitat for coastal marsh milk vetch in the drainage ditch adjacent to Cloverdale Road approximately 50 feet from the proposed site. However, this species was not observed during the June 2016 site assessment, which was within the appropriate blooming period. It is unlikely that this species will be impacted by construction or operation of a new fire station.

Conclusions and Recommendations

Based on the results of the June 10, 2016 site assessment, the proposed site contains low quality habitat for special-status species based on the level of development and human disturbance. There is high quality habitat for special-status species within the 250-foot buffer that was assessed as part of the study area. The site is bound by a school to the east, cultivated fields to the north and south, and privately owned agricultural land to the west (Figure 5).Theses recommendations are based on past experience working with the various regulatory agencies (i.e. USFWS, US Army Corps Engineers (USACE), CDFW) and include general avoidance and minimization measures to protect biological resources.

Aquatic and Semi-Aquatic Species

CRLF, SFGS and WPT could occur in aquatic and coastal scrub habitats adjacent to the locations. The site provides low quality dispersal habitat for these species because of the lack of vegetative cover and human activity. However, high quality habitat for all three species exists in close proximity to the site. CRLF and SFGS could utilize small mammal burrows occurring on the sites to locate prey or find cover. SFGS may bask in open areas within the adjacent coastal scrub habitat. Consequently, all three species could potentially move through the site while foraging or dispersing from breeding sites. Expansion of the project footprint into adjacent wetland or coastal scrub habitats could directly impact these species. In addition, the proposed location falls within the Coastal Zone, and as such, is subject to the requirements of the San Mateo County Local Coastal Program (LCP), which prohibits impacts to wetlands. Wetlands that may provide habitat for all three species occurs within the drainage ditch adjacent to Cloverdale Road. Due to the close proximity, there is potential for impacts to wetland habitat, and expansion into these areas would likely be prohibited.

The LCP policies specify that all outdoor lighting be kept at a distance away from a wetland sufficient not to affect the wildlife. The LCP defines wetlands as an area where the water table is at, near, or above the land surface long enough to bring about the formation of hydric soils or to support the growth of plants which normally are found to grow in water or wet ground. Such wetlands can include mudflats, marshes, and swamps, and may include wetlands found along streams (riparian). The sensitive habitats occurring within the study area include the drainage ditch adjacent to Cloverdale Road, characterized as wetland habitat, and Pescadero Creek, characterized as riparian habitat (Figure 3).

There is nothing in the CRLF Recovery plan concerning impacts to frogs from artificial lighting. However, impacts to individuals could include affects to the physiology and behavior of animals, leading to ecological consequences at the population, community, and ecosystem levels. Aquatic ecosystems may be particularly vulnerable to such effects, and nocturnally breeding animals such as frogs may be especially affected (Baker, 2006). An increase in artificial lighting on the sensitive habitats near the proposed site could potentially have an adverse effect on CRLF behavior. However, with the implementation of the lighting modifications described below in the Avoidance and Minimization section, these potential adverse effects would be reduced or eliminated to the extent that the additional artificial lighting would have a negligible impact on CRLF.

The operation of a new fire station at this location would result in increased noise levels in the vicinity. Increased noise levels can adversely affect the physiology and behavior of animals, potentially leading to ecological consequences at the population, community, and ecosystem levels. The existing County fire station is located on Pescadero Creek Road adjacent to Butano Creek. The County recently conducted a sediment removal project in Butano Creek and observed a thriving CRLF population, serving as evidence that the fire station operation has not negatively affected the CRLF population in Butano Creek. Furthermore, the existing high school produces elevated noise levels when students are present. Based on this anecdotal evidence, the County does not anticipate the operation of a new fire station at the proposed site to result in adverse effects to the CRLF population in the vicinity.

Rare Plant Species

Suitable habitat (coastal scrub) for coastal marsh milk vetch and Choris' popcorn-flower does not exist at the proposed site, and these species were not observed during the June 2016 site assessment, which was within the appropriate blooming period. Coastal marsh milk vetch and Choris' popcorn-flower are not likely to be affected by construction of the fire station at this location. However, suitable habitat for these species does occur adjacent to the site. If the project footprint extends into coastal scrub or wetland habitat, there is potential for impacts to these species.

Listed Bird Species

Suitable nesting and foraging habitat for San Francisco common yellowthroats, white-tailed kites, yellow warblers exist in close proximity to the proposed site, but outside of the study area. If the project footprint extends into riparian, coastal scrub, and wetland/marsh habitats there is potential for impacts to these species.

SFDW

Suitable habitat (riparian) for SFDW occurs outside of the study area, in close proximity the proposed site. If the project footprint were to be extended into riparian habitat there is potential for impacts to this species.

Avoidance, Minimization and Conservation Measures

A majority of the site is currently disturbed and does not contain wetlands or high quality special-status species habitat. While construction of the new fire station would not result in direct impacts to sensitive habitats, in the absence of avoidance and minimization measures, there is a potential for impacts to CRLF and SFGS given the presence of existing wetland habitat within 50 feet and riparian habitat within 1,000 feet of the site.

Example avoidance and minimization measures that are likely to be required include: buffers around existing coastal scrub and wetland habitat; exclusionary fencing with one way exit funnels; pre-construction surveys and biological monitoring during construction; environmental training for construction personnel; and project construction scheduled during the dry season.

Recommended Avoidance and Minimization Measure to Protect Biological Resources:

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

2. Areas of disturbance will be limited to the smallest footprint necessary.

3. Following the completion of all Project activities in a given year, temporary access and staging areas will be restored to pre-Project contours, and will be seeded with a native seed mix appropriate for the site.

4. All equipment will be maintained free of petroleum leaks. All vehicles will be inspected daily for leaks and, if necessary, repaired before leaving the staging area. Inspections will be documented in a record that is available for review on request.

5. No fueling will be performed within 50 ft of wetland or aquatic habitats unless equipment stationed in these locations is not readily relocated. For stationary equipment that must be fueled on site, such as sump pumps, containment will be provided in such a manner that any accidental spill of fuel will not be able to enter wetland or aquatic habitats or contaminate sediments that may come in contact with water.

6. A hazardous materials management/fuel spill containment plan will be developed and implemented by the Project contractor and given to all contractors and biological monitors working on the Project, with at least one copy of the plan located onsite at all times. The purpose of the plan is to provide onsite Project managers, environmental compliance monitors, and regulatory agencies with a detailed description of hazardous materials management, spill prevention, and spill response/cleanup measures associated with the implementation of the Project elements. Elements of the plan may include, but are not limited to the following:

    a. A discussion of hazardous materials and fuels management, including delineation of refueling areas, access and egress routes, waterways, and temporary storage areas,

    b. Materials Safety Data Sheets for all chemicals used and stored on site,

c. An inventory list of emergency equipment,

d. Spill control and countermeasures including employee spill prevention/response training, and

e. Notification and documentation procedures.

7. Vehicles will be washed off-site. No washing of vehicles will occur at Project sites.

8. A sediment fence or other sediment-control device will be installed around stockpiled soil material to prevent runoff from transporting sediment into sensitive habitats.

9. The work site, areas adjacent to the work site, and access areas will be maintained in an orderly condition, free and clear from debris and discarded materials. Personnel will not sweep, grade, or flush surplus materials, rubbish, debris, or dust onto adjacent areas or waterways. Upon completion of work, all materials and equipment involved in sediment removal will be removed from the Project site.

10. Suitable erosion control, sediment control, source control, treatment control, material management, and non-stormwater management best management practices will be implemented consistent with the latest edition of the California Stormwater Quality Association "Stormwater Best Management Practices Handbook," available at www.capmphandbooks.com.

11. For each activity, all Project personnel will participate in a worker environmental awareness program. Under this program, Project personnel will be informed about the presence of listed species and habitats associated with the species and that unlawful take of the animal or destruction of its habitat is a violation of Federal Endangered Species Act (FESA). Prior to Project activities, a qualified biologist approved by USFWS will instruct all Project personnel about (1) the description and status of the species; (2) the importance of their associated habitats; and (3) a list of measures being taken to reduce impacts on these species during Project implementation. A fact sheet conveying this information will be prepared for distribution to the Project crew and anyone else who enters the Project site. A member of the Project crew will be appointed and identified during the environmental awareness program who will be the point of contact for any employee or contractor who might encounter a listed species. The representative's name and telephone number will be provided to USFWS and NMFS prior to the initiation of any activities.

12. No firearms (except for federal, State, or local law enforcement officers and security personnel) will be permitted at the Project site to avoid harassment, killing or injuring of wildlife.

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

14. A designated work areas will be clearly identified in the field, such as with stakes, flagging, or fencing, and work will not be conducted outside this area.

15. In order to minimize the spread of invasive or undesirable plants, animals, or pathogens, all equipment (including personal gear) will be cleaned and adequately decontaminated prior to arriving on the Project site.

16. The Project site will be maintained trash-free, and food refuse will be contained in secure bins and removed daily during Project implementation.

17. A USFWS approved biological monitor will be present during all work activities in or immediately adjacent to habitat that could be occupied by federally listed species to look for individuals that may be impacted by Project implementation; activities are considered "immediately adjacent" to sensitive habitat if those activities could result in the physical disturbance of the habitat (e.g., as a result of mobilization of sediment into the habitat) or if individual listed species could move from that habitat into the Project site (e.g., seeking refuge under Project equipment). The biologist will have stop-work authority if any individual of a federally listed species is detected in an area where it may be injured or killed by Project activities.

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

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

22. If a SFGS is observed within the Project work area, either during this survey or at any time, Project activities that could potentially harm the individual shall be stopped immediately. The biologist (or a member of the Project crew, if the biologist is not on-site) will watch the individual until it has moved out of the work area. No individuals of this species will be relocated without explicit USFWS approval; however, if the snake will not leave the area on its own, the biologist will contact the USFWS to determine if moving any of the individuals is appropriate. If the USFWS approves moving animals, the biologist and USFWS will identify a suitable relocation site, and the USFWS-approved biologist must be given sufficient time to move the animals from the work site before ground disturbance is initiated.

23. Pipes, conduits and other Project materials could provide shelter for CRLF and SFGS. Therefore, all pipes, conduits, or similar structures that are stored at the site for one or more overnight periods will be either stored on an open-top trailer to elevate the materials above ground, securely capped prior to storage, or thoroughly inspected by the USFWS-approved biologist before the pipe is buried, capped, or otherwise used or moved.

24. To the maximum extent practicable, no Project activities will occur during wet weather or within 24-hours following a rain event. Wet weather for this purpose is defined as when there is more than 30% chance of rain (¼ inch of rain in a 24-hour period) in the 72-hour forecast. Prior to Project activities resuming, a USFWS-approved biologist will inspect the action area and all equipment/materials for the presence of CRLF. The animals will be allowed to move away from the Project site of their own volition or moved by the USFWS-approved biologist.

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

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

27. Pits one (1) foot or deeper that are going to be left unfilled for more than forty-eight (48) hours will be securely covered with boards or other material to prevent the CRLF and SFGS from falling into them. If this is not possible, the applicant will ensure wooden ramps or other structures of suitable surface that provide adequate footing for the CRLF are placed in the pit to allow for their unaided escape. The USFWS-approved biologist will inspect the pits prior to their being

filled to ensure there are no CRLF in them. The pit also will be examined by the USFWS-approved biologist each workday morning at least one hour prior to initiation of work and in the late afternoon no more than one hour after work has ceased to ascertain whether any individuals have become trapped. If the escape ramps fail to allow the animal to escape, the USFWS-approved biologist will remove and transport it to a safe location, or contact the USFWS for guidance.

Standard approach for minimizing lighting impacts on sensitive habitats:

The most critical element of light management is the selection of the lighting alternative that most effectively reduces the potential for impacts to sensitive species while accommodating lighting needs for public safety.

1) Keep lights out of wetland and riparian habitat:

    a. Design or modify lights in such a manner that the light is confined to the fire station footprint and is prevented from straying into wetland or riparian habitat. This can be achieved by modifying the light broadcast properties of a fixture and/or realigning, repositioning, shielding, and/or screening light sources from habitat view.

        i. Realign the fixture – change the angle of mounting arm or rotate fixture head so the source of light is not directly visible from the sensitive habitat. This can be accomplished by altering the mounting angle of the fixture on the mounting arm so light is directed down or away from sensitive habitat. If the fixture is parallel to the roadway surface or bent at a slight angle toward the road, the potential for light reaching sensitive habitat is less than if the fixture were at an obtuse angle.

        ii. Apply a shield to a drop globe fixture.

        iii. Change an open bottom or drop globe fixture to a cutoff fixture.

        iv. Apply a shield to a cutoff fixture.

        v. Reduce the mounting height of the fixture (when practical).

        vi. Change the lamp socket position in the fixture to compress the lighting footprint.

        vii. Change to a fixture with a different type of reflector providing a more favorable lighting footprint.

        viii. Install a flat 2422 acrylic amber lens in a cutoff fixture with an High Pressure Sodium (HPS) lamp of 70-watts or less (e.g. GELS 70W M250).

        ix. Turn the light off seasonally (requires that the lighting custodian is available and can be responsive to user requests for assistance).

    b. Different species respond differently to the various properties of light (brightness, color, etc.)

c. Confine light to the area of its intended use

i. Redirect the light fixture

ii. Change a drop globe fixture to a cutoff style fixture

iii. Install a light shield (if the shield can meet the wind loading criteria for the area)

2) Reduce luminance/brightness

a. A reduction in the total luminance (combination of lamp wattage and number of fixtures) of outside lights to the minimum required for pedestrian and motorist safety and fire station personnel. This may require selectively turning off certain lights, decreasing the total number of fixtures, and/or reducing the wattage of lights closest to the riparian area.

b. Reduce the amount of light emitted to the minimum required to effectively achieve its intended purpose.

i. Reduce wattage

ii. Lower mounting height (would not meet street lighting standards for height).

3) Change spectral qualities

a. Utilization or modification of lights such that the quality (color) of light emitted is less attractive or disruptive to special status species than light from traditional sources. This method should only be used in combination with options 1 and 2, above.

i. Selectively install amber-colored filtering lenses on cutoff fixtures of 70-watts or less.

1. Amber colored lenses filter out much of the short-wavelength light emitted by HPS lamps. Unlike other types of long-pass filters (e.g. dichroic filters), the angle at which the light strikes the lens has relatively little effect on its filtering properties. Filtering lenses are appealing because they are relatively inexpensive, are easy to install and maintain, and can be applied to existing HPS fixtures.

ii. Fixtures emitting only long-wavelength (550-700 nanometers) light are particularly useful in situations where lighting is needed very close to sensitive habitats. Long-wavelength light sources require less broadcast precision than conventional light sources, because they are less likely to cause problems for sensitive species.

iii. Employ Best Available Technology (BAT) – light managers should use the best available means to minimize the potential for lighting impacts to sensitive species.

Table 1. Special-Status Species with Potential to Occur Within One-Half Mile of the Proposed Pescadero Fire Station Location

Common Name	Scientific Name	Status	General Habitat Description	Habitat Present/ Absent	Rationale
Amphibians					
California red-legged frog (CRLF)	*Rana draytonii*	T, CH	Inhabits streams, freshwater pools, and ponds with overhanging vegetation. Deep pools with emergent vegetation are required for breeding.	P	Known to occur in the vicinity (within ½ mile) of the sites (CNDDB 2016).
Western Pond Turtle (WPT)	*Actinemys marmorata*	SSC	Permanent or nearly permanent water in ponds, marshes, rivers, streams, and irrigation ditches, usually with aquatic vegetation.	P	No known occurrences within a half mile of the study area (CNDDB, 2017). The vegetated drainage ditch on Cloverdale Road approximately 50 feet west of the proposed site provides suitable foraging and dispersal habitat for this species and the adjacent coastal scrub habitat provides suitable nesting habitat.
Reptiles					
San Francisco Garter snake (SFGS)	*Thamnophis sirtalis tetrataenia*	E, FP	Occurs in freshwater marshes, ponds, and slow-moving streams where its primary prey species, CRLF, is present. Prefers dense cover and access to upland grassland habitat.	P	Known to occur in the vicinity (within ½ mile) of the site (CNDDB, 2017).
Birds					
California Least tern	*Sterna antillarum browni*	E	Nests along the coast on bare or sparsely vegetated flat substrates. Forages for fish in open waters.	A	No suitable nesting, roosting, or foraging habitat is present in any of the sites.
Marbled murrelet	*Brachyramphus marmoratus*	T	Nests in old-growth forests and forages in coastal waters.	A	No suitable nesting, roosting, or foraging habitat is present at the site.
San Francisco common yellowthroat	*Geothlypis trichas sinuosa*	E	Nests primarily in fresh and brackish marshes in tall grass, tules and willows, uses salt	P	No documented occurrences within a ½ mile of the study area (CNDDB, 2017). Suitable breeding/winter habitat occurs in the vicinity of the site, along

			marshes primarily in winter.		Pescadero Creek and in agricultural fields.
White-tailed kite	*Elanus leucurus*	FP	Coastal and valley lowlands and woodland margins, grasslands, meadows, and marshes.	P	No documented CNDDB occurrences within a ½ of the study area (CNDDB, 2017). However, white-tailed kites have been regularly observed foraging in the annual grassland and seasonal wetlands within the vicinity (H.T.Harvey, 2015; County staff observations).
Yellow warbler	*Dendroica petechia*	SSC	Typical breeding habitat is riparian. Winter in a variety of habitats including scrub, woodlands, riparian, agricultural fields, and pastures.	P	No documented occurrences within a ½ mile of the study area (CNDDB, 2017). Suitable breeding/winter habitat occurs in the vicinity of the site, along Pescadero Creek and in agricultural fields.
Mammals					
San Francisco dusky-footed woodrat (SFDW)	*Neotoma fuscipes annectens*	SSC	Nests in a variety of habitats including riparian areas, oaks, woodlands, and scrub.	P	Known to occur in the vicinity of the study areas. Suitable nesting habitat occurs north of the site along the vegetated drainage ditch on Cloverdale Road.
Pallid bat	*Antrozous pallidus*	SSC	Roosts in crevices of rocky outcrops, cliffs, caves, mines, trees, and human structures. Forages over grasslands, open pine forests, gravel roads, and orchards.	A	The closest occurrence reported in the CNDDB is from 1945 within forested habitat approximately 3 miles from the project sites (CNDDB, 2017). Suitable roosting habitat occurs north of the proposed site along Pescadero Creek, but these areas are not likely to be affected by the project.
Plants					
Coastal marsh milk-vetch	*Astragalus pycnostachyus var. pycnostachyus*	1B.2	Coastal dunes (mesic), coastal scrub, marshes and swamps, (coastal, saltmarsh edges).	A	Habitat (coastal marsh) is absent. Coastal scrub habitat occurs adjacent to the site, but is not likely to be affected by the project.
Round-leaved filaree	*California macrophylla*	1B.2	Cismontane woodland valley and foothill grasses with clay soils.	A	Habitat (heavy clay soils) absent.
Fragrant fritillary	*Fritillaria liliacea*	1B.2	Cismontane woodland, coastal prairie, coastal scrub, valley and foothill grassland/ commonly serpentine soils.	A	Habitat (serpentine soils) absent.
Perennial goldfields	*Lasthenia californica ssp. macrantha*	1B.2	Coastal bluff scrub, coastal dunes, coastal scrub.	A	Habitat absent. Coastal scrub habitat occurs adjacent to the site, but is not likely to be affected by the project.

Rose leptosiphon	*Leptosiphon rosaceus*	1B.1	Coastal bluff scrub.	A	Habitat absent.
Marsh microseris	*Microseris paludosa*	1B.2	Closed-cone coniferous forest, cismontane woodland, coastal scrub, valley and foothill annual and perennial grasses.		Habitat absent. Coastal scrub habitat occurs adjacent to the site, but is not likely to be affected by the project.
Choris' popcornflower	*Plagiobothrys chorisianus var. chorisianus*	1B.2	Chaparral, coastal prairie, coastal scrub/mesic.	A/P	Habitat absent. Coastal scrub habitat occurs within the study area adjacent to the site, but is not likely to be affected by the project.

Key to Table 1 Abbreviations:
Absent (A) - no habitat present or site is outside of species' range. No further discussion warranted.
Present (P)- habitat present and species may be present
Federally Endangered (FE), Federally Threatened (FT) , State Endangered (SE), State Threatened (ST), Fully Protected (FP),
Species of Special Concern (SSC), Critical Habitat (CH)
CNPS Rare Plant Rank- 1B.2- Plants endangered in California and elsewhere

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Photos

Photo 1. Paved parking lot of Pescadero High School at Site D, facing west.

