PALEO SOLUTIONS
Paleontological and Archaeological Compliance and Consulting Services

PALEONTOLOGICAL IDENTIFICATION REPORT: CALTRANS DISTRICT 4 HIGHWAY 101 OVERCROSSING AT ADOBE CREEK PROJECT, IN PALO ALTO, SANTA CLARA COUNTY, CALIFORNIA

Prepared for: _____

Christopher Risden, Branch Chief
Office of Geotechnical Design-West
Geotechnical Services
Division of Engineering Services
California Department of Transportation, District 4
111 Grand Ave, Oakland, CA 94612

Cc: John M. Hesler
David J. Powers & Associates, Inc.
1871 The Alameda, Suite 200
San Jose, CA 95126
408.248.3500

Prepared by: _____

Geraldine L. Aron, M.S., Principal Paleontologist
Jennifer Kelly, M.S., Assistant Project Manager
Jeff Hathaway, M.S., PG, Technical Editor
Paleo Solutions, Inc.
911 S. Primrose Ave Unit N
Monrovia, CA 91016

For individuals with sensory disabilities this document is available in alternate formats. Please call or write to Department of Transportation, District 4, 111 Grand Ave, Oakland, CA 94612, or use the CA Relay Service TTY number 1-800-735-2929 or dial 711.

December 10, 2013 (revised January 20, 2017)

TABLE OF CONTENTS

Figures

Tables

1.0 INTRODUCTION

The Highway 101 Overcrossing at Adobe Creek is a project to provide year-round access over Highway 101 (U.S. 101) in the City of Palo Alto. It will improve pedestrian and cyclist connectivity to the Palo Alto Baylands Nature Preserve, East Bayshore Road businesses, and regional Bay Trail network from residential neighborhoods and employment districts in south Palo Alto. The improved connectivity and access would support regional bicycle commuting and encourage greater recreational activity and use of the Baylands and trail system. The new overcrossing would replace serve as a replacement for the existing Benjamin Lefkowitz pedestrian/bicycle undercrossing of U.S. 101 at Adobe Creek, a facility that experiences frequent closures due to flooding each year between October 15th and April 15th.

Adobe Creek crosses under U.S. 101 approximately 0.3 miles north of San Antonio Road and 1.3 miles south of Oregon Expressway. On the east side of U.S. 101, the overcrossing would connect to the existing Bay Trail that is adjacent to East Bayshore Road. On the west side of U.S. 101, the overcrossing would connect to the existing bike lane on West Bayshore Road via a short trail and bridge over Adobe Creek and would also include a trail along the east side of Adobe Creek between U.S. 101 and East Meadow Drive (see Figures 1 and 2).

The purpose of this Paleontological Inventory Report (PIR) is to provide general guidance for developing paleontological monitoring efforts including minimum proposal requirements, general fieldwork and laboratory methods, and curation considerations. This PIR is designed to comply with the Standard Environmental Reference (SER); Chapter 8 Paleontology, Volume I of the Environmental Handbook: Guidance for Compliance (Caltrans, 2012).

1.1 PROJECT DESCRIPTION

The Highway 101 Overcrossing at Adobe Creek Project consists of the construction of a year-round, grade-separated, shared bicycle and pedestrian bridge over U.S. 101 and East and West Bayshore Roads at Adobe Creek; construction of sidewalk and bikeway improvements along West Bayshore Road; and construction of an approximately 800-foot long trail along the east side of Adobe Creek between U.S. 101 and East Meadow Drive. Ancillary improvements to be constructed as part of the new facility would include new signage and striping, sidewalk improvements, retaining walls, fencing, railings, landscaping, utility relocations, amenities, and lighting.

The proposed main pedestrian/bicycle bridge over U.S. 101 would be a bowstring steel truss structure of approximately 165 feet in length that would clear-span the freeway. The structure, which would have a total width of 14 feet, would be supported on concrete pier walls located between the freeway and East and West Bayshore Roads. The vertical clearance of the structure over U.S. 101 would be approximately 18.5 feet.