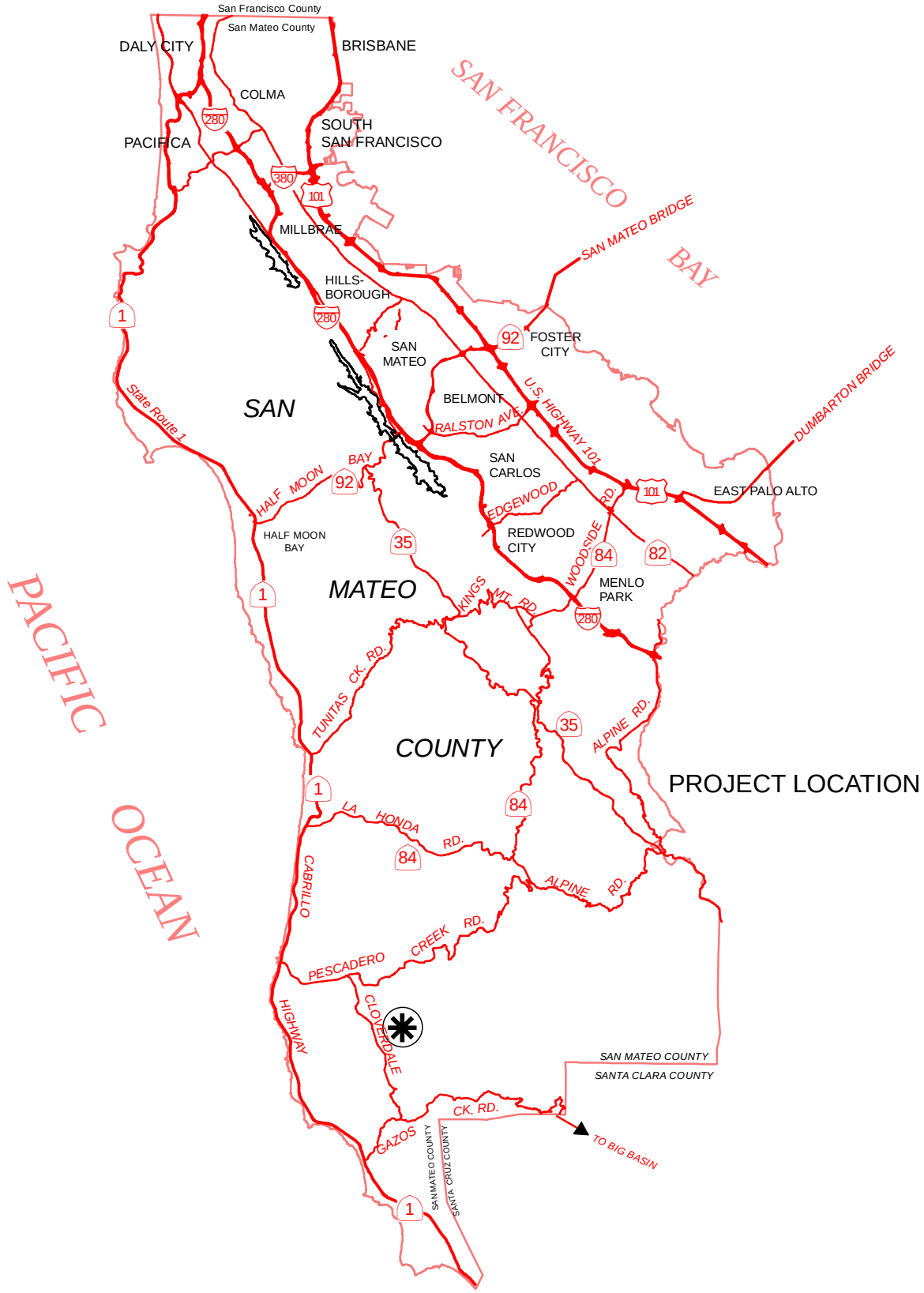
Photo 2. Pescadero High School and parking lot at Site D pictured, looking north at from Butano Cutoff.

Photo 3. Site D, looking west at fallow agricultural field adjacent to Pescadero High School parking lot.

Photo 4. Existing conditions at Site D, looking south from the corner of Butano cutoff and Cloverdale Road.

Photo 5. Vegetated drainage ditch and adjacent coastal scrub habitat pictured, facing west at the corner of Butano Cutoff and Cloverdale Road.

Photo 6. Vegetated drainage ditch located approximately 50 feet west of Site D, facing north from the corner of Cloverdale Road and Butano Cutoff.



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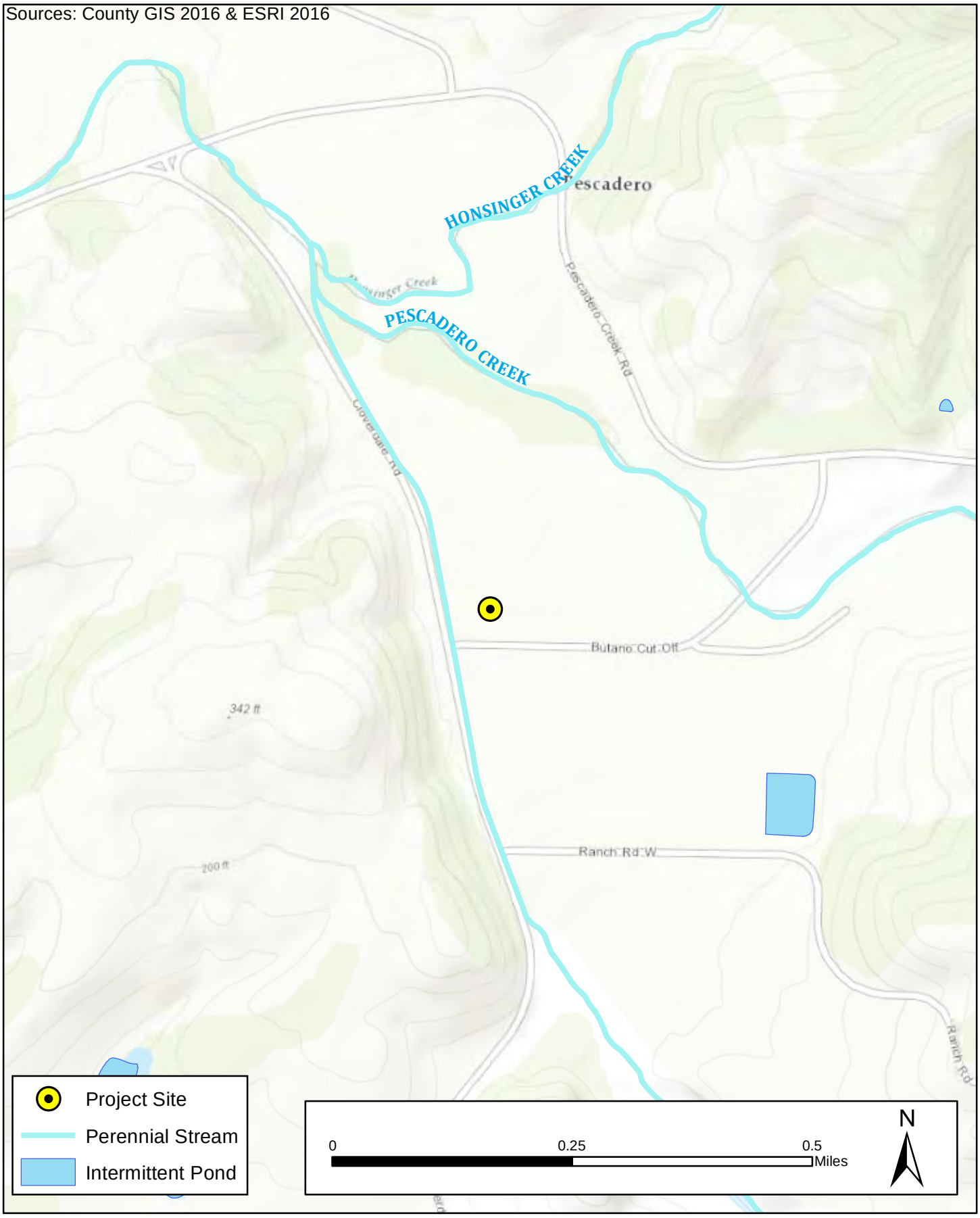
DESIGNED BY:	PESCADERO FIRE STATION SITING ANALYSIS UNINCORPORATED SAN MATEO COUNTY VICINITY MAP	SCALE: NONE
CHECKED BY: JC		DATE: MARCH 2017
DRAWN BY: TE		FILE NO: 1/XXXX

JAMES C. PORTER, DIRECTOR OF PUBLIC WORKS
SAN MATEO COUNTY

555 COUNTY CENTER, 5TH FLOOR
REDWOOD CITY, CALIFORNIA 94063-1665



COUNTY OF SAN MATEO
DEPARTMENT OF PUBLIC WORKS

Figure 2. Location Map
Pescadero Fire Station Siting Analysis

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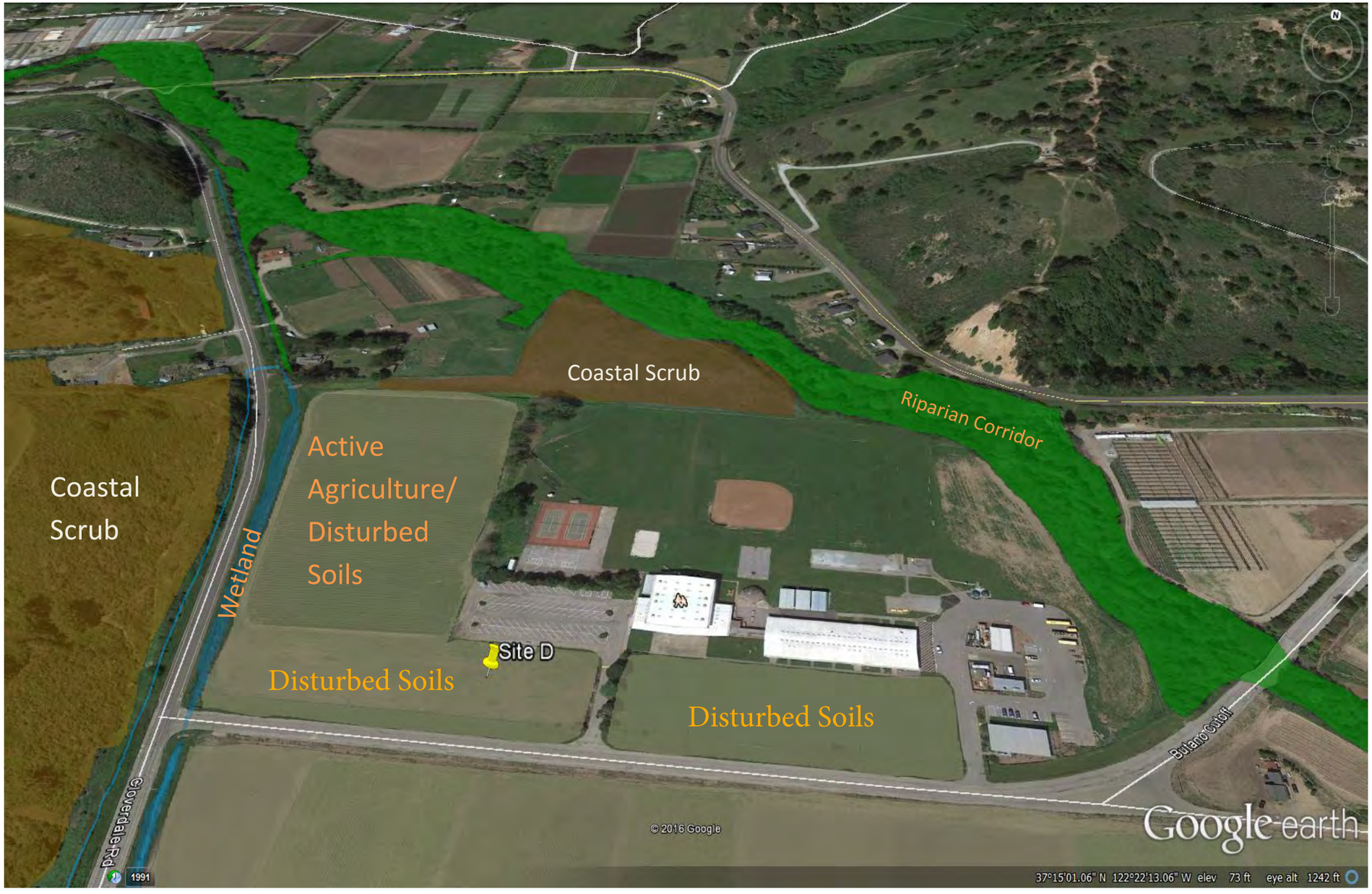


Generalized Habitat Types

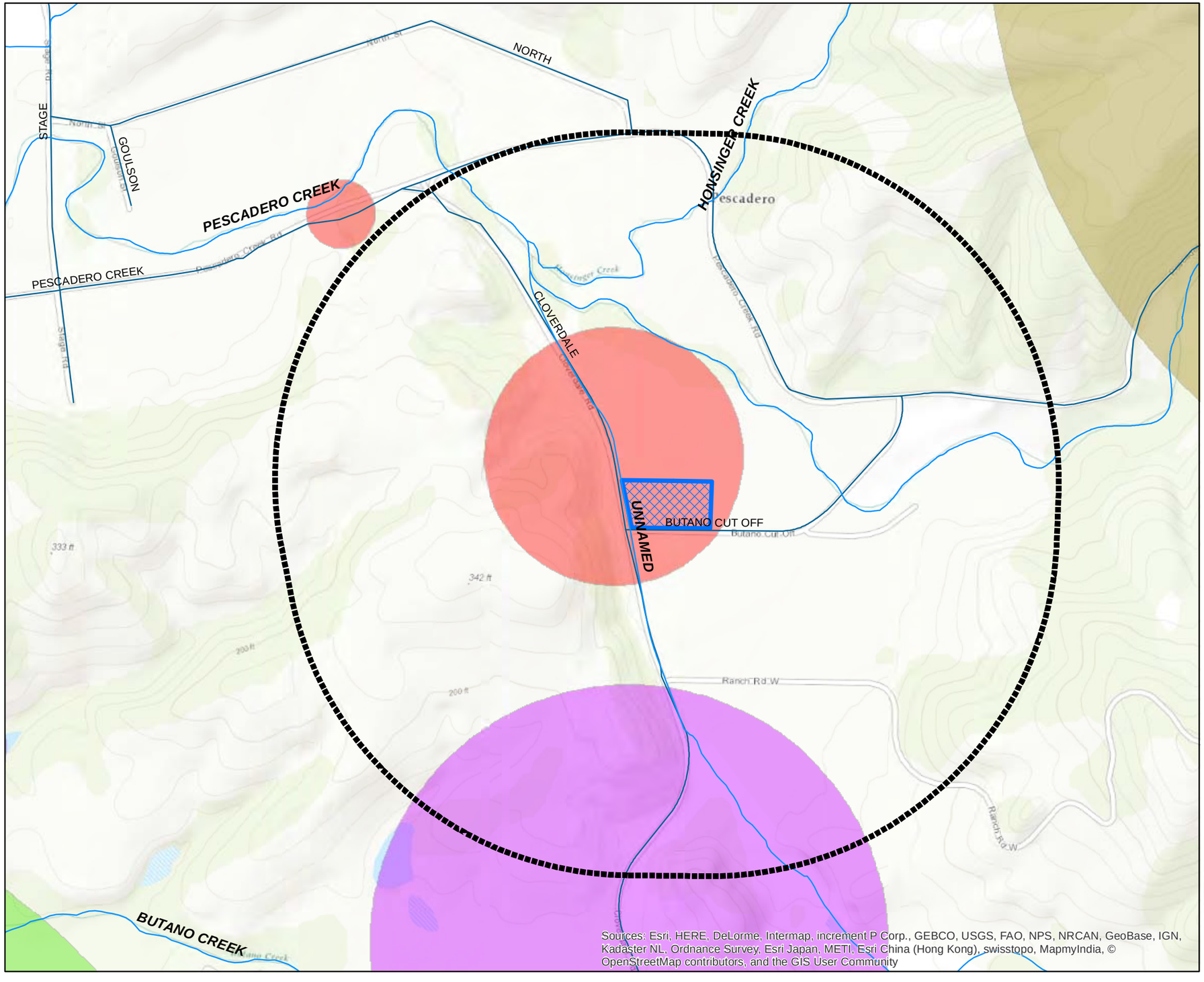
- Riparian Habitat
- Wetland Habitat
- Coastal Scrub Habitat
- Active Agriculture/ Disturbed Soils

N

COUNTY OF SAN MATEO
DEPARTMENT OF PUBLIC WORKS

Figure 3. General Habitat Types in the vicinity of Pescadero High School.

Figure 4. California Diversity Database Map - Pescadero Fire Station Siting Analysis



Legend

- Site D
- 1/2 Mile Buffer
- California red-legged frog
- San Francisco garter snake
- Townsend's big-eared bat
- coastal marsh milk-vetch

N
W E
S

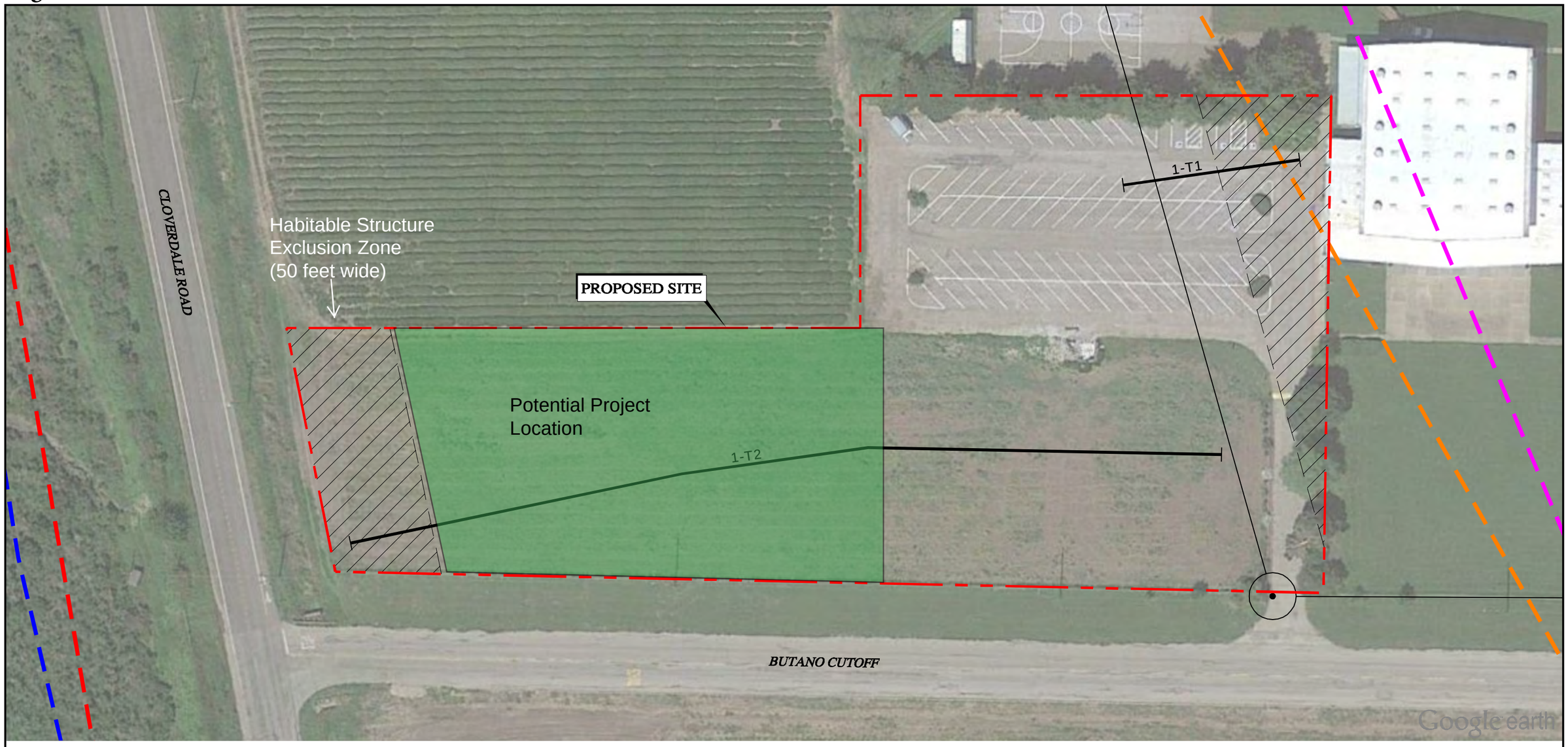
0 0.125 0.25 0.5 Miles

Figure 5c. California Natural Diversity Database Map- Site D

COUNTY OF SAN MATEO
DEPARTMENT OF PUBLIC WORKS

G:\Users\utility\watershed_protection\PERMITS\WPS2016-013 Pescadero Fire Station

Figure 5. Site Plan



EXPLANATION

ALL LOCATIONS ARE APPROXIMATE

- U.S.G.S QFFD
- FAULT (BRABB, GRAYMER, & JONES, 2000)
- FAULT (STATE OF CALIFORNIA SPECIAL STUDIES ZONES, 1982)
- FAULT (BRABB, GRAYMER, & JONES, 1998)
- EARTHQUAKE FAULT ZONE LIMIT
- 1-T2 FAULT TRENCH (ENGEO, 2016)
- PROPOSED HABITABLE STRUCTURE EXCLUSION ZONE

N

0 FEET 60

0 METERS 30

BASE MAP SOURCE: GOOGLE EARTH MAPPING SERVICE

ENGEO Expect Excellence

SITE PLAN
PESCADERO FIRE STATION
PESCADERO, CALIFORNIA

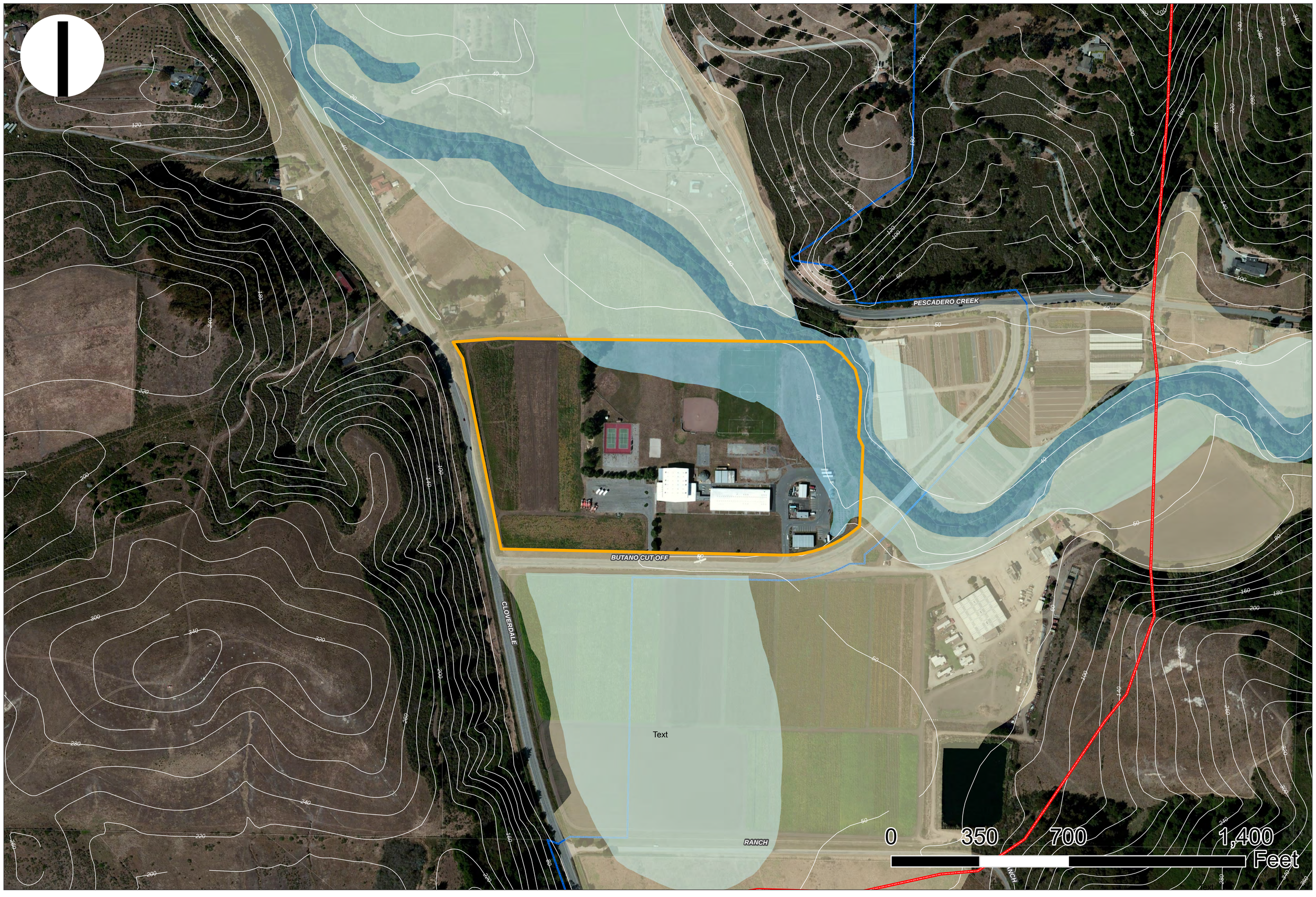
PROJECT NO.: 11780.000.001
SCALE: AS SHOWN
DRAWN BY: DLB CHECKED BY: RHB

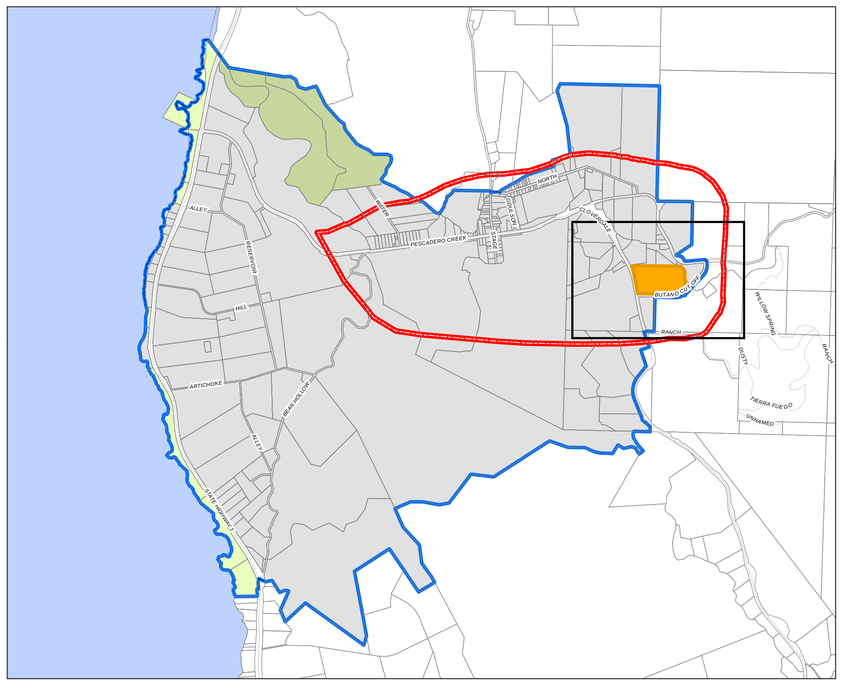
FIGURE NO. 2

ORIGINAL FIGURE PRINTED IN COLOR

G:\Drafting\DRAFTING2_Dwg_10000 to 12999\11780\000\GEX\11780000001-GEX-2-SitePlan-0716.dwg Plot Date: 7-25-16 llee

FIGURE 6. FEMA 100 -YEAR FLOOD ZONE





PESCADERO COMMUNITY MAP

Note: Matrix data based on fire station minimum site criteria, San Mateo County Planning Department Geographic Information System data, Local Coastal Program Policy, and site inspections conducted by the Steering Committee.

This product is for informational purposes and may not have been prepared for, or be suitable for legal, enginnering, or surveying purposes. Users of this information should review or consult the primary data and information sources to ascertain the usability of the information.

L:_PlanningLayer\GIS\CMO-PF\Pesc2016_SiteD.mxd BA

LEGEND

- SUBJECT PARCEL
- CALFIRE RESPONSE AREA
- TSUNAMI INUNDATION ZONE
- PRIME SOILS (CLASS I, II, III)
- FEMA FLOOD ZONES (A, AE, AE w/ FLOODWAY)
- PESCADERO
- COUNTY PARCELS

Indicates criteria is not met, has a high probabilty of occurring on the parcel, or may have significant/unavoidable impacts

Indicats criteria may be met however impacts are likely to occur

Indicates criteria may be met or where impacts may be minimized through siting of development

Indicates criteria is met, has a low probability of occurring on the parcel, or may result in minimal impacts

[1] ***Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) Definitions:***

Zone X:

Area of minimal flood hazard; area determinted to be outside the 500-year flood. Flood insurance is not required.

Zone A:

Areas with a 1% annual chance of flooding and a 26% chance of flooding over the life of a 30-year mortgage. Because detailed analysis are not performed for such area; no depths or base flood elevations are shown. Mandatory flood insurance is required.

Zone AE:

The base floodplain where base flood elevations are provided. Mandatory flood insurance is required.

[2] ***CEQA = California Environmental Quality Act.***

PROPERTY DETAILS		
Site #		D
Property		350 Butano Cut Off
Site Identifying Name		**High School**
APN		087-053-010
Gross Parcel Acreage (Assessor's Data)		28.61
Acreage		28.61, A portion located on the northwest corner
Owner		La Honda- Pescadero Union High School District
Zoning		RM-CZ/CD
Local Coastal Program Land Use Designation		Agriculture and Institutional
Existing Water Source		Small well for school.
AGENCY CRITERIA / DEVELOPMENT AND LAND USE POLICY ISSUES		
County Fire Minimum 1-3 Acre Site Available		Yes
Safe Access for Engines		Yes
Within County Fire Response Circle		Yes
Slopes in excess of 20% (County mapped contours)		Less than 20%
Mapped Flood Zones[1]		Partial Majority within Zone X; Rear Ag. and play fields within Zone X (0.2%), Zone AE and Zone AE with Floodway
Tsunami Zone		No
Sensitive Habitat/ Riparian Corridor		Yes (drainage along Cloverdale Road, Pescadero Creek)
Mapped Prime Soils		None mapped However, Ag. field likely meets LCP Prime Soils definition; Class I Prime Soils are mapped along Cloverdale Rd. and
Septic		Potential shallow groundwater, setbacks from drainages
PROCESS		
Land Use Requirements[2]		Local Coastal Program amendment (voter approval required); CSA 11 water service extension (LAFCo approval required); Rezoning; Coastal Development Permit, CEQA

FAULT EVALUATION REPORT

PROPOSED FIRE STATION (APN 087-053-010)
360 BUTANO CUTOFF
PESCADERO, CALIFORNIA

Submitted to:
Ms. Theresa Yee
County of San Mateo
555 County Center, 5th Floor
Redwood City, CA 94063

Prepared by:
ENGEO Incorporated

July 21, 2016

Project No:
11780.000.001

Project No.
11780.000.001

July 21, 2016

Ms. Theresa Yee
County of San Mateo
555 County Center, 5th Floor
Redwood City, CA 94063

Subject: Proposed Fire Station (APN 087-053-010)
360 Butano Cutoff
Pescadero, California

FAULT EVALUATION REPORT

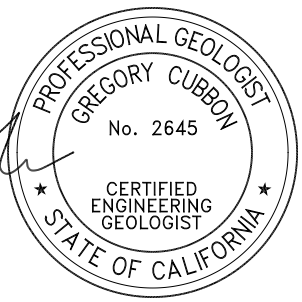
Dear Ms. Yee:

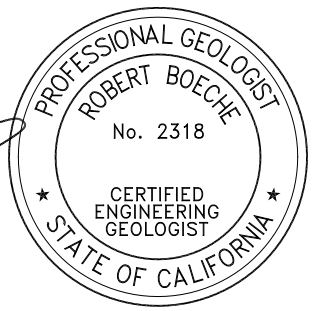
With your authorization, we prepared this report describing the results of our fault exploration for a proposed fire station to be potentially located at a portion of the existing Pescadero High School (APN 087-053-010) located at 360 Butano Cutoff in Pescadero, California. The accompanying report presents the findings of our exploration and our conclusions and recommendations regarding potential fault hazards at the site.

Evidence of faulting was not encountered in the fault trenches excavated at the site. In our opinion, hazards associated with fault rupture at the site can be mitigated by implementation of the fault setback recommendations provided in this report. Additional design-level exploration services will be required in the future in order to present grading, drainage, and foundation design recommendations. We are pleased to have been of service to you on this project and are prepared to consult further with you and your design team as the project progresses.

Sincerely,

ENGEO Incorporated





Greg Cubbon, CEG
gc/rhb/bvv

Robert H. Boeche, CEG

TABLE OF CONTENTS

1.0 INTRODUCTION

1.1 PURPOSE AND SCOPE

The purpose of this study was to evaluate the potential for surface fault rupture along a portion of the Coastways section of the San Gregorio fault at the subject site as identified on the Alquist-Priolo Earthquake Fault Zone map for the Franklin Point Quadrangle (1982). Our scope of work included the following:

- Review of publicly available regional geologic maps.
- Review of the California Geological Survey (CGS) Alquist-Priolo Earthquake Fault Hazard Map for the Franklin Point Quadrangle and supporting documentation provided in the California Geological Survey (CGS) Fault Evaluation Report and United States Geological Survey (USGS) Quaternary Fault and Fold Database (QFFD) for the San Gregorio Fault.
- Review of single and stereo-paired historic aerial images flown between 1958 and 2002, and available historic topographic maps.
- Excavation and logging of two trenches at the site.
- Soil profile dating by Soil Tectonics, Inc.
- Preparation of this report.

The documents and maps reviewed for this study are described in the References. The results of the Soil Tectonics soil profile analysis are summarized in Appendix A.

This report was prepared for the exclusive use of our client and their consultants. In the event that any changes are made in the character, design or layout of the development, we must be contacted to review the conclusions and recommendations contained in this report to determine whether modifications are necessary.

1.2 ALQUIST-PRIOLO EARTHQUAKE FAULT ZONE ACT

The Alquist-Priolo program requires the State Geologist, via the CGS to establish regulatory zones around fault traces that are considered active and sufficiently well defined to create the potential for surface fault rupture hazards to structures. A fault trace is considered “active” if it is judged to have had identifiable surface rupture during the Holocene (defined by the CGS as the last 11,000 years). The State requires geological investigations prior to construction of new structures within Earthquake Fault hazard zones as described in CGS Special Publication 42 and Note 49. The policies and criteria of the State Mining and Geology Board with reference to the Alquist-Priolo Earthquake Fault Zoning Act are described in CGS Special Publication 42, Specific Criteria that include:

Appendix B Section 3603 (a): No structure for human occupancy, identified as a project under Section 2621.6 of the Act, shall be permitted to be placed across the trace of an active fault. Furthermore, as the area within fifty (50) feet of such active faults shall be presumed to be underlain by active branches of that fault unless proven otherwise by an appropriate geologic investigation and report prepared as specified in Section 3603(d) of this subchapter, no such structures shall be permitted in this area.

Appendix C Guidelines for Evaluating the Hazards of Surface Rupture: Setback distances of proposed structures from hazardous faults. The setback distance generally will depend on the quality of data and type and complexity of fault(s) encountered at the site.

1.3 PROJECT LOCATION

Based on conversations with you, it is our understanding that the proposed San Mateo County fire station may be constructed within the southwestern portion of APN 087-053-010 in Pescadero, California (Figure 1). Based on recent site visits, the northeastern portion of the proposed development area is located within a paved parking area, while the remainder of the site is located within a fallow field with low height seasonal vegetation. At the time of our site visits, it appeared as though the fallow field had been tilled recently to control weeds. The remainder of the parcel located outside of the proposed development area is occupied by both agriculture and buildings/athletic fields associated with Pescadero High School.

The current topography of the site can generally be characterized as relatively flat with a gentle slope towards the west.

1.4 PROJECT DESCRIPTION

Although no formal plans are available at this time, it is our understanding that a new fire station may be constructed at the subject site. We anticipate project development will include the construction of one to two structures, paved parking areas, and landscaping.

1.5 REGIONAL GEOLOGY

The site is located within the Coast Ranges geomorphic province of California. The Coast Ranges province is typified by a system of northwest-trending, fault-bounded mountain ranges and intervening alluviated valleys. Bedrock in the Coast Ranges consists of igneous, metamorphic, and sedimentary rocks that range in age from Jurassic to Pleistocene. The present geology of the Coast Ranges is the result of deformation and deposition along the tectonic boundary between the North American plate and the Pacific plate. Plate boundary fault movements are largely concentrated along the well-known fault zones, which in the area include the San Andreas, Calaveras, and Hayward faults, as well as other lesser-order faults.

1.6 LOCAL GEOLOGY

The site geology has been mapped by Brabb et al. (2000 and 1998, Figure 3) as underlain by Holocene age, younger (outer) alluvial fan deposits (Qyfo) consisting of unconsolidated fine sand, silt, and clayey silt.

1.7 SAN GREGORIO FAULT

The history of mapping and identification of the San Gregorio fault zone in the vicinity of the site as identified on the Franklin Point 7.5 minute Quadrangle is described in the Fault Evaluation Report (FER-116) by Smith (1981). In 1976, the CDMG established Special Studies Zones (SSZ) around the San Gregorio fault zone based on the mapping of Weber (1975), Hall et al. (1974), Brown (1972), and Clark (1970). However, the limits of the SSZ and location of segments of the San Gregorio fault zone were revised in 1982 based on additional data by Weber and Lajoie (1980), Weber and Cotton (1980), and interpretation of aerial photographs by Smith (FER-116, 1981). Revisions to the Alquist-Priolo Earthquake Fault Hazard Map for the Franklin Point Quadrangle have not been made since publication of the revised map in 1982. Fault segments as shown on the Alquist-Priolo Earthquake Fault Hazard Map for the Franklin Point Quadrangle (1982) in the vicinity of the project (Figures 2 and 6) appear to be based on interpretation of aerial photographs and geomorphology. Specifically, FER-116 indicates the segment mapped just west and roughly parallel with Cloverdale Road is based on an apparent broad, topographic scarp with deflected drainage channels. This segment is located west of the project area. Three discontinuous segments mapped just south but not entering the site appear to be based on tonal lineaments and closed depressions observed in aerial photographs. Although removed from the current Alquist-Priolo Earthquake Fault Hazard Map for the Franklin Point Quadrangle (1982) and QFFD, the prior Earthquake Fault Hazard Map for the Franklin Point Quadrangle (1976) depicted a segment of the San Gregorio fault passing through the current school site, just east of the project area. A similar segment is still depicted on regional geologic maps prepared by Brabb et al. (2000 and 1998, Figures 2 and 6), and is shown to pass through or in close proximity to the northeastern corner of the site.

As described in FER-116 and the USGS QFFD, the San Gregorio fault zone is part of a larger fault zone, known as the San Gregorio-Hosgri fault zone,that extends over a distance of approximately 400 kilometers from roughly Bolinas in the north to Lompoc in the south. Near the project, the San Gregorio fault zone consists of a complex system of numerous fault strands that include but are not limited to the Frijoles segment, Seal Cove segment, Ano Nuevo segment, Greyhound Rock segment, and Coastways segment, which is the focus of this study. According to the QFFD, the Coastways segment mapped in the vicinity of the site is considered to be a Holocene age fault (i.e. defined as active within the last 11,000 years).

The QFFD indicates that estimated slip rates along the San Gregorio fault zone vary, with some estimates as low as 0.4 mm/year and others as high as 10 mm/yr. Movement along the San Gregorio fault zone is predominantly right lateral strike slip, although some segments may include a component of reverse movement. Recurrence intervals are estimated to be on the order of 400 to 1,000 years, with the last major earthquake on the fault occurring after 1200 to 1470 AD but before the arrival of Spanish missionaries in 1775 AD. As described in FER-116,

few seismic events have been recorded in the project area, with most nearby seismic activity associated with the San Andreas fault.

1.8 REGIONAL SEISMICITY

Because of the presence of nearby active faults, the Central Coast Region of California is considered seismically active. Numerous small earthquakes occur every year in the region, and large (>M7) earthquakes have been recorded and can be expected to occur in the future. The site is located within the Earthquake Fault Hazard Zone for the San Gregorio fault (Figure 4). Figure 5 shows the approximate location of active and potentially active faults and significant historic earthquakes mapped within the project area. Based on the 2008 USGS National Seismic Hazard Maps database, the nearest active fault is the San Gregorio fault, located immediately west of the subject site. Other active or potentially active faults located near the site include the San Andreas fault, located approximately 11.9 miles to the northeast, the Monte Vista Shannon fault, located approximately 14 miles to the northeast; and the Zayante Vergeles fault, located approximately 24.3 miles to the southeast.

1.9 AERIAL PHOTOGRAPH REVIEW

We reviewed the following individual and stereo-paired images of the site:

TABLE 1.9-1
Aerial Photographs

Date	Film ID	Line Number	Photograph Numbers	Scale
10/13/2005	KAV 9200	8	28/29	1:15,000
8/15/2000	AV 6600	8	59/60	1:12,000
8/5/1997	AV 5434	8	54/55	1:12,000
8/8/1995	KAV 4905	4	19	1:24,000
8/27/1993	AV 4515	8	58/59/60	1:12,000
9/24/1991	KAV 4122	4	15/16	1:36,000
7/2/1991	AV 4075	8	66	1:12,000
6/21/1989	AV 3593	4	16/17	1:36,000
7/3/1985	AV 2664	4	16/17	1:36,000
11/2/1981	AV 2050	07	41	1:54,000
5/11/1979	AV 1700	06/07	37/38 & 34/35	1:54,000
9/4/1975	AV1215	07	35/36	1:54,000
9/8/1970	AV 965	965	35/36 & 40	1:48,000
2/20/1967	AV 784	22	05/06	1:36,000
4/21/1966	AV 710	07	47	1:36,000
7/9/1963	AV 550	06	39/40	1:36,000
8/22/1960	AV 385	09	22/23	1:30,000
3/1/1958	SF Area	01	126/127	1:36,000

Review of the above photographs indicates that the site was used as agricultural land since at least 1958. In the 1958 photographs, a small barn structure is visible in the southwest corner of the project area, roughly at the intersection of Cloverdale Road and Butano Cutoff. By the time of the photographs dated 1960, the barn had been demolished and the current school had been built. No significant changes to the project area are visible in the remaining photographs reviewed.

The project area appears to be located in a broad, linear alluvial valley that trends in a roughly northwest/southeast direction. A relatively linear, north/south trending prominent break in slope is visible to the west of Cloverdale Road. Additionally, tonal lineaments trending in a northwest/southeast direction are periodically visible in the open fields located south of the site. The features mentioned above are roughly coincident with the fault traces depicted by USGS QFFD mapping and the Alquist-Priolo Earthquake Fault Hazard Map for the Franklin Point Quadrangle (1982). It should be noted that none of the features described above appear to traverse the project area.