Leading up to the main bridge would be additional steel truss spans over East and West Bayshore Roads, as well as concrete approach ramp structures. The steel truss and concrete ramp on the east side of U.S. 101 would be supported on concrete pier walls. The steel truss on the west side

of U.S. 101 would be supported on concrete pier walls, and the concrete approach ramp structure would be supported on oval concrete columns, some of which would be within the existing parking lot for the office building located at 3600 West Bayshore Road. This would require some reconfiguration of the parking lot but no net loss of parking spaces is anticipated.

The ramp on the east side of U.S. 101 would connect to the existing Bay Trail that is located adjacent to East Bayshore Road.

The ramp on the west side of U.S. 101 would connect to a new pedestrian/bicycle bridge over Adobe Creek adjacent to West Bayshore Road. The new bridge would be a single-span, prefabricated steel half-through truss structure approximately 140 feet in length and 14 feet in width. The existing sidewalk would be widened and would connect to the existing bike lane on West Bayshore Road. The sidewalk would also connect to an approximately 800-foot long trail to be constructed along the east side of Adobe Creek between U.S. 101 and East Meadow Drive. Construction of the trail would consist of paving the existing gravel maintenance road that is above the top-of-bank, which is used by the Santa Clara Valley Water District (SCVWD). Trailheads would be constructed at each end. A 2-foot high fence would also be constructed on top of the existing raised floodwall for safety purposes.

1.1.1 Right-of-Way Requirements

With one exception, the proposed project will be constructed within the existing public rights-of-way of Caltrans, the City, and the Santa Clara Valley Water District (SCVWD). The exception is that right-of-way will be required from a portion of the existing parking for the office building located at 3600 West Bayshore Road (Assessor's Parcel Number 127-10-076).

1.1.2 Construction and Phasing

Based on preliminary geotechnical recommendations, the bridges would be supported on cast-in-drilled-holes (CIDH) piles that would likely extend to a depth of up to approximately 75 feet. Pile driving is not proposed. Major construction phases are anticipated to include:

- Site preparation and utility relocation work in advance of the primary bridge construction.
- Principal Span substructure construction (piles, pile caps and pier walls) within the Caltrans right-of-way. This stage would be expedited to minimize impacts to the traveling public.
- East Approach Structure and West Approach Structure construction (including construction of the Adobe Creek Bridge). Work within the banks of Adobe and Barron Creeks, if any, would be limited to between April 15 and October 15.
- Placement of the Principal Span prefabricated steel superstructure over U.S. 101. This would require night work for temporary closure of U.S. 101 during setting of the Principal Span.
- Adobe Creek Reach Trail Construction. This work would be scheduled to minimize impacts to SCVWD operations.

The City has identified an equipment staging/materials storage area that would be utilized by the contractor during construction. The site is a nearby, City-owned, parcel on the west side of San Antonio Road, just north of U.S. 101, near the San Antonio Road/Casey Street intersection. The area to be used for staging is a gravel lot that is presently used for equipment storage and vehicle parking. Project construction is anticipated to take roughly 18 months.

1.2 STAFF QUALIFICATIONS

All aspects of this paleontological resources inventory report were directed by Paleo Solutions, Inc. Paleontological Principal Investigator, Geraldine L Aron. Ms. Aron exceeds the minimum qualifications to be a project manager and principal investigator under the Society of Vertebrate Paleontology (SVP, 1995), U.S.D.A. Forest Services, and the Bureau of Land Management (BLM) guidelines. Paleo Solutions' Assistant Project Manager and Research Specialist, Jennifer Kelly, assisted with all literature reviews and requests, in addition to co-authoring the technical report for the PIR.