2.0 SITE EXPLORATION

2.1 TRENCH EXCAVATIONS

We excavated and logged a total of approximately 650 feet of trench as depicted on Figure 2. The trenches were excavated with a tracked excavator to depths ranging from approximately 8.5 to 13.5 feet. The trenches could not be excavated past a depth of approximately 13.5 feet due to high groundwater and unstable soils. The excavations were benched or shored for safety and the south walls of the trenches were cleaned of smeared materials and logged by ENGEO geologists as noted on the logs. The trench locations and significant features were located by measuring from existing landmarks.

The purpose of the trench excavations was to expose the alluvial deposits so that they could be closely examined for evidence of recent fault displacement. The geologic logging process included description of soil color, estimated grain size, structure and interpretation of geologic features such as development of soil weathering profiles, depositional layering and contacts between differing soil layers.

We retained Dr. Glenn Borchardt to provide a detailed pedochronologic description of represented weathering profiles developed in Trench 1-T1 at Station 48. The purpose of the pedochronologic description was to correlate the soils observed onsite with nearby dated profiles and to estimate the age of weathering profiles. The results of Dr. Borchardt's study are presented in Appendix A.

The trenches were excavated in a roughly southwest/northeast direction and were oriented roughly perpendicular to the trend of mapped fault traces in the project area. Trench 1-T1 was excavated on the eastern side of the project area in the existing parking lot to the limit of the eastern edge of the AP Earthquake Fault Hazard Zone (Figure 2). Trench 1-T2 was excavated

from the western side to the eastern side of the project area in an open field and is entirely located within the AP Earthquake Fault Hazard Zone (Figure 2).

2.2 SUBSURFACE CONDITIONS

The following sections described the geologic units encountered in Trenches 1-T1 and 1-T2. The trench logs are included as Figure 7. Groundwater was encountered in both trenches at depths of roughly 10½ to 13 feet below the ground surface.

2.2.1 Artificial Fill (Unit 1 in 1-T1, Unit 1A and 1B in 1-T2)

Artificial fill was encountered across the extent of both trenches and ranged in thickness from approximately 1 to 2 feet, including soils disturbed as a result of tilling. The fill encountered was generally black to light brown lean clay with minor debris items (rusted metal, porcelain). Additionally, a leach line and remnants of a wooden septic tank was encountered between Stations 420 and 425 in 1-T2, in the vicinity of the former barn. In Trench 1-T1, the artificial fill is overlain by a pavement section consisting of approximately 2 inches of asphaltic concrete over 4 inches of aggregate base. Based on conversations with representatives of Pescadero High School, we understand that the school site may have been raised in the past to help reduce the potential for flooding. Additionally, we observed that the site is roughly 1 to 2 feet higher in elevation than agricultural fields to the south of the site.

2.2.2 Holocene Alluvium, A Horizon (Unit 2, Both Trenches)

An A Horizon, consisting of black silty lean clay, was observed underlying artificial fill across both trenches. Where encountered, this soil was generally porous and contained abundant rootlets and worm burrows. This unit is described as containing three separate A Horizons (A1, A2, and A3) in the report prepared by Dr. Borchardt (Appendix A).

2.2.3 Holocene Alluvium, Bt Horizon (Unit 3 in 1-T1, Unit 3A and Upper Unit 3 in 1-T2)

A Bt Horizon, consisting of brown and light brown silty lean clay was observed underlying the A Horizon across both trenches. Where encountered, this soil was observed to contain numerous root traces and worm burrows, with black clay coating the root trace and burrow surfaces. The upper portion of Unit 3 in 1-T2 is interpreted to include the Bt Horizon, although the moisture content and increased clay content of this soil between Station 450 and 540 made identifying the geologic contact with underlying soils difficult to discern. As such, a facies change is shown on the log for Trench 1-T2 at Station 450.

2.2.4 Holocene Alluvium, BC Horizon (Unit 4 in 1-T1, Unit 3B and Lower Unit 3 in 1-T2)

A BC Horizon, consisting of light yellowish brown silty lean clay was observed underlying the Bt Horizon across both trenches. Where encountered, this soil was observed to contain some root traces and worm burrows, with black clay coating the root trace and burrow surfaces. Additionally, the BC horizon contained noticeably more silt than the overlying Bt Horizon. The

lower portion of Unit 3 in 1-T2 is interpreted to include the BC Horizon, although the moisture content and increased clay content of this soil between Station 450 and 540 made identifying the geologic contact with underlying soils difficult to discern. As such, a facies change is shown on the log for trench 1-T2 at Station 450. As discussed in the report prepared by Dr. Borchardt, the age of this soil is interpreted to be approximately 4,700 years.

2.2.5 Holocene Alluvium, Ab1/Btb1 Horizon (Unit 5 in 1-T1, Unit 4 in 1-T2)

An Ab1/Btb1 Horizon, consisting of dark brown and gray lean clay was observed underlying the BC Horizon across both trenches. Where encountered, this soil was observed to contain abundant root traces and worm burrows, with black clay coating the root trace and burrow surfaces. This soil appeared to have a moderate blocky structure. As discussed in the report prepared by Dr. Borchardt, the age of the lower portion (i.e. Btb1) of this soil is interpreted to be approximately 5,300 years.

2.2.6 Holocene Alluvium, Ab2 Horizon (Unit 6 in 1-T1, Unit 5 in 1-T2)

An Ab2 Horizon, consisting of brown silty lean clay was observed underlying the Ab2 Horizon across both trenches. Where encountered, this soil was observed to exhibit a moderate blocky structure with clay films on blocky surfaces. As discussed in the report prepared by Dr. Borchardt, the soil age is interpreted to be approximately 6,300 years.

2.3 FAULTING

No evidence of faulting, folding or warping was observed in the soils exposed in Trenches 1-T1 or 1-T2.

3.0 DISCUSSION AND RECOMMENDATIONS

Review of FER-116 indicates that the mapped traces of the San Gregorio fault (depicted on Figure 6) immediately west and south of the site are based on geomorphic expression and tonal lineaments observed through review of aerial photographs. The fault traces immediately south of the site are shown to be queried and discontinuous, while the fault trace to the west of the site (roughly coincident with Cloverdale Road) is located along a prominent break in slope. The locations of potential fault traces that are mapped on the Alquist-Priolo Earthquake Fault Hazard Map for the Franklin Point Quadrangle (1982) due to tonal lineaments to the south of the site and the linear break in slope to the west of the site and are in general agreement with similar features observed during our review of aerial photographs. None of the fault traces depicted on the Alquist-Priolo Zone map or QFFD are shown to pass through the site.

The trace of the San Gregorio fault shown in close proximity to or through the northeastern corner to the east of the site as mapped by Brabb et al. (1998, 2000) appears to be based on prior geologic data and is not included on the Alquist-Priolo Earthquake Fault Hazard Map for the Franklin Point Quadrangle (1982) or mapping by the QFFD. Additionally, the referenced maps

prepared by Brabb et al. are small-scale regional geologic maps; therefore, fault traces as shown in a smaller, site-specific location may not be entirely accurate.

The base of the soil profile exposed in our trenches was estimated to be approximately 6,300 years in age (Appendix A), and no warping or offset of soils within the trenches was observed. The guidelines for implementation of the Alquist-Priolo act indicate that structures may not be constructed across the trace of an active fault, which CGS defines as a fault that has experienced movement in the last 11,000 years. As discussed in a previous section, recurrence intervals along the San Gregorio fault are estimated to be in the range of 400 to 10,000 years. Considering soils encountered in our trenches are up to 6,300 years in age, it is our opinion that offset or warping of soils should have been observed if active splays of the San Gregorio fault were present across the subject site. Dr. Borchardt, who concluded that the modern soil and underlying mid-Holocene paleosols observed in our trenches could be used to evaluate the potential for surface fault rupture at the site, drew a similar conclusion (Appendix A).

Considering the general absence of fault traces mapped through the site, lack of geomorphic evidence for an active fault traversing the site, and the age of un-faulted soils exposed in our trenches in conjunction with the recurrence interval of the San Gregorio fault, it is our opinion that the results of this study sufficiently satisfy the intent of the Alquist-Priolo act.

Based on the results of this study we have the following recommendations:

- Structures intended for human occupancy should be set back from the eastern edge of Trench 1-T1 and western edge of Trench 1-T2 a minimum of 50 feet as depicted on Figure 2.

- It will be acceptable to construct other improvements such as roads, parking lots, landscaping, and underground utilities within the recommended fault setback zones. However, these improvements may be susceptible to damage in the event of fault rupture.

4.0 LIMITATIONS AND UNIFORMITY OF CONDITIONS

If changes occur in the nature or design of the project, we should be allowed to review this report and provide additional recommendations, if any. It is the responsibility of the owner to transmit the information and recommendations of this report to the appropriate organizations or people involved in design of the project, including, but not limited to, developers, owners, buyers, architects, engineers, and designers. The conclusions and recommendations contained in this report are solely professional opinions and are valid for a period of no more than 2 years from the date of report issuance.

We strived to perform our professional services in accordance with generally accepted geotechnical engineering principles and practices currently employed in the area; no warranty is expressed or implied. There are risks of earth movement and property damages inherent in building on or with earth materials. We are unable to eliminate all risks or provide insurance; therefore, we are unable to guarantee or warrant the results of our services.

This report is based upon field and other conditions discovered at the time of report preparation. We developed this report with limited subsurface exploration data. We assumed that our subsurface exploration data is representative of the actual subsurface conditions across the site. If unexpected conditions are encountered, notify ENGEO immediately to review these conditions and provide additional and/or modified recommendations, as necessary.

Actual field or other conditions will necessitate clarifications, adjustments, modifications or other changes to ENGEO's documents. Therefore, ENGEO must be engaged to prepare the necessary clarifications, adjustments, modifications or other changes before construction activities commence or further activity proceeds. If ENGEO's scope of services does not include onsite construction observation, or if other persons or entities are retained to provide such services, ENGEO cannot be held responsible for any or all claims arising from or resulting from the performance of such services by other persons or entities, and from any or all claims arising from or resulting from clarifications, adjustments, modifications, discrepancies or other changes necessary to reflect changed field or other conditions.

SELECTED REFERENCES

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FIGURES

FIGURES

N

0 FEET 2000

0 METERS 1000

BASE MAP SOURCE: GOOGLE EARTH MAPPING SERVICE

ENGEO Expect Excellence

VICINITY MAP

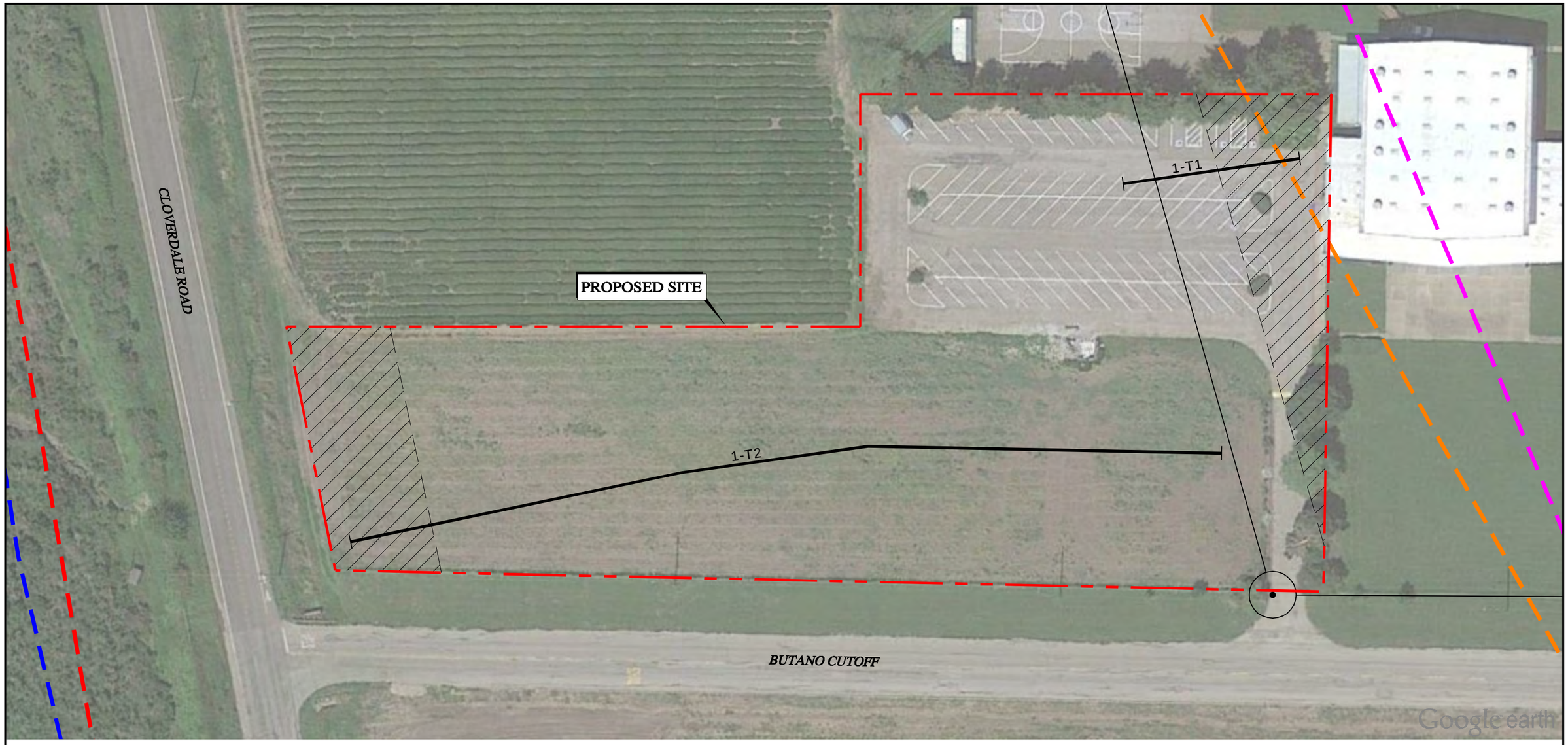
PESCADERO FIRE STATION

PESCADERO, CALIFORNIA

PROJECT NO.: 11780.000.001			FIGURE NO. 1
SCALE: AS SHOWN			
DRAWN BY: DLB	CHECKED BY: RHB		

G:\Drafting\DRAFTING2_Dwg_10000 to 12999\11780\000\GEX\11780000001-GEX-1-VicMap-0716.dwg Plot Date: 7-25-16 llee

ORIGINAL FIGURE PRINTED IN COLOR



EXPLANATION

ALL LOCATIONS ARE APPROXIMATE

- U.S.G.S QFFD
- FAULT (BRABB, GRAYMER, & JONES, 2000)
- FAULT (STATE OF CALIFORNIA SPECIAL STUDIES ZONES, 1982)
- FAULT (BRABB, GRAYMER, & JONES, 1998)
- EARTHQUAKE FAULT ZONE LIMIT
- 1-T2 FAULT TRENCH (ENGEO, 2016)
- PROPOSED HABITABLE STRUCTURE EXCLUSION ZONE

N

0 FEET 60

0 METERS 30

BASE MAP SOURCE: GOOGLE EARTH MAPPING SERVICE

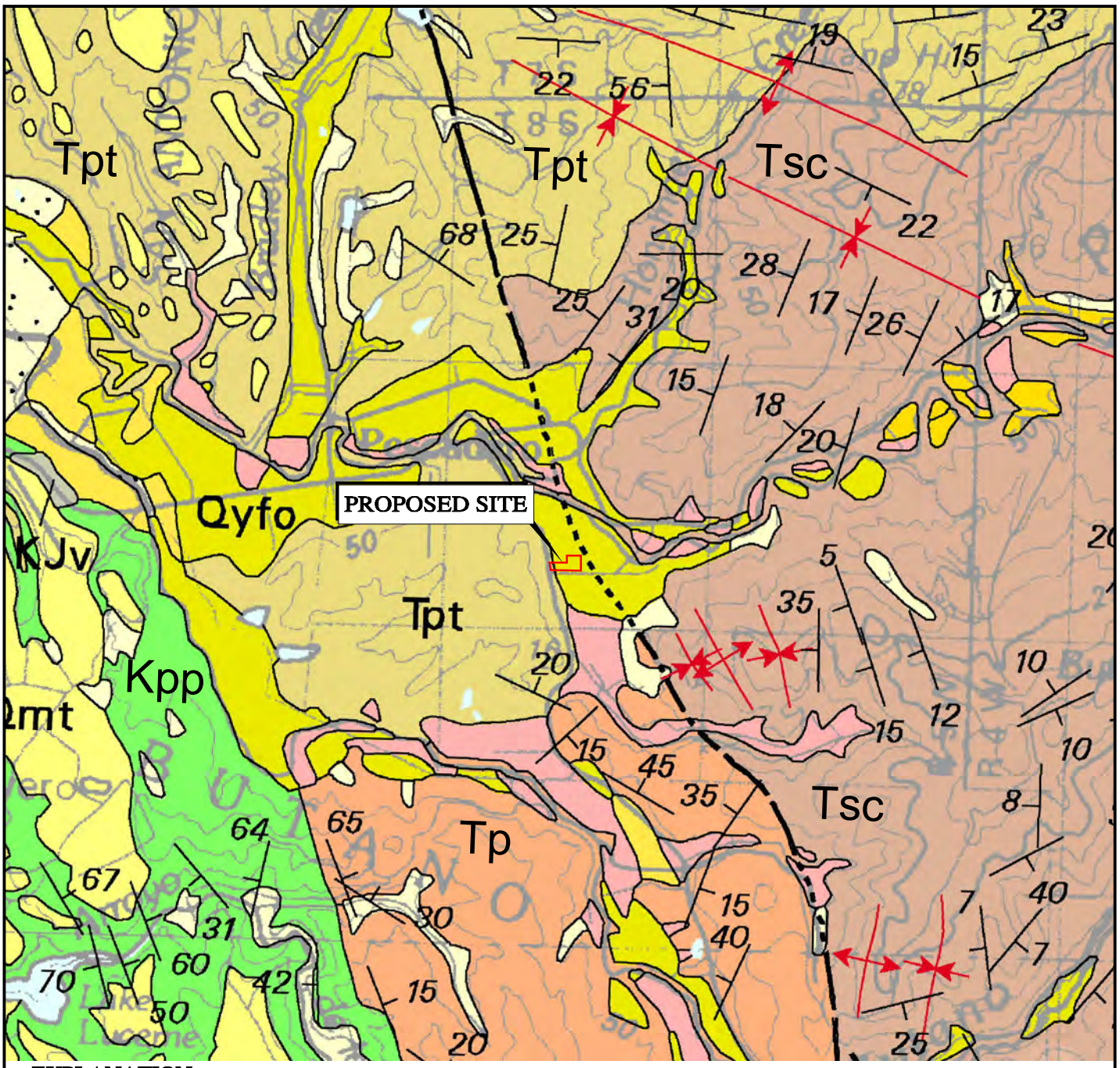
ENGEO Expect Excellence

SITE PLAN
PESCADERO FIRE STATION
PESCADERO, CALIFORNIA

PROJECT NO.: 11780.000.001	FIGURE NO. 2
SCALE: AS SHOWN	
DRAWN BY: DLB	CHECKED BY: RHB

G:\Drafting\DRAFTING2_Dwg_10000 to 12999\11780\000\GEX\11780000001-GEX-2-SitePlan-0716.dwg Plot Date: 7-25-16 Ilee

ORIGINAL FIGURE PRINTED IN COLOR



EXPLANATION

FAULT-DASHED WHERE APPROXIMATELY LOCATED, SHORT DASHED WHERE INFERRED, DOTTED WHERE CONCEALED, QUERIED WHERE LOCATION IS UNCERTAIN STRIKE-SLIP MOVEMENT

AXIS OF FOLD

ANTICLINE — SYNCLINE

STRIKE AND DIP OF STRATA

INCLINED — VERTICAL — OVERTURNED

Qyfo	YOUNGER ALLUVIAL FAN DEPOSIT
Tp	PURISIMA FORMATION
Tpt	TAHANA MEMBER
Tsc	SANTA CRUZ MUDSTONE
Kpp	PIGEON POINT FORMATION

BASE MAP SOURCE: BRABB, GRAYMER, JONES, 2000

ENGEO Expect Excellence

REGIONAL GEOLOGIC MAP

PESCADERO FIRE STATION

PESCADERO, CALIFORNIA

PROJECT NO.: 11780.000.001		FIGURE NO. 3
SCALE: AS SHOWN		
DRAWN BY: DLB	CHECKED BY: RHB	

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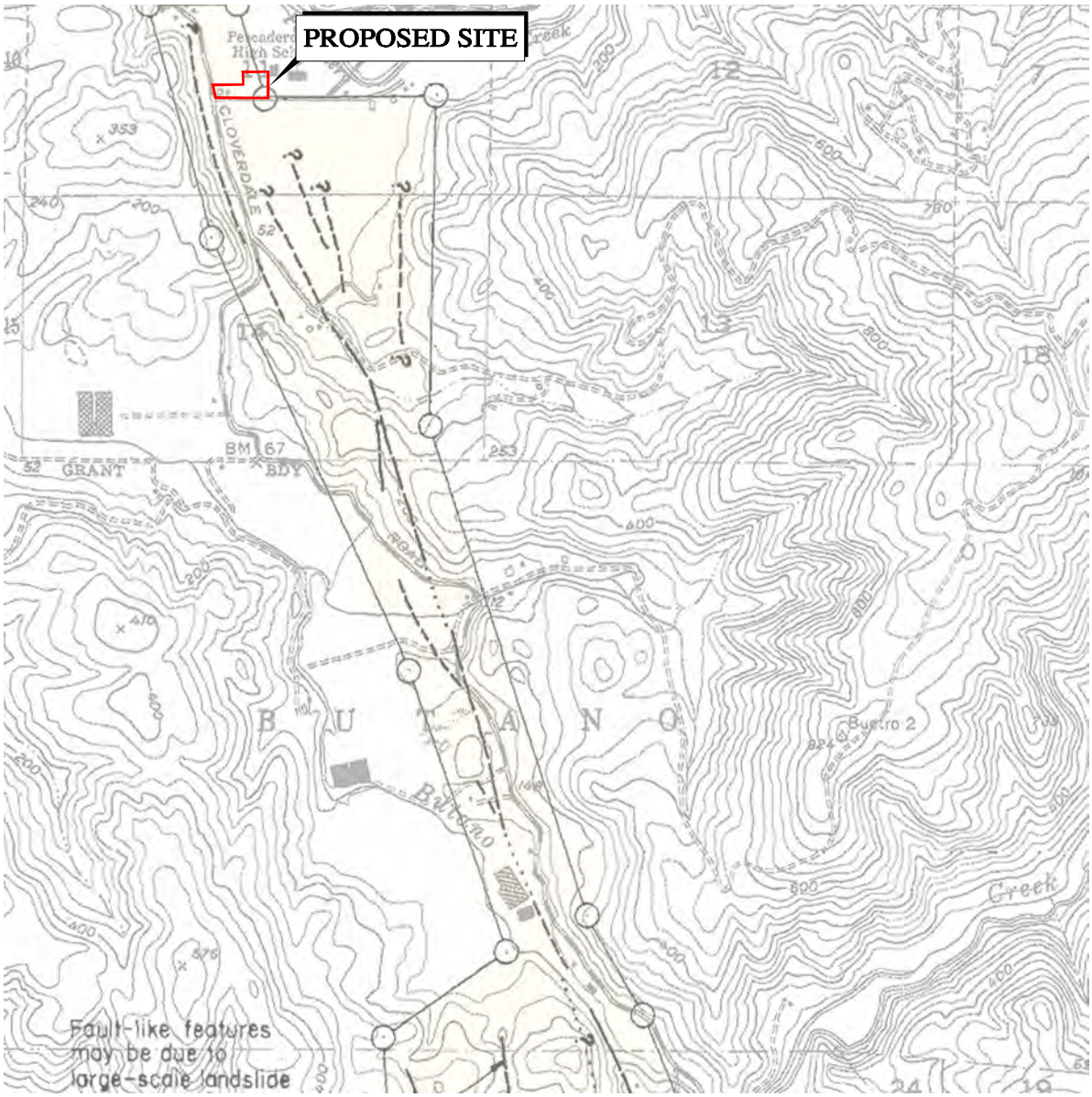

EXPLANATION

1906 C
?

FAULTS CONSIDERED TO HAVE BEEN ACTIVE DURING HOLOCENE TIME AND TO HAVE A RELATIVELY HIGH POTENTIAL FOR SURFACE RUPTURE; SOLID LINE WHERE ACCURATELY LOCATED, LONG DASH WHERE APPROXIMATELY LOCATED, SHORT DASH WHERE INFERRED, DOTTED WHERE CONCEALED; QUERY (?) INDICATES ADDITIONAL UNCERTAINTY. EVIDENCE OF HISTORIC OFFSET INDICATED BY YEAR OF EARTHQUAKE-ASSOCIATED EVENT OR C FOR DISPLACEMENT CAUSED BY CREEP OR POSSIBLE CREEP

EARTHQUAKE FAULT ZONE BOUNDARIES; DELINEATED AS STRAIGHT-LINE SEGMENTS THAT CONNECT ENCIRCLED TURNING POINTS SO AS TO DEFINE EARTHQUAKE FAULT ZONE SEGMENTS

N

0 FEET 2000
0 METERS 1000

BASE MAP SOURCE: CDMG, 1982

ENGEO Expect Excellence

EARTHQUAKE FAULT ZONE MAP

PESCADERO FIRE STATION

PESCADERO, CALIFORNIA

PROJECT NO.: 11780.000.001		FIGURE NO. 4
SCALE: AS SHOWN		
DRAWN BY: DLB	CHECKED BY: RHB	

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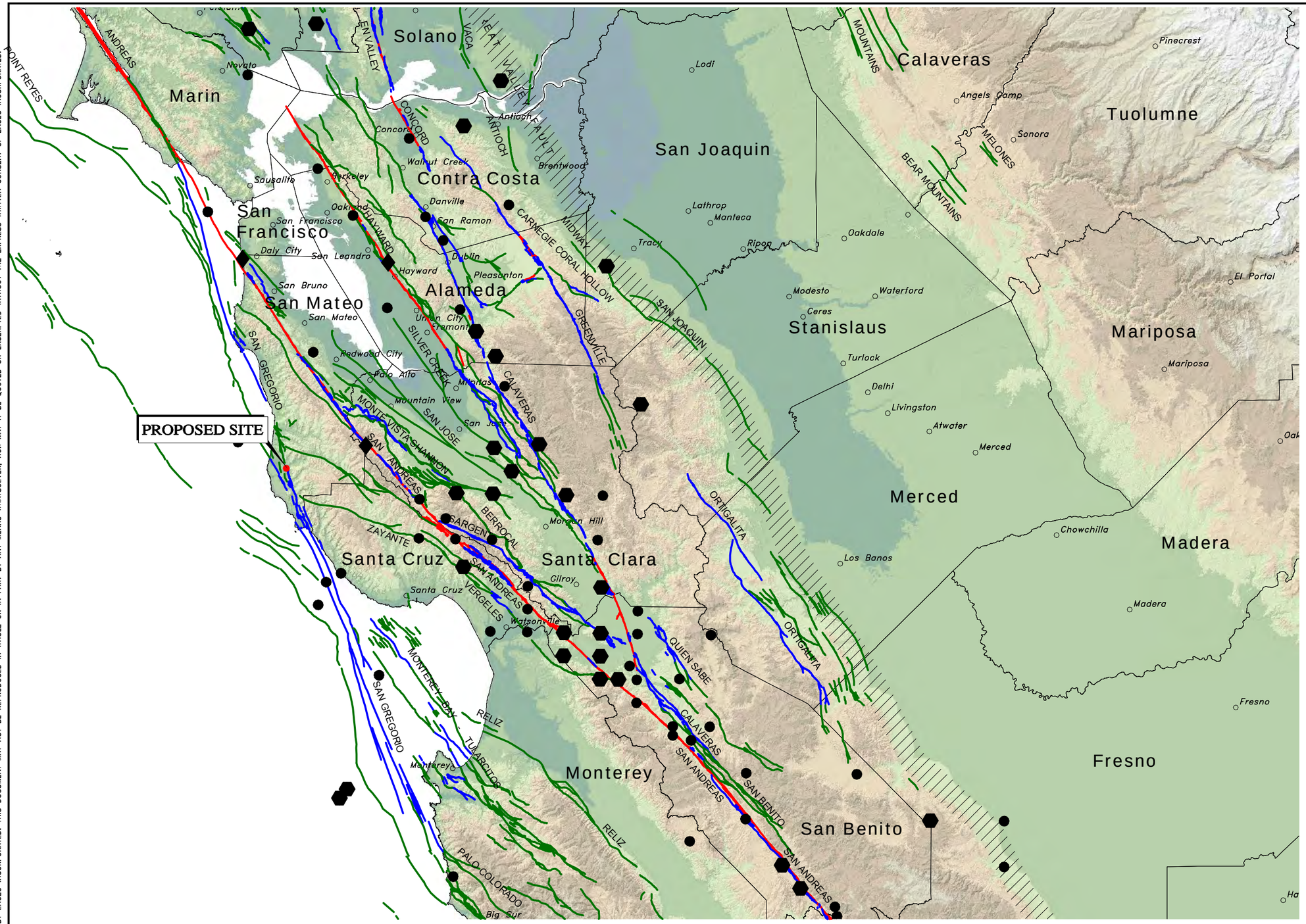
ORIGINAL FIGURE PRINTED IN COLOR



BASE MAP SOURCE:
COLOR HILLSHADE IMAGE BASED ON THE NATIONAL ELEVATION DATASET (NED) AT 30 METER RESOLUTION
U.S.G.S. QUATERNARY FAULT DATABASE, NOVEMBER, 2010
U.S.G.S. HISTORIC EARTHQUAKE DATABASE (1800–2000)

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REGIONAL FAULTING AND SEISMICITY

PESCADERO FIRE STATION
PESCADERO, CALIFORNIA

PROJECT NO.: 11780.000.001		FIGURE NO 5
SCALE: AS SHOWN		
DRAWN BY: DLB	CHECKED BY: RHB	

ORIGINAL FIGURE PRINTED IN COLOR

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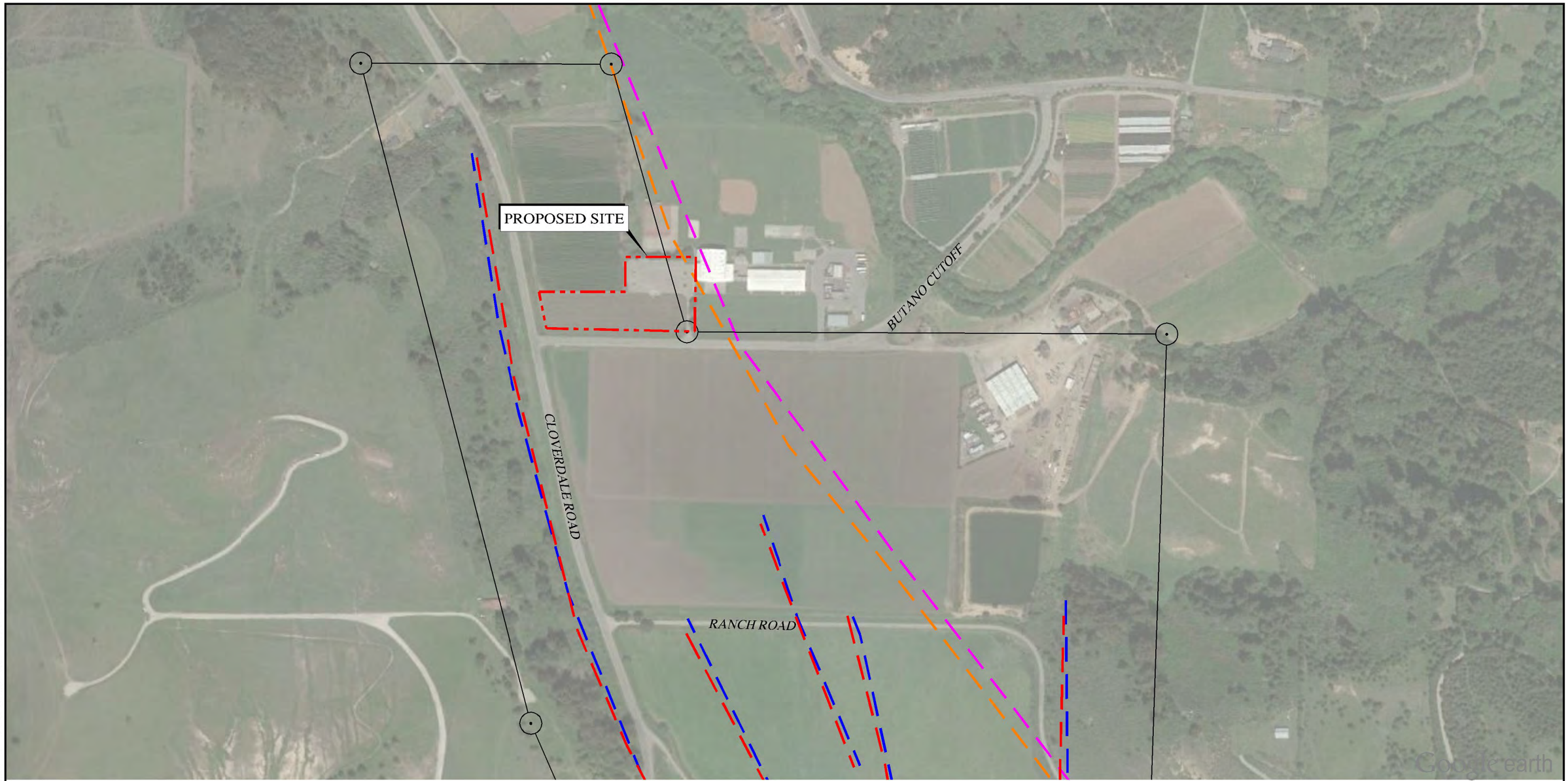

EXPLANATION

ALL LOCATIONS ARE APPROXIMATE

- U.S.G.S. QFFD
- FAULT (BRABB, GRAYMER, & JONES, 2000)
- FAULT (STATE OF CALIFORNIA SPECIAL STUDIES ZONES, 1982)
- FAULT (BRABB, GRAYMER, & JONES, 1998)
- EARTHQUAKE FAULT ZONE LIMIT

N

0 FEET 400

0 METERS 200

BASE MAP SOURCE: GOOGLE EARTH MAPPING SERVICE

ENGEO Expect Excellence

FAULT COMPILATION MAP

PESCADERO FIRE STATION

PESCADERO, CALIFORNIA

PROJECT NO.: 11780.000.001		FIGURE NO. 6
SCALE: AS SHOWN		
DRAWN BY: DLB	CHECKED BY: RHB	

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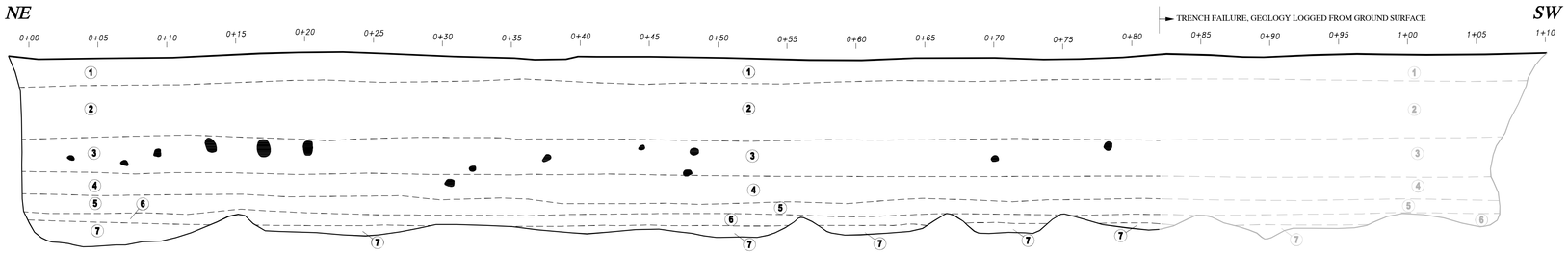
ORIGINAL FIGURE PRINTED IN COLOR

1-T1

TREND 260°

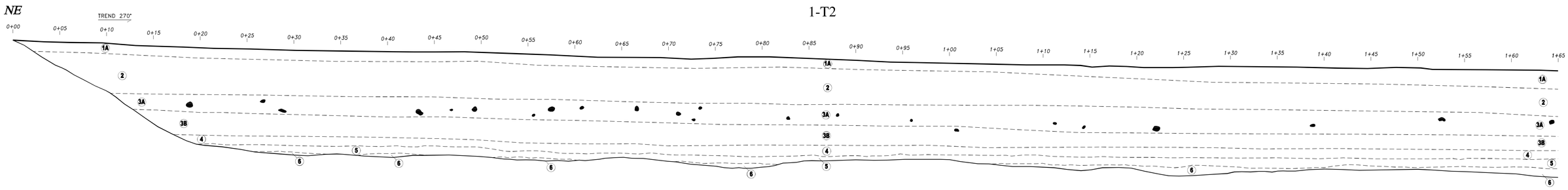


TRENCH 1-T1 EXPLANATION

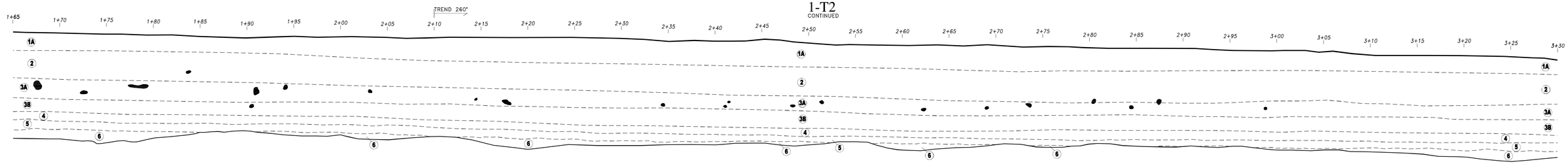
1. Artificial Fill. Black and light brown silty lean CLAY. Covered by approximately 2 inches of asphaltic concrete over 4 inches of light yellowish brown aggregate base.
2. Holocene Alluvium. Black silty lean CLAY, porous, abundant rootlets and worm burrows. 'A' Horizon.
3. Holocene Alluvium. Mottled brown and light brown silty lean CLAY, contains worm burrows and root traces. Burrows and root trace surfaces covered with black clay coating. 'Bt' Horizon.
4. Holocene Alluvium. Light yellowish brown silty lean CLAY, contains some worm burrows and root traces. Contains more silt than Unit 3. Black clay coating on burrow and root trace surfaces. 'BC' Horizon.
5. Holocene Alluvium. Dark brown and gray lean CLAY, abundant root traces and worm burrows, clay coating on root trace and worm burrow surfaces. Moderate blocky structure. 'Ab1/Btb1' Horizon.
6. Holocene Alluvium. Dark brown and black lean CLAY. Moderately well developed blocky structure, abundant worm burrows and root traces with clay coating on surfaces. 'Ab2' Horizon.
7. Holocene Alluvium. Brown silty lean CLAY, moderate blocky structure, clay films on blocky surfaces. 'Btb2/Bctb2' Horizon.

KROTOVINA

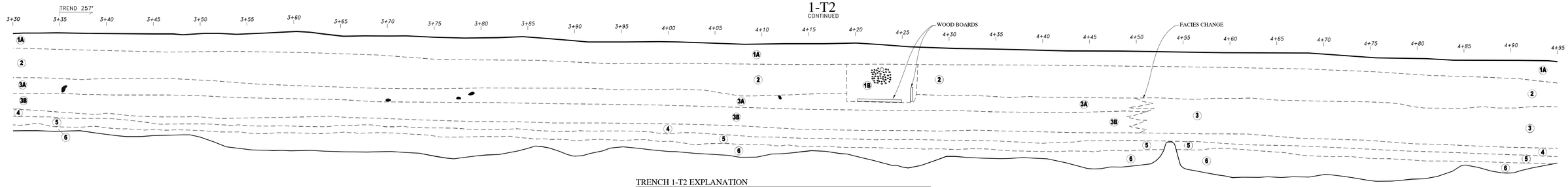
1-T2



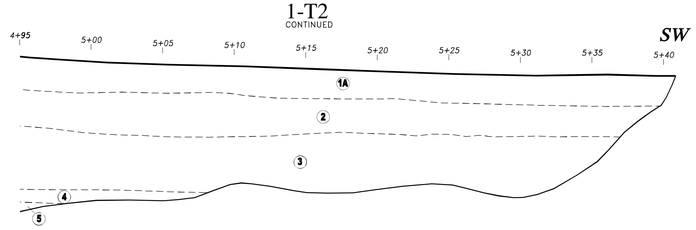
1-T2
CONTINUED



1-T2
CONTINUED



1-T2
CONTINUED



TRENCH 1-T2 EXPLANATION

1A. Artificial Fill/Disturbed native soil from tilling. Black silty lean CLAY with orange mottling at base of unit. Contains abundant rootlets and worm burrows and occasional trash items (rusted metal bolts, porcelain).

1B. Artificial Fill. Black silty lean CLAY with trash items (rusted metal, glass, some wood). Leach line and remnants of wooden septic box. Leach line consists of approximately 5 inch diameter clay pipe segments with gaps between segments, pipe surrounded with 1 inch diameter gravels.

2. Holocene Alluvium. Black silty lean CLAY, porous, abundant rootlets and worm burrows.'A' Horizon.

3. Holocene Alluvium. Dark grey with orange mottling lean to fat CLAY, contains worm burrows and root traces. More abundant burrows and root traces visible in upper portion of unit. Burrows and root trace surfaces covered with black clay coating. Facies change at roughly Station 450 to Units 3A and 3B. Lower portion of unit much more clayey than Unit 3B. 'Bt/BC' Horizon. Analagous to Units 3 & 4 in trench 1-T1.

3A. Holocene Alluvium. Brown and light brown silty lean CLAY, contains worm burrows and root traces. contains worm burrows and root traces. Burrows and root trace surfaces covered with black clay coating. Facies change at roughly Station 450 to Unit 3. 'Bt' Horizon. Analagous to Unit 3 in trench 1-T1.