Geraldine Aron, Principal Investigator/Project Manager of Paleo Solutions, has over 15 years of experience in the field of paleontology, with the completion of her Master of Science in Geology. Ms. Aron has directed and conducted paleontological resource investigations for projects involving the California Environmental Quality Act (CEQA) and National Environmental Policy Act (NEPA). She has taught paleontology laboratory classes and taken numerous field geology classes that involved field trips and research opportunities in and around California. Her field projects, both geological and paleontological, include areas in Utah, central and eastern Nevada, and throughout most California counties. Her career also has included an appointment as a staff paleontologist at the San Diego Natural History Museum, where she gained valuable experience both in the field and in specimen preparation. Geraldine is certified by the California Energy Commission (CEC) to conduct paleontological monitoring and teach environmental awareness programs. Ms. Aron holds a current California, Arizona, and Nevada BLM Permit and a current U.S.D.A Forest Service Permit with the Angeles National Forest. She has completed numerous Paleontological Mitigation and Monitoring Programs and implemented them.

Jennifer Kelly, Assistant Project Manager/Research Specialist, has been with Paleo Solutions for 3.5 years and has gained extensive experience in the field, as well as co-authoring over 30 technical reports and EIR/PEA/EIS's. She has gained experience monitoring, salvaging, and in fossil preparation, leading to project management, and report writing. She has experience from the La Brea Tar Pits/Page Museum (Paleontology department) and field experience as a Staff Geologist for Leighton Geotechnical. Her expertise is Geology, and she has a Masters Degree in Geological Sciences, emphasis in Geochemistry. Jennifer has taught lab courses in paleontology and general geology, and also assisted with field mapping classes. Her field experience, both geological and paleontological, includes areas from Maine to California. Jennifer is HAZWOPER 40-hour certified and a registered Orange County Paleontologist. She is a co-Principal Investigator on the Arizona and Nevada State BLM Permits.

Jeff Hathaway specializes in technical writing, data collection, and the making of geological and paleontological maps with the aid of GIS and graphic design software. Jeff's expertise is in Geology. Jeff completed his BS and MS in Geology and BS in Chemistry at the California State University at Fullerton. Jeff also has geotechnical experience working as a Geologist for Pacific Soils Engineering, Inc. where he achieved status as a Professional Geologist (PG) by the California State Board for Geologist and Geophysicists. He acted as a technical editor and writer for this report.

Barbara Webster created the maps for this project. She received her BA in 2009- at Gonzaga University with a History concentration and Spanish minor. She then completed a graduate-level field school at the Utah State University, in Logan, Utah. She has monitoring experience on archaeological and paleontological projects, as well as both historical and prehistoric archaeology experience in the Humbolt-Toiyabe National Forest in Elko, Nevada as an archaeologist and surveyor. She also has extensive knowledge of GIS and database management and creation, including work at the Smithsonian and with the US Park Service in both Nevada and Illinois.

1.3 REGULATORY CONTEXT

1.3.1 Federal Regulations

A variety of federal statutes specifically address paleontological resources. They generally become applicable to specific projects if the project involves: 1) a federal agency, license, permit, approval, or funding, and/or 2) crosses federal lands (Caltrans, 2012).

Antiquities Act of 1906
The Antiquities Act of 1906 (16 USC 431–433) was enacted with the primary goal of protecting cultural resources in the United States. This act explicitly prohibits appropriation, excavation, injury, and destruction of any historic or prehistoric ruin or monument, or any object of antiquity located on lands owned or controlled by the federal government, without prior permission of the secretary of the Federal department that has jurisdiction over the site. It also establishes criminal penalties, including fines and/or imprisonment, for these acts. The Antiquities Act of 1906 contains a requirement for studies by qualified experts in the subject matter, and contains precise stipulations regarding the management/curation of collected materials. The Antiquities Act itself and its implementing regulation (43 CFR 3) do not specifically mention paleontological resources, though an interpretation of the Act to include paleontological resources is possible.

The National Environmental Policy Act of 1969
The National Environmental Policy Act as amended (Pub. L. 91-190, 42 U.S.C. 4321-4347, January 1, 1970, as amended by Pub. L. 94-52, July 3, 1975, Pub. L. 94-83, August 9, 1975, and Pub. L. 97-258 § 4(b), Sept. 13, 1982) recognizes the continuing responsibility of the Federal Government to "preserve important historic, cultural, and natural aspects of our national heritage . . ." (Sec. 101 [42 USC § 4321]) (#382). This is interpreted to refer to paleontological as well as cultural resources.