3B. Holocene Alluvium, Light yellowish brown silty lean CLAY, contains some worm burrows and root traces. Burrows and root trace surfaces covered with black clay coating. Contains more silt than Unit 3A. Facies change at roughly Station 450 to Unit 3. 'BC' Horizon. Analagous to Unit 4 in trench 1-T1.

4. Holocene Alluvium. Dark brown and gray lean CLAY, abundant root traces and worm burrows, clay coating on root trace and worm burrow surfaces. Moderate blocky structure. 'Ab1/Btb1' Horizon.

5. Holocene Alluvium. Dark brown and black lean CLAY. Moderately well developed blocky structure, abundant worm burrows and root traces with clay coating on surfaces. 'Ab2' Horizon.

6. Holocene Alluvium. Brown silty lean CLAY, moderate blocky structure, clay films on blocky surfaces. 'Btb2/Bctb2' Horizon.

KROTOVINA

ENGEO Expect Excellence	TRENCH LOGS PESCADERO FIRE STATION PESCADERO, CALIFORNIA	PROJECT NO.: 11780.000.001 SCALE: 1"=5' DRAWN BY: DLB CHECKED BY: RHB	FIGURE NO. 7

ORIGINAL FIGURE PRINTED IN COLOR

APPENDIX A

Soil Tectonics Report

APPENDIX A

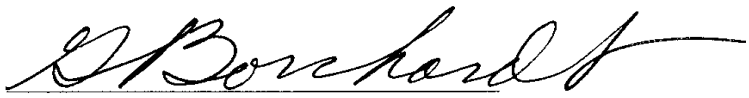
APPENDIX A

PEDOCHRONOLOGICAL REPORT FOR PESCADERO FIRE STATION, PESCADERO, CALIFORNIA

Prepared for ENGEO, Inc., San Jose, California, Project No. 11780.000.001

July 12, 2016

Soil Tectonics
P.O. Box 5335
Berkeley, CA 94705



Glenn Borchardt

Principal Soil Scientist
Certified Professional Soil Scientist No. 24836

PEDOCHRONOLOGICAL REPORT FOR PESCADERO FIRE STATION, PESCADERO, CALIFORNIA

Prepared for ENGEO, Inc., San Jose, California, Project No. 11780.000.001

July 12, 2016

Glenn Borchardt

INTRODUCTION

An assessment of seismic and landslide risk due to ground movement can be aided greatly by the techniques of pedochronology (Borchardt, 1992, 1998), soil dating. This is because the youngest geological unit overlying fault traces is generally a soil horizon. The age and relative activity of ground movement often can be estimated by evaluating the age and relative disturbance of overlying soil units, as well as buried soils called paleosols. Terms, prefixes, and suffixes are defined in the Soils Glossary at the end of this report.

Soil horizons exhibit a wide range of physical, chemical, and mineralogical properties that evolve at varying rates. Soil scientists use various terms to describe these properties. A black, highly organic "A" horizon, for example, may form within a few centuries, while a dark brown, clayey "Bt" horizon may take up to 40,000 years to form. Certain soil properties are invariably absent in young soils. For instance, soils developed in granitic alluvium of the San Joaquin Valley do not have Munsell hues redder than 10YR until they are at least 100,000 years old (Birkeland, 1999; Harden, 1982). Still other properties, such as the movement and deposition of clay-size particles and the precipitation of calcium carbonate at extraordinary depths, indicate soil formation during a climate much wetter than at present. In the absence of a radiometric age date for the material from which a particular soil formed, an estimate of its age must take into account all the known properties of the soil and the landscape and climate in which it evolved.

METHOD

The first step in studying a soil is the compilation of the data necessary for describing it (Birkeland, 1999; Borchardt, 2010). At minimum, this requires a Munsell color chart, hand lens, acid bottle, and instruments for 1:1 soil:water pH and electrical conductivity (EC) measurements. The second step may involve collecting samples of each horizon of the soil profile column for laboratory analysis of particle size. This is done to check the textural classifications made in the field and to evaluate the genetic relationships between horizons and between different soils in the

landscape. When warranted, the clay mineralogy and chemistry of the soil also is analyzed to provide additional information on the changes undergone by the initial material from which the soil weathered. The last step is the comparison of this accumulated soil data with that for soils having developed under similar conditions, preferably in the same region. Such information is scattered in soil survey reports (e.g., Welch, 1981), soil science journals, and consulting reports. In a particular locality, there is seldom enough comparative data available for this purpose. That is why, at the very least, the study of one soil profile always makes the evaluation of the next that much easier.

RESULTS OF THIS EVALUATION

Soil Profile No. 1 was studied to assess the age of the soil in Trench 1-T1 excavated 192 m east of the mapped trace of the San Gregorio fault at Pescadero High School, Pescadero, California (Table 1). I did some previous pedochronology along the San Gregorio fault on the Sangamon terrace (122 ka) at Pillar Point near Half Moon Bay (Borchardt, 2001) and at Moss Beach (Borchardt, 2007).

Soil Profile No. 1

This profile was developed in clay to clayey very fine sand overbank deposits 192 m east of the mapped trace of the San Gregorio fault. It is essentially a three-part soil, with a moderately developed modern soil (Figures 1 to 3) underlain by two weakly developed paleosols (Figures 4 and 5). This sequence has been observed elsewhere in the Bay Area where sedimentation rates also are relatively high due to rapid sea level rise since 11 ka (WLA, 2003; Borchardt, 2008; Baldwin and others, 2009; Borchardt, 2012; 2016).

Late Holocene Soil

Buried beneath 65-cm of fill, the modern soil consists of a tri-part cumulic A horizon that is a 133-cm thick very dark brown to very dark grayish brown silty clay with medium moderate angular blocky structure and many fine to medium continuous random tubular pores (Table 1; Figures 1 and 2). These three A horizons overly a 76-cm thick dark brown silty clay Bt horizon with medium moderate to strong angular blocky to prismatic structure with many fine to medium continuous vertical to random tubular pores (Figure 3). It has many thin to medium thick black clay films lining pores. This overlies a 39-cm thick brown silty clay loam to clayey very fine sand 2BC horizon with medium moderate subangular blocky structure with a few fine continuous random tubular pores.

Mid-Holocene Paleosol b1

The second part of this profile is an extremely weak paleosol consisting of a 14-cm thick grayish brown silty clay 3Ab1 horizon with a few fine faint yellowish brown mottles, medium strong subangular blocky structure, a few fine continuous random tubular pores, and a few thin clay films lining pores (Table 1; Figure 4). This overlies an 18-cm thick brown silty clay 3Btb1 horizon with few to many fine faint yellowish brown mottles, medium moderate subangular to

angular blocky structure, and many thin clay films lining a few fine continuous random tubular pores.

Mid-Holocene Paleosol b2

The third part of this profile is a weak paleosol consisting of a 20-cm thick very dark brown clay 4Ab2 horizon with medium to coarse strong subangular blocky structure and a few thin to medium thick clay films lining many fine to coarse continuous random tubular pores (Table 1; Figure 4). This overlies a 13-cm thick very dark grayish brown clay 4Btb2 horizon with common medium distinct yellow mottles, medium to coarse strong subangular blocky structure, and a few thin clay films lining many fine to coarse continuous random tubular pores (Figure 5). This overlies a >22-cm thick brown clay 4BCtb2 horizon with common medium distinct yellow mottles, medium to coarse strong subangular to angular blocky structure, and common thin to medium thick clay films lining many fine to coarse continuous random tubular pores.

Soil pH and Electrical Conductivity

The properties of young sediments of consistent texture generally are not expected to show much change with depth. That is why changes in chemical properties, such as soil pH and electrical conductivity (EC), supply information on the degree soil weathering. Such "depth functions" prove that pedogenesis indeed did occur, and help to support the judgements involved in preparing soil descriptions (Borchardt, 2016). Unweathered rocks and sediments usually have no changes in pH and EC with depth.

The pH in Soil Profile No. 1, for instance, is 5.75 in the surface of the modern soil, decreases in the A2 horizon, and then increases to 5.9 in the 2BC horizon (Figure 6). The slight increase in the A1 probably was produced by Ca-laden vegetative material deposited on the soil. The subsequent increase with depth probably reflects the young age of this soil. As mentioned, the pH of unweathered sediments generally is about 7.0.

The EC in Soil Profile No. 1 also increases with depth in the modern soil, reaching a maximum in the Bt horizon (Figure 7). This is 171 cm from the buried surface of the modern soil—a wetting front about 71 cm deeper than what would be expected under the current climate. I attribute this to the cumulic nature of the profile: Recent flooding appears to have contributed silts and clays to the surface, thickening the modern soil.

Soil Ages

Soil profiles estimated to be mid- to late-Holocene at Contra Costa Community College (CCCC) (WLA, 2003, Borchardt, 2008, Baldwin, 2009, Borchardt, 2012; 2016) are remarkably similar to the profile at our present site. In that study, we obtained bulk samples of the two Ab horizons to get the MRT (mean residence time) for C-14 in each (Borchardt, 2016). The Ab1 and Ab2 horizons had calibrated MRT ages of 3.375 ka and 4.040 ka. The difference between the two was 0.865 ky, which was slightly less than the 1 ky estimated in the field. Because MRT

ages represent carbon from the beginning of soil development (t_o) to the end of soil development (t_b), I used the difference (0.865 ky) to estimate that the beginning of soil development in the Ab2 began at 4.47 ka and ended 865 years later at 3.61 ka. Similar calculations were performed for the Ab1 horizon. The 286-cm thick profile was deposited since 4.47 ka.

The present site affords almost the same situation. In this instance, we dated the top 1 cm of the 4Ab2 horizon at 5.3 ka (Table 2). The paleosols had Bt and solum horizon thicknesses of 8 and 32 cm for the b1 and 13 and 65 cm for the b2. When compared to the 76-cm Bt and 209-cm solum thicknesses of the modern soil, this yielded average t_d values of 0.6 ky for the b1 and 1.0 ky for the b2 (Table 1). The upshot is that pedogenesis in paleosol b2 adds 1.0 ky to the C14 age, yielding a 6.3-ka age for the base of the profile.

The sedimentation rate for the profile was 0.54 mm/yr for the last 6.3 ka (3.39 m in 6.3 ky). This was similar to the soil profile studied at CCCC, which had a sedimentation rate of 0.64 mm/yr for the last 4.5 ka (2.86 m in 4.5 ky). That is why the paleosols were so weak. They had less than a thousand years of exposure to the elements before the next series of floods buried them. Coincidentally, the modern soil at CCCC had a sedimentation rate of 0.53 mm/yr, which also was similar to the rate found for the bay marsh along the Hayward fault at Point Pinole (0.44 mm/yr) since 1.3 ka (Borchardt, 1988). These rates are commensurate with the worldwide rise in sea level that has occurred in geologically stable areas (Bloom, 1970). This suggests that rising sea level controls the base level and rate of overbank deposition in the Pescadero Creek drainage.

Seismic Hazard

The relatively high sedimentation rate in the area makes it impossible to safely excavate deep enough to uncover additional, still older paleosols. Nevertheless, the 6.3-ka age of the soil profile we examined should be sufficient for detecting any hazardous traces of the San Gregorio fault. A study of the fault at Moss Beach about 33 km to the north estimated that the Holocene slip rate was about 4 mm/yr (Simpson, Lettis, and Randolph, 1998). That site had a 1.5- to 6-m high east-facing scarp, with evidence for the most recent event having occurred 220 to 730 years ago (average 475 years ago). The penultimate event occurred between 620 and 1400 A.D. (average 1010 A.D.). These earthquakes are estimated to have been about M7 with offsets between 3 and 5 m. With the implied recurrence interval of about 500 years, the 6.3-ka soil at our site would have experienced about a dozen events had it been exposed to the San Gregorio fault. That level of activity would be obvious in seismic excavations despite the soil age being younger than desired.

CONCLUSIONS

1. Both the modern soil and the underlying mid-Holocene paleosols can be used to evaluate surface fault rupture (SFR) at this site.
2. Offsets or warping of the paleosols should be considered potential for SFR.

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Table 1. Soil profile described on the alluvial plain about 192 m east of the mapped trace of the San Gregorio fault near intersection of Cloverdale Road and Butano Cutoff, west of Pescadero High School at Pescadero, California. Abbreviations and definitions are given in Schoeneberger and others (2012) and Soil Survey Staff (1993, 1999, 2010).

Description of soil developed in overbank deposits by Glenn Borchardt, who measured and sampled the soil on June 22, 2016 at latitude N37.24768^{o} and longitude W122.36591^{o} at station 48' in the south wall of Trench 1-T1 at an elevation of 54'(54' Google Earth and 51' GPS). Mediterranean climate with mean annual precipitation of 26.62"/yr at Half Moon Bay (1948-2010). Slope 0% along trench (natural slope is 2.6% for a distance of 192 m west). Moderate drainage. Water at 396 cm. The parent material is silty clay overbank deposits. Soil pH is medium acid throughout. Soil in the area is mapped as: *Soquel loam, Cumulic Haploxerolls, 0-1% slope, with a solum thickness of 94 cm overlying a paleosol.*

Horizon	Depth, cm	Description
Fill	0-65	10-cm asphalt over 55 cm fill
A1	65-117	Very dark brown (10YR2/2m; 4/2d) silty clay; medium moderate angular blocky structure; sticky and plastic when wet, very friable when moist, and extremely hard when dry; many fine to medium continuous random tubular pores; few thin very dark brown clay films lining pores; diffuse smooth boundary; pH 5.75; conductivity 267 uS; Sample No. 16B031.
A2	117-160	Very dark brown (10YR2/2m; 5/2d) silty clay; medium moderate angular to subangular blocky structure; sticky and plastic when wet, very friable when moist, and very hard when dry; many fine to medium continuous random tubular pores; diffuse smooth boundary; pH 5.63; conductivity 277 uS; Sample No. 16B032.
A3	160-198	Very dark grayish brown (10YR3/2m; 5/2d) silty clay; medium moderate angular to subangular blocky structure; sticky and plastic when wet, very friable when moist, and very hard when dry; many fine to medium continuous random tubular pores; gradual wavy boundary; pH 5.70; conductivity 362 uS; Sample No. 16B033.
Bt	198-274	Dark brown (10YR3/3m; 6/4d) silty clay; medium moderate to strong angular blocky to prismatic structure; sticky and plastic when wet, very friable when moist, and very hard when dry; many fine to medium continuous vertical to random tubular pores; diffuse smooth boundary; many thin to medium thick black clay films lining pores; pH 5.80; conductivity 448 uS; Sample No. 16B034.

2BC 274-313 Brown (10YR5/3m; 7/4d) silty clay loam to clayey very fine sand; medium moderate subangular blocky structure; slightly sticky and slightly plastic when wet, very friable when moist, and very hard when dry; few fine continuous random tubular pores; clear wavy boundary; pH 5.92; conductivity 298 uS; Sample No. 16B035.

*ESTIMATED AGE:	t_o	=	4.7	ka
	t_b	=	0	ka
	t_d	=	4.7	ky

3Ab1 313-327 Grayish brown (10YR5/2m; 6/4d) silty clay with few fine faint yellowish brown (10YR5/6md) mottles; medium strong subangular blocky structure; slightly sticky and slightly plastic when wet, very friable when moist, and very hard when dry; few fine continuous random tubular pores; few thin clay films lining pores; clear wavy boundary; pH 5.89; conductivity 320 uS; Sample No. 16B036.

3Btb1 327-345 Brown (10YR4/3m; 7/4d) silty clay with few to many fine faint yellowish brown (10YR5/6md) mottles; medium moderate subangular to angular blocky structure; sticky and plastic when wet, very friable when moist, and very hard when dry; few fine continuous random tubular pores; many thin clay films lining pores; clear smooth boundary; pH 5.87; conductivity 309 uS; Sample No. 16B037.

*ESTIMATED AGE:	t_o	=	5.3	ka
	t_b	=	4.7	ka
	t_d	=	0.6	ky

4Ab2 345-365 Very dark brown (10YR2/2m; 5/2d) clay with very few fine faint yellow (10YR7/6md) mottles; medium to coarse strong subangular blocky structure; sticky and plastic when wet, very friable when moist, and very hard when dry; many fine to coarse continuous random tubular pores; few thin to medium thick clay films lining pores; clear smooth boundary; pH 5.91; conductivity 267 uS; Sample No. 16B038. [Upper 1-cm in sample 16B041 had a C-14 age of 5,295 calendar years.]

4Btb2 365-378 Very dark grayish brown (10YR3/2m; 5/2d) clay with common medium distinct yellow (10YR7/6md) mottles; medium to coarse strong subangular blocky structure; sticky and plastic when wet, very friable when moist, and extremely hard when dry; many fine to coarse continuous random tubular pores; few thin clay films lining pores; clear smooth boundary; pH 5.92; conductivity 235 uS; Sample No. 16B039.

4BCtb2 378-400+ Brown (10YR4/3m; 6/4d) clay with common medium distinct yellow (10YR7/6md) mottles; medium to coarse strong subangular to angular blocky structure; sticky and plastic when wet, very friable when moist, and very hard when dry; many fine to coarse continuous random tubular pores; common thin to medium thick clay films lining pores; pH 5.93; conductivity 330 uS; Sample No. 16B040.

*ESTIMATED AGE:	t_o	=	6.3	ka
	t_b	=	5.3	ka
	t_d	=	1.0	ky

*Pedochronological estimates based on available information. All ages should be considered subject to ±50% variation unless otherwise indicated (Borchardt, 1992). Bold dates are absolute.

t_o = date when soil formation or aggradation began, ka

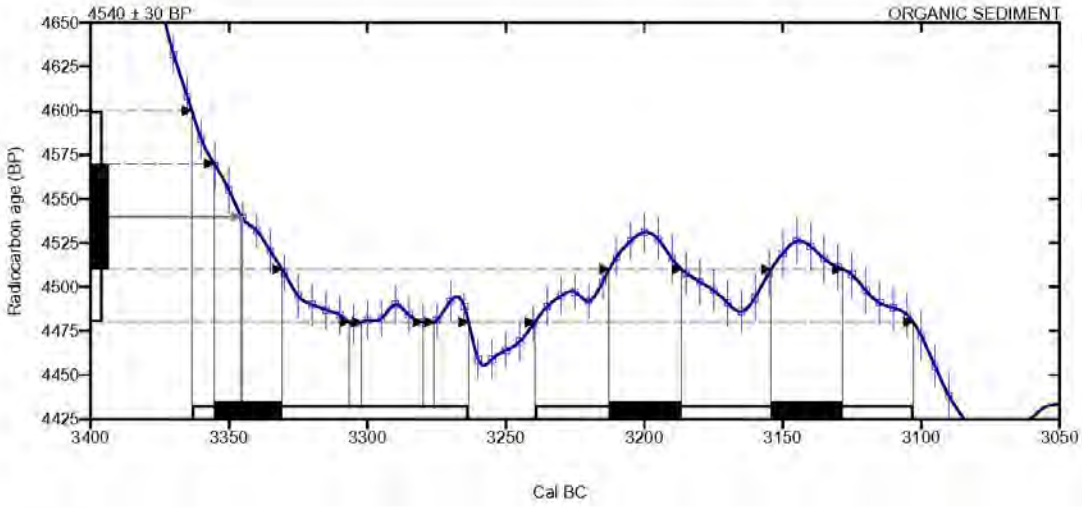
t_b = date when soil or strata was buried, ka

t_d = duration of soil development or aggradation, ky

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12 = -25.3 o/oo : lab. mult = 1)

Laboratory number	**Beta-440519 : 16B041**
Conventional radiocarbon age	**4540 ± 30 BP**
Calibrated Result (95% Probability)	**Cal BC 3365 to 3265 (Cal BP 5315 to 5215)** **Cal BC 3240 to 3105 (Cal BP 5190 to 5055)**
Intercept of radiocarbon age with calibration curve	Cal BC 3345 (Cal BP 5295)
Calibrated Result (68% Probability)	Cal BC 3355 to 3330 (Cal BP 5305 to 5280) Cal BC 3215 to 3185 (Cal BP 5165 to 5135) Cal BC 3155 to 3130 (Cal BP 5105 to 5080)



Database used
INTCAL13

References

Mathematics used for calibration scenario
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Beta Analytic Radiocarbon Dating Laboratory
4985 S.W. 74th Court, Miami, Florida 33155 • Tel: (305)667-5167 • Fax: (305)663-0964 • Email: beta@radiocarbon.com

1

Table 2. Analysis of the soil carbon in the upper 1-cm of the 4Ab2 horizon showing a calibrated age of 5,295 calendar years (5.295 ka).

Figure 1. Soil Profile No. 1 192 m east of the San Gregorio fault at Pescadero High School, Pescadero, California, showing the very dark brown A1 horizon. View S.

Figure 2. Base of the 133-cm thick A horizon showing krotovinas and/or remnants of the Bt horizon left behind by soil tongue development. View S.

Figure 3. Bt and 2BC horizons. Note the black krotovina in the middle of the Bt and the vertical root traces. View S.

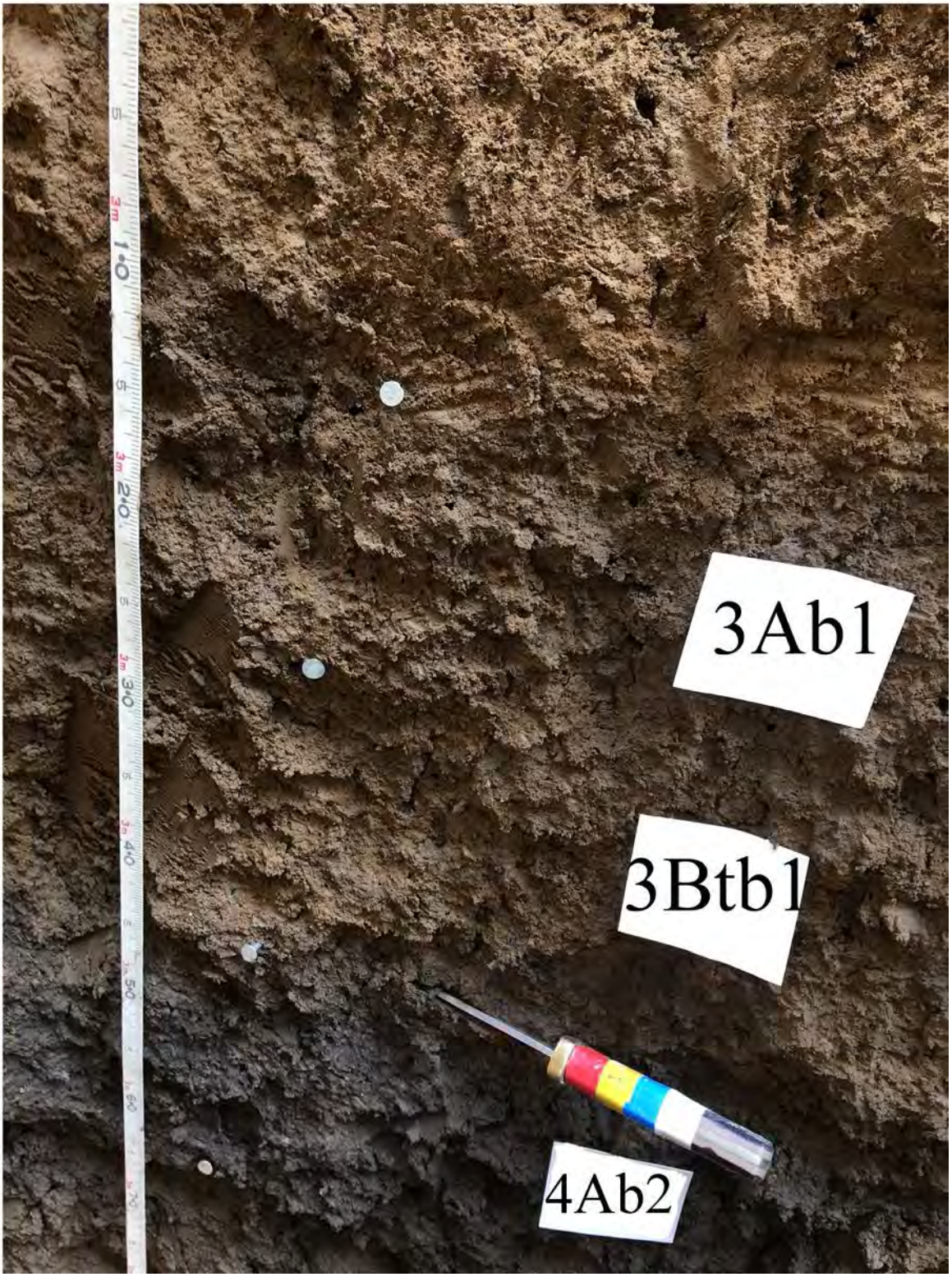

Figure 4. The short-duration b1 and b2 paleosols. The top 1cm of the Ab2 horizon had a C-14 age of 5.3 ka (Table 2). The b2 paleosol was estimated to have a t_d of 1 ka, yielding a t_o age for the profile of 6.3 ka.

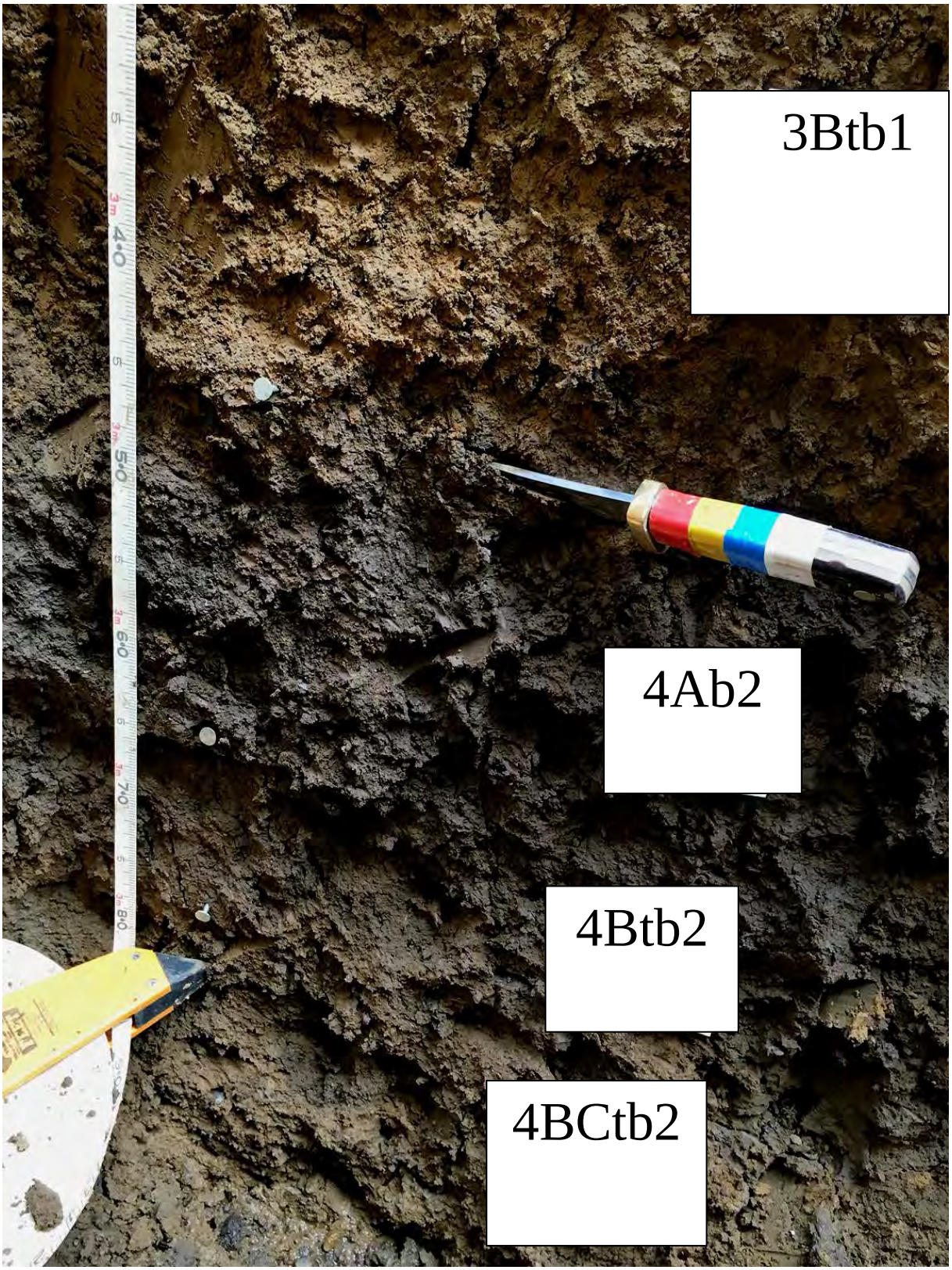

Figure 5. Paleosol b2 showing the location of the C-14 sample taken from the top 1 cm of the 4Ab2 horizon (at the tip of the knife). View S.

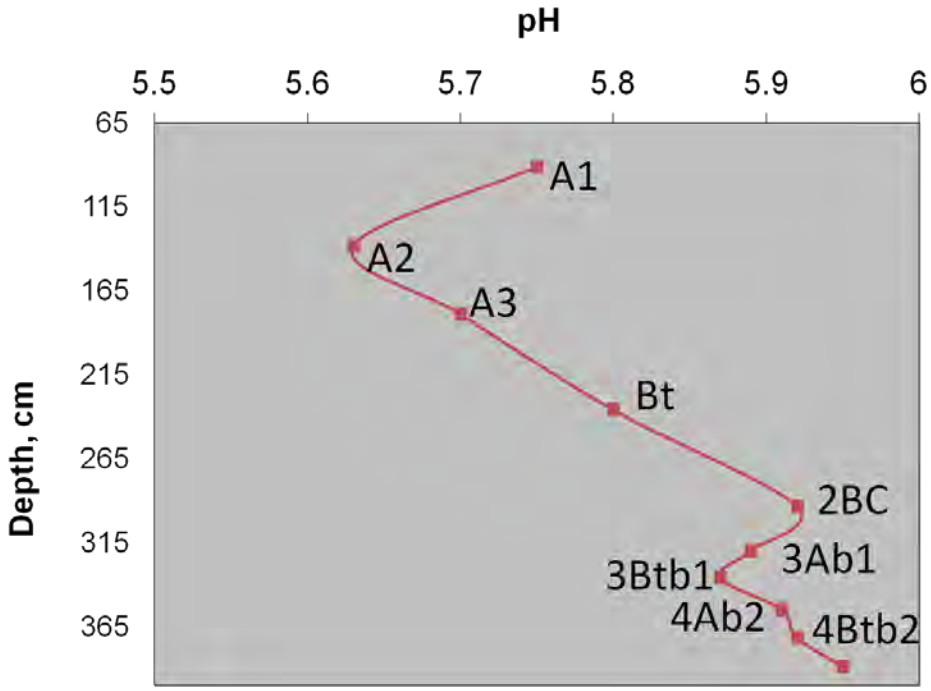

Figure 6. Depth function for pH in Soil Profile No. 1 192 m east of the San Gregorio fault at Pescadero High School, Pescadero, California.

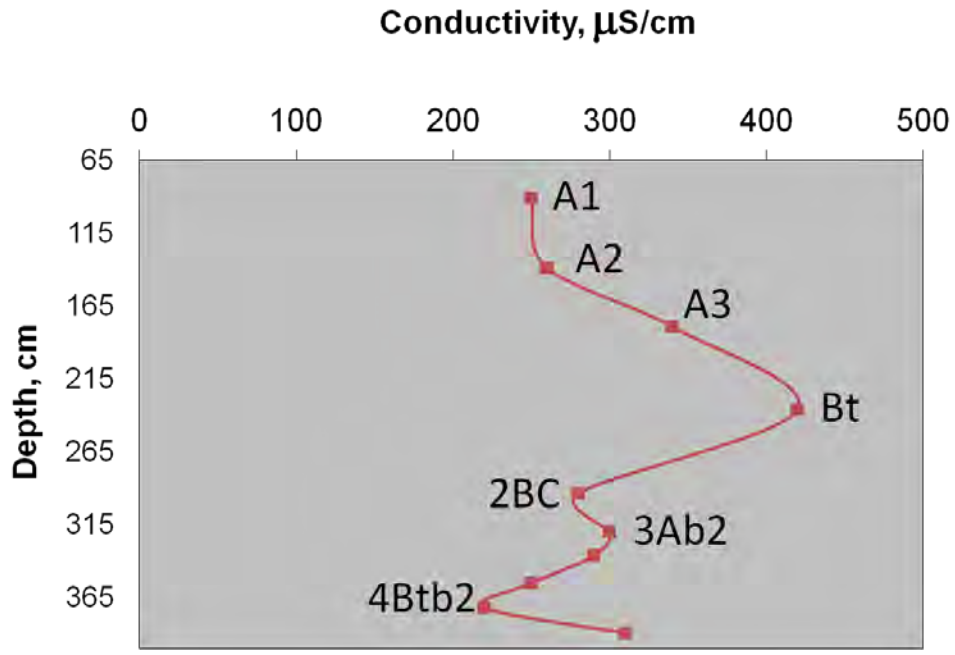

Figure 7. Depth function for electrical conductivity in Soil Profile No. 1 192 m east of the San Gregorio fault at Pescadero High School, Pescadero, California. The maximum indicates an area of salt entrapment. These often exist at the base of fine-textured paleosols (Borchardt, 2016).

July 1, 2015

SOILS GLOSSARY

AGE. Elapsed time in calendar years. Because the cosmic production of C-14 has varied during the Quaternary, radiocarbon years (expressed as ky B.P.) must be corrected by using tree-ring and other data. Abbreviations used for corrected ages are: ka (kilo anno or years in thousands) or Ma (millions of years). Abbreviations used for intervals are: yr (years), ky (thousands of years). radiocarbon ages = yr B.P. Calibrated ages are calculated from process assumptions, relative ages fit in a sequence, and correlated ages refer to a matching unit. (See also yr B.P., HOLOCENE, PLEISTOCENE, QUATERNARY, PEDOCHRONOLOGY).

AGGRADATION. Deposition on the earth's surface in the direction of uniformity of grade.

ALKALI (SODIC) SOIL. A soil having so high a degree of alkalinity (pH 8.5 or higher) or so high a percentage of exchangeable sodium (15 % or more of the total exchangeable bases) that plant growth is restricted.

ALKALINE SOIL. Any soil that has a pH greater than 7.3. (See Reaction, Soil.)

ANGULAR ORPHANS. Angular fragments separated from weathered, well-rounded cobbles in colluvium derived from conglomerate.

ARGILLAN. (See Clay Film.)

ARGILLIC horizon. A horizon containing clay either translocated from above or formed in place through pedogenesis.

ALLUVIATION. The process of building up of sediments by a stream at places where stream velocity is decreased. The coarsest particles settle first and the finest particles settle last.

ANOXIC. (See also GLEYED SOIL). A soil having a low redox potential.

AQUICLUDE. A saturated body of sediment or rock that is incapable of transmitting significant quantities of water under ordinary hydraulic gradients.

AQUITARD. A body of rock or sediment that retards but does not prevent the flow of water to or from an adjacent aquifer. It does not readily yield water to wells or springs but may serve as a storage unit for groundwater.

ATTERBERG LIMITS. The moisture content at which a soil passes from a semi-solid to a plastic state (plastic limit, PL) and from a plastic to a liquid state (liquid limit, LL). The plasticity index (PI) is the numerical difference between the LL and the PL.

BEDROCK. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

BISEQUUM. Two soils in vertical sequence, each soil containing an eluvial horizon and its underlying B horizon.

BOUDIN, BOUDINAGE. From a French word for sausage, describes the way that layers of rock break up under extension. Imagine the hand, fingers together, flat on the table, encased in soft clay and being squeezed from above, as being like a layer of rock. As the spreading clay moves

the fingers (sausages) apart, the most mobile rock fractions are drawn or squeezed into the developing gaps.

BURIED SOIL. A developed soil that was once exposed but is now overlain by a more recently formed soil.

CALCAREOUS SOIL. A soil containing enough calcium carbonate (commonly with magnesium carbonate) to effervesce (fizz) visibly when treated with cold, dilute hydrochloric acid. A soil having measurable amounts of calcium carbonate or magnesium carbonate.

CARBONATE MORPHOLOGY STAGES. Descriptive classes of calcite precipitation indicating increasing pedogenesis over time:

Stage	Description	Percent Carbonate
I	Bk horizon with few filaments and coatings	<10
I+	Bk with common filaments and continuous clast coatings	<10
II	Bk with continuous clast coatings, white masses, few nodules	>10
II+	Bk as above, but matrix is completely whitened, common nodules	>15
>II	K horizon that is 90% white, many nodules	>20
III+	K that is completely plugged	>40
IV	K as above, but upper part cemented and has weak platy structure	>50
V	K same as above, but laminar layer is strong with incipient brecciation	>50
VI	K brecciation and recementation, as well as pisoliths, are common	>50

CATENA. A sequence of soils of about the same age, derived from similar parent material and forming under similar climatic conditions, but having different characteristics due to variation in relief and drainage. (See also TOPOSEQUENCE.)

CEC. Cation exchange capacity. The amount of negative charge balanced by positively charged ions (cations) that are exchangeable by other cations in solution (meq/100 g soil = cmol(+)/kg soil).

CLAY. As a soil separate, the mineral soil particles are less than 0.002 mm in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

CLAY FILM. A coating of oriented clay on the surface of a sand grain, pebble, soil aggregate, or ped. Clay films also line pores or root channels and bridge sand grains. Frequency classification is based on the percent of the ped faces and/or pores that contain films: very few--<5%; few--5-25%; common--25-50%; many--50-90%; and continuous--90-100%. Thickness classification is based on visibility of sand grains: thin--very fine sand grains standout; moderately thick--very fine sand grains impart microrelief to film; thick--fine sand grains enveloped by clay and films visible without magnification. Synonyms: clay skin, clay coat, argillan, illuviation cutan.

CLAY LAMELLAE. Thin, generally wavy bands that appear as multiple micro-Bt horizons at the base of the solum in sandy Holocene deposits. The lamellae generally are 1-3 cm in thickness and 5 to 30 cm apart. There may be two to six or more clay lamellae comprising the Bt horizon of such a soil.

COBBLE. Rounded or partially rounded fragments of rock ranging from 7.5 to 25 cm in diameter.

COLLUVIUM. Any loose mass of soil or rock fragments that moves downslope largely by the force of gravity. Usually it is thicker at the base of the slope.

COLLUVIUM-FILLED SWALE. The prefailure topography of the source area of a debris flow.

COMPARATIVE PEDOLOGY. The comparison of soils, particularly through examination of features known to evolve through time.

CONCRETIONS. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

CONDUCTIVITY. The ability of a soil solution to conduct electricity, generally expressed as the reciprocal of the electrical resistivity. Electrical conductance is the reciprocal of the resistance ($1/R = 1/ohm = ohm^{-1}$ = mho [reverse of ohm] = siemens = S), while electrical conductivity is the reciprocal of the electrical resistivity (EC = 1/r = 1/ohm-cm = mho/cm = S/cm or mmho/cm = dS/m). EC, expressed as uS/cm, is equivalent to the ppm of salt in solution when multiplied by 0.640. Pure rain water has an EC of 0, standard 0.01 N KCl is 1411.8 uS at 25C, and the growth of salt-sensitive crops is restricted in soils having saturation extracts with an EC greater than 2,000 uS/cm. Measurements in soils are usually performed on 1:1 suspensions containing one part by weight of soil and one part by weight of distilled water.

CONSISTENCE, SOIL. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are --

Loose.--Noncoherent when dry or moist; does not hold together in a mass.

Friable.--When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.--When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.--When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.--When wet, adheres to other material, and tends to stretch somewhat and pull apart, rather than to pull free from other material.

Hard.--When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.--When dry, breaks into powder or individual grains under very slight pressure.

Cemented.--Hard and brittle; little affected by moistening.

CTPOT. Easily remembered acronym for climate, topography, parent material, organisms, and time; the five factors of soil formation.

CUMULIC. A soil horizon that has undergone aggradation coincident with its active development.

CUTAN. (See Clay Film.)

DEBRIS FLOW. Incoherent or broken masses of rock, soil, and other debris that move downslope in a manner similar to a viscous fluid.

DEBRIS SLOPE. A constant slope with debris on it from the free face above.

DEGRADATION. A modification of the earth's surface by erosion.

DURIPAN. A subsurface soil horizon that is cemented by illuvial silica, generally deposited as opal or microcrystalline silica, to the degree that less than 50 percent of the volume of air-dry fragments will slake in water or HCl.

ELUVIATION. The removal of soluble material and solid particles, mostly clay and humus, from a soil horizon by percolating water.

EOLIAN. Deposits laid down by the wind, landforms eroded by the wind, or structures such as ripple marks made by the wind.

FAULT-LINE SCARP. A scarp that has been produced by differential erosion along an old fault line.

FAULTSLIDE. A landslide that shows physical evidence of its interaction with a fault.

FIRST-ORDER DRAINAGE. The most upstream, field-discernible concavity that conducts water and sediments to lower parts of a watershed.

FLOOD PLAIN. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

FOSSIL FISSURE. A buried rectilinear chamber associated with extension due to ground movement. The chamber must be oriented along the strike of the shear and must have vertical and horizontal dimensions greater than its width. It must show no evidence of faunal activity and its walls may have silt or clay coatings indicative of frequent temporary saturation with ground water. May be mistaken for an animal burrow. Also known as a paleofissure.

FRIABILITY. Term for the ease with which soil crumbles. A friable soil is one that crumbles easily.

GENESIS, SOIL. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum (A and B horizons) from the unconsolidated parent material.

GEOMORPHIC. Pertaining to the form of the surface features of the earth. Specifically, geomorphology is the analysis of landforms and their mode of origin.

GLEYED SOIL. A soil having one or more neutral gray horizons as a result of water logging and lack of oxygen. The term "gleyed" also designates gray horizons and horizons having yellow and gray mottles as a result of intermittent water logging.

GRAVEL. Rounded or angular fragments of rock 2 to 75 mm in diameter. Soil textures with >15% gravel have the prefix "gravelly" and those with >90% gravel have the suffix "gravel."

HIGHSTAND. The highest elevation reached by the ocean during an interglacial period.

HOLOCENE. The most recent epoch of geologic time, extending from 10 ka to the present.