Federal Land Management and Policy Act of 1976
The Federal Land Management and Policy Act of 1976 (FLMPA) (43 U.S.C. 1712[c], 1732[b]); sec. 2, Federal Land Management and Policy Act of 1962 [30 U.S.C. 611]; Subpart 3631.0 et seq.), Federal Register Vol. 47, No. 159, 1982) defines significant fossils as: unique, rare or particularly well-preserved; an unusual assemblage of common fossils; being of high scientific interest; or providing important new data concerning [1] evolutionary trends, [2] development of biological communities, [3] interaction between or among organisms, [4] unusual or spectacular circumstances in the history of life, [5] or anatomical structure. Prior to the passage of the Paleontological Resources Preservation portion of the Omnibus Public Lands Act, this was the primary legislative backing for paleontological resource management and preservation policies.

Paleontological Resources Preservation, Omnibus Public Lands Act
The Omnibus Public Lands Act, (Public Law 111-011, Title VI, Subtitle D (OPLA-PRP, 2009)) is recent legislation directing the Secretaries (Interior and Agriculture) to manage and protect paleontological resources on federal land using ―scientific principles and expertise. OPLA-PRP incorporates most of the recommendations of the report of the Secretary of the Interior entitled Assessment of Fossil Management on Federal and Indian Lands (2000) in order to formulate a consistent paleontological resources management framework. In passing the OPLA-PRP, Congress officially recognized the scientific importance of paleontological resources on some federal lands by declaring that fossils from these lands are federal property that must be preserved and protected. The OPLA-PRP codifies existing policies of the BLM, National Park Service, U.S. Forest Service, Bureau of Reclamation, and U.S. Fish and Wildlife Service, and provides the following:

- Uniform criminal and civil penalties for illegal sale and transport, and theft and vandalism of fossils from federal lands
- Uniform minimum requirements for paleontological resource-use permit issuance (terms, conditions, and qualifications of applicants)
- Uniform definitions for “paleontological resources” and “casual collecting”
- Uniform requirements for curation of federal fossils in approved repositories

Federal legislative protections for scientifically significant fossils applies to projects that take place on federal lands (with certain exceptions such as DOD), involve federal funding, require a federal permit, or involve crossing state lines. If any portion of this project occurs on federally managed lands (i.e. BLM) federal protections for paleontological resources on those lands apply under NEPA, FLPMA, and OPLA-PRP.

1.3.2 State Regulations

California Environmental Quality Act
CEQA encourages the protection of all aspects of the environment by requiring state and local agencies to prepare multidisciplinary analyses of the environmental impacts of a proposed project, and to make decisions based on the findings of those analyses. CEQA includes in its definition of historical resources any object [or] site …that has yielded or may be likely to yield information important in prehistory (14 CCR 15064.5[3]), which is typically interpreted as including fossil materials and other paleontological resources. More specifically, destruction of a

unique paleontological resource or site or unique geologic feature‖ constitutes a significant impact under CEQA (State CEQA Guidelines Appendix G). CEQA does not provide an explicit definition of a unique paleontological resource, but a definition is implied by comparable language within the act relating to archeological resources: The procedures, types of activities, persons, and public agencies required to comply with CEQA are defined in: Guidelines for the Implementation of CEQA, as amended March 29, 1999 (Title 14, Chapter 3, California Code of Regulations: 15000 et seq.). One of the questions listed in the CEQA Environmental Checklist (Section 15023, Appendix G, Section XIV, Part A) is:

- **Will the proposed project directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?**
  Treatment of paleontological resources under CEQA is generally similar to treatment of cultural resources, requiring evaluation of resources in the project; assessment of potential impacts on significant or unique resources; and development of mitigation measures for potentially significant impacts, which may include monitoring, combined with data recovery excavation and/or avoidance.