HORIZON, SOIL. A layer of soil, approximately parallel to the surface, that has distinct characteristics produced by soil-forming processes. These are the major soil horizons:

O horizon.--The layer of organic matter on the surface of a mineral soil. This layer consists of decaying plant residues.

A horizon.--The mineral horizon at the surface or just below an O horizon. This horizon is the one in which living organisms are most active and therefore is marked by the accumulation of humus. The horizon may have lost one or more of soluble salts, clay, and sesquioxides (iron and aluminum oxides).

E horizon -- This eluvial horizon is light in color, lying beneath the A horizon and above the B horizon. It is made up mostly of sand and silt, having lost most of its clay and iron oxides through reduction, chelation, and translocation.

B horizon.--The mineral horizon below an A horizon. The B horizon is in part a layer of change from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics caused (1) by accumulation of clay, sesquioxides, humus, or some combination of these; (2) by prismatic or blocky structure; (3) by redder or stronger colors than the A horizon; or (4) by some combination of these.

C horizon.--The relatively unweathered material immediately beneath the solum. Included are sediment, saprolite, organic matter, and bedrock excavatable with a spade. In most soils this material is presumed to be like that from which the overlying horizons were formed. If the material is known to be different from that in the solum, a number precedes the letter C.

R horizon.--Consolidated rock not excavatable with a spade. It may contain a few cracks filled with roots or clay or oxides. The rock usually underlies a C horizon but may be immediately beneath an A or B horizon.

Major horizons may be further distinguished by applying prefix Arabic numbers to designate differences in parent materials as they are encountered (e.g., 2B, 2BC, 3C) or by applying suffix numerals to designate minor changes (e.g., B1, B2).

The following is from the Natural Resources Conservation Service, except for the proposed addition of mn:

“Suffix Symbols

Lowercase letters are used as suffixes to designate specific kinds of master horizons and layers. The term “accumulation” is used in many of the definitions of such horizons to indicate that these horizons must contain more of the material in question than is presumed to have been present in the parent material. The suffix symbols and their meanings are as follows:

a Highly decomposed organic material

This symbol is used with O to indicate the most highly decomposed organic materials, which have a fiber content of less than 17 percent (by volume) after rubbing.

b Buried genetic horizon

This symbol is used in mineral soils to indicate identifiable buried horizons with major genetic features that were developed before burial. Genetic horizons may or may not have formed in the overlying material, which may be either like or unlike the assumed parent material of the buried soil. This symbol is not used in organic soils, nor is it used to separate an organic layer from a mineral layer.

c *Concretions or nodules*

This symbol indicates a significant accumulation of concretions or nodules. Cementation is required. The cementing agent commonly is iron, aluminum, manganese, or titanium. It cannot be silica, dolomite, calcite, or more soluble salts.

co *Coprogenous earth*

This symbol, used only with L, indicates a limnic layer of coprogenous earth (or sedimentary peat).

d *Physical root restriction*

This symbol indicates noncemented, root-restricting layers in natural or human-made sediments or materials. Examples are dense basal till, plowpans, and other mechanically compacted zones.

di *Diatomaceous earth*

This symbol, used only with L, indicates a limnic layer of diatomaceous earth.

e *Organic material of intermediate decomposition*

This symbol is used with O to indicate organic materials of intermediate decomposition. The fiber content of these materials is 17 to 40 percent (by volume) after rubbing.

f *Frozen soil or water*

This symbol indicates that a horizon or layer contains permanent ice. The symbol is not used for seasonally frozen layers or for dry permafrost.

ff *Dry permafrost*

This symbol indicates a horizon or layer that is continually colder than 0^{o} C and does not contain enough ice to be cemented by ice. This suffix is not used for horizons or layers that have a temperature warmer than 0^{o} C at some time of the year.

g *Strong gleying*

This symbol indicates either that iron has been reduced and removed during soil formation or that saturation with stagnant water has preserved it in a reduced state. Most of the affected layers have chroma of 2 or less, and many have redox concentrations. The low chroma can represent either the color of reduced iron or the color of uncoated sand and silt particles from which iron has been removed. The symbol g is not used for materials of low chroma that have no history of wetness, such as some slates or E horizons. If g is used with B, pedogenic change in addition to gleying is implied. If no other pedogenic change besides gleying has taken place, the horizon is designated Cg.

h *Illuvial accumulation of organic matter*

This symbol is used with B to indicate the accumulation of illuvial, amorphous, dispersible complexes of organic matter and sesquioxides if the sesquioxide component is dominated by aluminum but is present only in very small quantities. The organo-sesquioxide material coats sand and silt particles. In some horizons these coatings have coalesced, filled pores, and cemented the horizon. The symbol h is also used in combination with s as "Bhs" if the amount of the sesquioxide component is significant but the color value and chroma, moist, of the horizon are 3 or less.

i *Slightly decomposed organic material*

This symbol is used with O to indicate the least decomposed of the organic materials. The fiber content of these materials is 40 percent or more (by volume) after rubbing.

j *Accumulation of jarosite*

Jarosite is a potassium or iron sulfate mineral that is commonly an alteration product of pyrite that has been exposed to an oxidizing environment. Jarosite has hue of 2.5Y or yellower and normally has chroma of 6 or more, although chromas as low as 3 or 4 have been reported. [Note: No longer used to indicate "juvenile."]

jj *Evidence of cryoturbation*

Evidence of cryoturbation includes irregular and broken horizon boundaries, sorted rock fragments, and organic soil materials existing as bodies and broken layers within and/or between mineral soil layers. The organic bodies and layers are most commonly at the contact between the active layer and the permafrost.

k *Accumulation of secondary carbonates*

This symbol indicates an accumulation of visible pedogenic calcium carbonate (less than 50 percent, by volume). Carbonate accumulations exist as carbonate filaments, coatings, masses, nodules, disseminated carbonate, or other forms.

kk *Engulfment of horizon by secondary carbonates*

This symbol indicates major accumulations of pedogenic calcium carbonate. The suffix kk is used when the soil fabric is plugged with fine grained pedogenic carbonate (50 percent or more, by volume) that exists as an essentially continuous medium. The suffix corresponds to the stage III plugged horizon or higher of the carbonate morphogenetic stages (Gile et al., 1966).

m *Cementation or induration*

This symbol indicates continuous or nearly continuous cementation. It is used only for horizons that are more than 90 percent cemented, although they may be fractured. The cemented layer is physically root-restrictive. The dominant cementing agent (or the two dominant ones) may be indicated by adding defined letter suffixes, singly or in pairs. The horizon suffix km or kkm indicates cementation by carbonates; qm, cementation by silica; sm, cementation by iron; yym, cementation by gypsum; kqm, cementation by lime and silica; and zm, cementation by salts more soluble than gypsum.

ma *Marl*

This symbol, used only with L, indicates a limnic layer of marl.

mn *Mangans*

This symbol indicates an accumulation of manganese oxide, generally as ped coatings called mangans (First used by Borchardt on 20130418.)

n *Accumulation of sodium*

This symbol indicates an accumulation of exchangeable sodium.

o *Residual accumulation of sesquioxides*

This symbol indicates a residual accumulation of sesquioxides.

p *Tillage or other disturbance*

This symbol indicates a disturbance of the surface layer by mechanical means, pasturing, or similar uses. A disturbed organic horizon is designated Op. A disturbed mineral horizon is designated Ap even though it is clearly a former E, B, or C horizon.

q *Accumulation of silica*

This symbol indicates an accumulation of secondary silica.

r *Weathered or soft bedrock*

This symbol is used with C to indicate cemented layers (moderately cemented or less cemented). Examples are weathered igneous rock and partly consolidated sandstone, siltstone, or slate. The excavation difficulty is low to high.

s *Illuvial accumulation of sesquioxides and organic matter*

This symbol is used with B to indicate an accumulation of illuvial, amorphous, dispersible complexes of organic matter and sesquioxides if both the organic-matter and sesquioxide components are significant and if either the color value or chroma, moist, of the horizon is 4 or more. The symbol is also used in combination with h as “Bhs” if both the organic-matter and sesquioxide components are significant and if the color value and chroma, moist, are 3 or less.

se *Presence of sulfides*

Typically dark colors (e.g., value <4, chroma <2); may have a sulphurous odor.

ss *Presence of slickensides*

This symbol indicates the presence of slickensides. Slickensides result directly from the swelling of clay minerals and shear failure, commonly at angles of 20 to 60 degrees above horizontal.

They are indicators that other vertic characteristics, such as wedge-shaped peds and surface cracks, may be present.

t *Accumulation of silicate clay*

This symbol indicates an accumulation of silicate clay that either has formed *in situ* within a horizon or has been moved into the horizon by illuviation, or both. At least some part of the horizon should show evidence of clay accumulation either as coatings on surfaces of peds or in pores, as lamellae, or as bridges between mineral grains.

u *Presence of human-manufactured materials (artifacts)*

This symbol indicates the presence of manufactured artifacts that have been created or modified by humans, usually for a practical purpose in habitation, manufacturing, excavation, or construction activities. Examples of artifacts are processed wood products, liquid petroleum products, coal, combustion by-products, asphalt, fibers and fabrics, bricks, cinder blocks, concrete, plastic, glass, rubber, paper, cardboard, iron and steel, altered metals and minerals, sanitary and medical waste, garbage, and landfill waste.

v *Plinthite*

This symbol indicates the presence of iron-rich, humus-poor, reddish material that is firm or very firm when moist and hardens irreversibly when exposed to the atmosphere and to repeated wetting and drying.

w *Development of color or structure*

This symbol is used with B to indicate the development of color or structure, or both, with little or no apparent illuvial accumulation of material. It should not be used to indicate a transitional horizon.

x *Fragipan character*

This symbol indicates a genetically developed layer that has a combination of firmness and brittleness and commonly a higher bulk density than the adjacent layers. Some part of the layer is physically root-restrictive.

y *Accumulation of gypsum*

This symbol indicates an accumulation of gypsum (<50% by volume).

yy *Dominance of gypsum*

This symbol indicates an accumulation of gypsum (>50% by volume); light colored (e.g., value >7, chroma <4); may be pedogenically derived or inherited transformation of primary gypsum from parent material.

z *Accumulation of salts more soluble than gypsum*

This symbol indicates an accumulation of salts that are more soluble than gypsum; e.g., NaCl.

HUMUS. The well-decomposed, more or less stable part of the organic matter in mineral soils.

ILLUVIATION. The deposition by percolating water of solid particles, mostly clay or humus, within a soil horizon.

INTERFLUVE. The land lying between streams.

ISOCHRONOUS BOUNDARY. A gradational boundary between two sedimentary units indicating that they are approximately the same age. Opposed to a nonisochronous boundary, which by its abruptness indicates that it delineates units having significant age differences.

KROTOVINA. An animal burrow filled with soil.

LEACHING. The removal of soluble material from soil or other material by percolating water.

LOWSTAND. The lowest elevation reached by the ocean during a glacial period.

MANGAN. A thin coating of manganese oxide (cutan) on the surface of a sand grain, pebble, soil aggregate, or ped. Mangans also line pores or root channels and bridge sand grains.

MAP. Mean annual precipitation.

MODERN SOIL. The portion of a soil section that is under the influence of current pedogenetic conditions. It generally refers to the uppermost soil regardless of age.

MODERN SOLUM. The combination of the A and B horizons in the modern soil.

MORPHOLOGY, SOIL. The physical make-up of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

MOTTLING, SOIL. Irregularly marked with spots of different colors that vary in number and size. Mottling in soils usually indicates poor aeration and lack of drainage. Descriptive terms are as follows: abundance--few, common, and many; size--fine, medium, and coarse; and contrast--faint, distinct and prominent. The size measurements are these: fine, less than 5 mm in diameter along the greatest dimension; medium, from 5 to 15 mm, and coarse, more than 15 mm.

MRT (MEAN RESIDENCE TIME.) The average age of the carbon atoms within a soil horizon. Under ideal reducing conditions, the humus in a soil will have a C-14 age that is half the true age of the soil. In oxic soils humus is typically destroyed as fast as it is produced, generally yielding MRT ages no older than 300-1000 years, regardless of the true age of the soil.

MUNSELL COLOR NOTATION. Scientific description of color determined by comparing soil to a Munsell Soil Color Chart (Available from Macbeth Division of Kollmorgen Corp., 2441 N. Calvert St., Baltimore, MD 21218). For example, dark yellowish brown is denoted as 10YR3/4m in which the 10YR refers to the hue or proportions of yellow and red, 3 refers to value or lightness (0 is black and 10 is white), 4 refers to chroma (0 is pure black and white and 20 is the pure color), and m refers to the moist condition rather than the dry (d) condition.

OVERBANK DEPOSIT. Fine-grained alluvial sediments deposited from floodwaters outside of the fluvial channel.

OXIC. A soil having a high redox potential. Such soils typically are well drained, seldom being waterlogged or lacking in oxygen. Rubification in such soils tends to increase with age.

PALEO SOIL TONGUE. A soil tongue that formed during a previous soil-forming interval.

PALEOSEISMOLOGY. The study of prehistoric earthquakes through the examination of soils, sediments, and rocks.

PALEOSOL. A soil that formed on a landscape in the past with distinctive morphological features resulting from a soil-forming environment that no longer exists at the site. The former

pedogenic process was either altered because of external environmental change or interrupted by burial.

PALINSPASTIC RECONSTRUCTION. Diagrammatic reconstruction used to obtain a picture of what geologic and/or soil units looked like before their tectonic deformation.

PARENT MATERIAL. The great variety of unconsolidated organic and mineral material in which soil forms. Consolidated bedrock is not yet parent material by this concept.

PED. An individual natural soil aggregate, such as a granule, a prism, or a block.

PEDOCHRONOLOGY. The study of pedogenesis with regard to the determination of when soil formation began, how long it occurred, and when it stopped. Also known as soil dating. Two ages and the calculated duration are important:

t_o = age when soil formation or aggradation began, ka

t_b = age when the soil or stratum was buried, ka

t_d = duration of soil development or aggradation, ky

Pedochronological estimates are based on available information. All ages should be considered subject to $\pm$50% variation unless otherwise indicated.

PEDOCHRONOPALEOSEISMOLOGY. The study of prehistoric earthquakes by using pedochronology.

PEDOLOGY. The study of the process through which rocks, sediments, and their constituent minerals are transformed into soils and their constituent minerals at or near the surface of the earth.

PEDOGENESIS. The process through which rocks, sediments, and their constituent minerals are transformed into soils and their constituent minerals at or near the surface of the earth.

PERCOLATION. The downward movement of water through the soil.

pH VALUE. The negative log of the hydrogen ion concentration. Measurements in soils are usually performed on 1:1 suspensions containing one part by weight of soil and one part by weight of distilled water. A soil with a pH of 7.0 is precisely neutral in reaction because it is neither acid nor alkaline. An acid or "sour" soil is one that gives an acid reaction; an alkaline soil is one that gives an alkaline reaction. In words, the degrees of acidity or alkalinity are expressed as:

Extremely acid	<4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4

Strongly alkaline	8.5 to 9.0
Very strongly alkaline	>9.0
Used if significant:	
Very slightly acid	6.6 to 6.9
Very mildly alkaline	7.1 to 7.3

PHREATIC SURFACE. (See Water Table.)

PLANATION. The process of erosion whereby a portion of the surface of the Earth is reduced to a fundamentally even, flat, or level surface by a meandering stream, waves, currents, glaciers, or wind.

PLEISTOCENE. An epoch of geologic time extending from 10 ka to 1.8 Ma; it includes the last Ice Age.

PROFILE, SOIL. A vertical section of the soil through all its horizons and extending into the parent material.

QUATERNARY. A period of geologic time that includes the past 1.8 Ma. It consists of two epochs--the Pleistocene and Holocene.

PROGRADATION. The building outward toward the sea of a shoreline or coastline by nearshore deposition.

REFUGIUM. A place of refuge. Plants, animals, and soil minerals tend to accumulate only in the most ideal areas when surrounded by a hostile environment.

RELICT SOIL. A surface soil that was partly formed under climatic conditions significantly different from the present.

RUBIFICATION. The reddening of soils through the release and precipitation of iron as an oxide during weathering. Munsell hues and chromas of well-drained soils generally increase with soil age.

SALINE SOIL. A soil that contains soluble salts in amounts that impair the growth of crop plants but that does not contain excess exchangeable sodium.

SAND. Individual rock or mineral fragments in a soil that range in diameter from 0.05 to 2.0 mm. Most sand grains consist of quartz, but they may be of any mineral composition. The textural class name of any soil that contains 85 percent or more sand and not more than 10 percent clay.

SECONDARY FAULT. A minor fault that bifurcates from or is associated with a primary fault. Movement on a secondary fault never occurs independently of movement on the primary, seismogenic fault.

SHORELINE ANGLE. The line formed by the intersection of the wave-cut platform and the sea cliff. It approximates the position of sea level at the time the platform was formed.

SILT. Individual mineral particles in a soil that range in diameter from the upper limit of clay (0.002 mm) to the lower limit of very find sand (0.05 mm.) Soil of the silt textural class is 80 percent or more silt and less than 12 percent clay.

SLICKENSIDES. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may form along a fault plane; at the bases of slip surfaces on steep slopes; on faces of blocks, prisms, and columns undergoing shrink-swell. In tectonic slickensides the striations are strictly parallel.

SLIP RATE. The rate at which the geologic materials on the two sides of a fault move past each other over geologic time. The slip rate is expressed in mm/yr, and the applicable duration is stated. Faults having slip rates less than 0.01 mm/yr are generally considered inactive, while faults with Holocene slip rates greater than 0.1 mm/yr generally display tectonic geomorphology.

SMECTITE. A fine, platy, aluminosilicate clay mineral that expands and contracts with the absorption and loss of water. It has a high cation-exchange capacity and is plastic and sticky when moist.

SOIL. A natural, three-dimensional body at the earth's surface that is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

SOIL SEISMOLOGIST. Soil scientist who studies the effects of earthquakes on soils.

SOIL SLICKS. Curvilinear striations that form in swelling clayey soils, where there is marked change in moisture content. Clayey slopes buttressed by rigid materials may allow minor amounts of gravitationally driven plastic flow, forming soil slicks sometimes mistaken for evidence of tectonism. Soil slicks disappear with depth and the striations are seldom strictly parallel as they are when movement is major. (See also SLICKENSIDES.)

SOIL TECTONICS. The study of the interactions between soil formation and tectonism.

SOIL TONGUE. That portion of a soil horizon extending into a lower horizon.

SOLUM. Combined A and B horizons. Also called the true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

STONELINE. A thin, buried, planar layer of stones, cobbles, or bedrock fragments. Stonelines of geological origin may have been deposited upon a former land surface. The fragments are more often pebbles or cobbles than stones. A stoneline generally overlies material that was subject to weathering, soil formation, and erosion before deposition of the overlying material. Many stonelines seem to be buried erosion pavements, originally formed by running water on the land surface and concurrently covered by surficial sediment.

STRATH TERRACE. A gently sloping terrace surface bearing little evidence of aggradation.

STRUCTURE, SOIL. The arrangement of primary soil particles into compound particles or aggregates that are separated from adjoining aggregates. The principal forms of soil structure are--platy (laminated), prismatic (vertical axis of aggregates longer than horizontal), columnar (prisms with rounded tops), blocky (angular or subangular), and granular. Structureless soils are either single grained (each grain by itself, as in dune sand) or massive (the particles adhering without any regular cleavage, as in many hardpans).

SUBSIDIARY FAULT. A branch fault that extends a substantial distance from the main fault zone.

SURFACE FAULT RUPTURE (SFR). Permanent disturbance of soil surface occurring as a result of tectonic offset. This may produce ground cracks, offsets, and warping of soil horizons.

TECTOTURBATION. Soil disturbance resulting from tectonic movement.

TEXTURE, SOIL. Particle size classification of a soil, generally given in terms of the USDA system which uses the term "loam" for a soil having equal properties of sand, silt, and clay. The basic textural classes, in order of their increasing proportions of fine particles are sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sand clay, silty clay, and clay. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

TOPOSEQUENCE. A sequence of kinds of soil in relation to position on a slope. (See also CATENA.)

TRANSLOCATION. The physical movement of soil particles, particularly fine clay, from one soil horizon to another under the influence of gravity.

UNIFIED SOIL CLASSIFICATION SYSTEM. The particle size classification system used by the U.S. Army Corps of Engineers and the Bureau of Reclamation. Like the ASTM and AASHO systems, the sand/silt boundary is at 80 um instead of 50 um used by the USDA. Unlike all other systems, the gravel/sand boundary is at 4 mm instead of 2 mm and the silt/clay boundary is determined by using Atterberg limits.

VERTISOL. A soil with at least 30% clay, usually smectite, that fosters pronounced changes in volume with change in moisture. Cracks greater than 1 cm wide appear at a depth of 50 cm during the dry season each year. One of the ten USDA soil orders.

WATER TABLE. The upper limit of the soil or underlying rock material that is wholly saturated with water. Also called the phreatic surface.

WAVE-CUT PLATFORM. The relatively smooth, slightly seaward-dipping surface formed along the coast by the action of waves generally accompanied by abrasive materials.

WEATHERING. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

WETTING FRONT. The greatest depth affected by moisture due to precipitation.

yr B.P. Uncorrected radiocarbon age expressed in years before present, calculated from 1950. Calendar-corrected ages are expressed in ka, or, if warranted, as A.D. or B.C.