California Public Resources Code
The State of California Public Resources Code (Chapter 1.7), Section 5097.5 and 30244, includes additional state level requirements for the assessment and management of paleontological resources. These statutes requires reasonable mitigation of adverse impacts to paleontological resources resulting from development on state lands, define the removal of paleontological sites or features from state lands as a misdemeanor, and prohibit the removal of any paleontological site or feature from state land without permission of the applicable jurisdictional agency. Section 30244 requires reasonable mitigation for impacts on paleontological resources that occur as a result of development on public lands.

2.0 BACKGROUND AND METHODS

The Highway 101 Overcrossing at Adobe Creek Project site lies in the Palo Alto USGS 7.5' Topographic quadrangle, in Santa Clara County, California (see Figure 2).

The scope of the paleontological analysis included brief reviews of published geologic mapping and scientific literature, encompassing the surrounding portions of the project. Paleo Solutions also searched the Miocene Mammal Mapping project (MIOMAP, 2013), a database housed at the University of California at Berkeley, served through the University of California Museum of Paleontology (UCMP) and the UCMP locality database.

3.0 GEOLOGY AND PALEONTOLOGY

3.1 REGIONAL GEOLOGY

The Highway 101 Overcrossing at Adobe Creek Project site lies in the southern portion of the San Francisco Bay area. The San Francisco Bay area, including the San Pablo and Suisun bays, is the only area of California where streams from the interior of the state reach the sea. This system occupies a late Pliocene structural depression that has been flooded several times in response to Pleistocene glacial cycles. San Francisco Bay is fairly shallow, highly tidal, and is edged by numerous shallow mudflat areas of variable contours (Norris and Webb, 1976).

During Jurassic and Cretaceous times, the western margin of what is now the United States was an active margin, comprised of the Farallon Plate subducting under the North American plate. As the Farallon Plate was drawn under the North American plate, portions of the sea floor were accreted onto the margin of the North American Plate, forming the Coast Range Ophiolite Sequence. At the same time, basins east of this margin were being filled with both terrestrial and oceanic sediments, as well as some volcanic sediment, forming the Great Valley Sequence (Stoffer, 2002). As subduction slowed, and the oceans receded and advanced between Cretaceous and Oligocene times, both terrestrial and oceanic sediments were deposited in what is now known as Santa Clara County. Volcanic activity occurred sporadically throughout this region as well, including sills and dikes, and rhyolite flows and tuffs. Beginning in the middle to late Oligocene, active subduction of the Farallon Plate began to cease, and the San Andreas Fault began to form. This changed the character of motions and uplifts, and led to significant faulting in the area as stresses changed on the rocks. Finally, from the Oligocene to the Holocene, the San Andreas Fault became the dominant tectonic regime we know today, and the depositional regime changed from mainly oceanic to almost exclusively terrestrial (Stoffer, 2002).

Figure 1. Overview of the the Highway 101 Overcrossing at Adobe Creek Project.

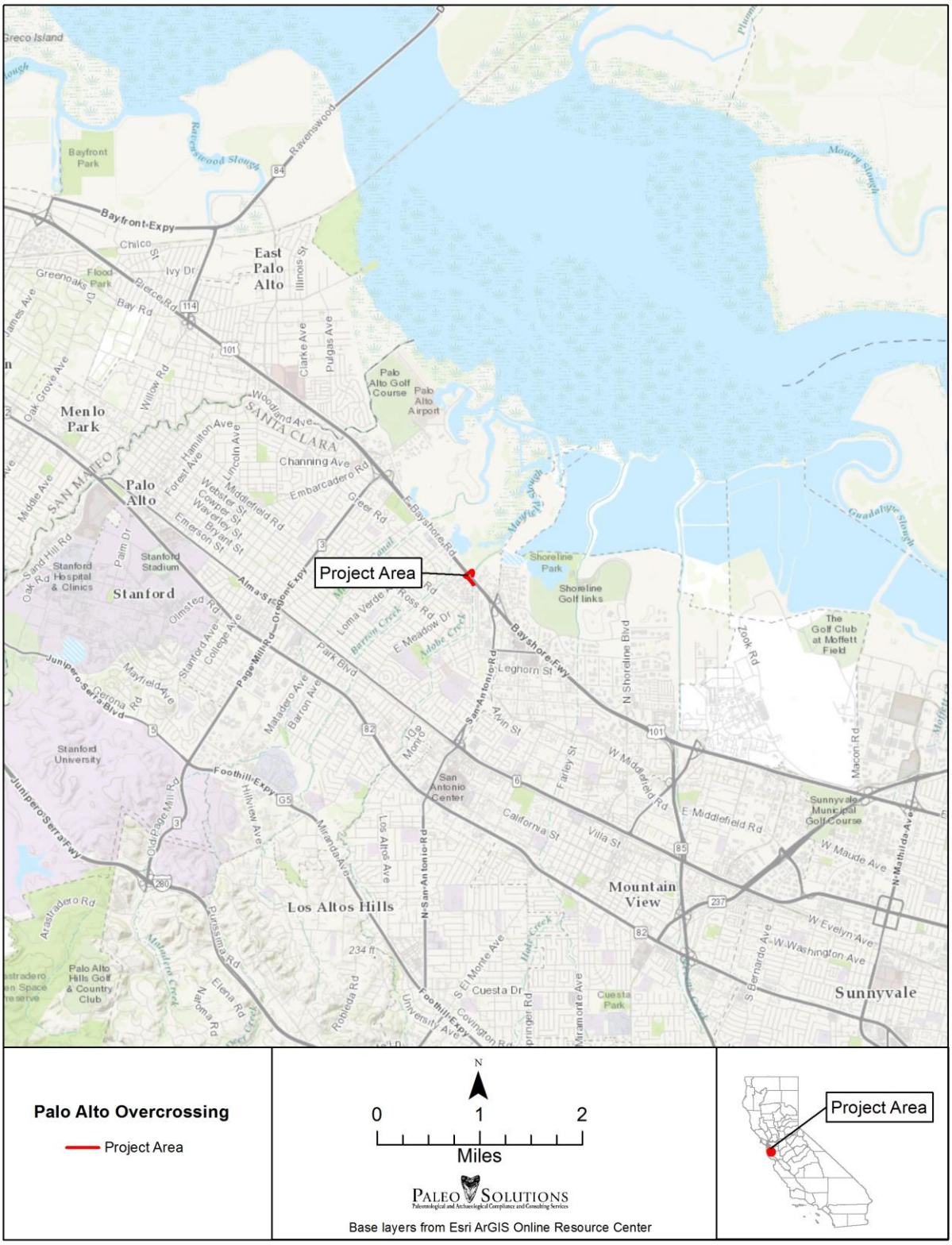

Figure 2. Location Map of the Highway 101 Overcrossing at Adobe Creek Project.

3.2 SITE GEOLOGY

The two formations that lie underneath the footprint of the project are Holocene estuarine clays, mapped by Thomas Dibblee, Jr. as Surficial Sediments, silty and organic clay (Qac) and Surficial Sediments, estuarine organic and silty clays, extremely variable (Qbm, Figure 3). The soils study and analysis, as performed by Parikh Consultants in 2012, reviewed the Geologic Map and Map Database of the Palo Alto 30'x60' Quadrangle, California" by E.E. Brabb et al. (1998), finding that the project site is located in an area mapped as Historic artificial fill (af), Holocene Bay Mud (Qhbm), Pleistocene Alluvial fan and fluvial deposits (Qpaf), and Historic Artificial stream channels (Qhasc). Neither the Qpaf nor the Qhasc occur underneath or within approximately 1/2 mile of the project footprint. The Holocene Bay Mud is equivalent to the Surficial Sediments, estuarine organic and silty clays (Qbm) of Dibblee as described in 3.3.2 below.

3.3 GEOLOGICAL UNITS

The following is a description of the geological units that are present on and around the project alignment. As can be seen in Figure 3, the units are presented from oldest to youngest.

3.3.1 Surficial Sediments, silty and organic clay (Qac)

This unit is briefly described as silty clay and organic clay, fossiliferous; represents intra-fan areas, and it is mapped as part of undivided Qa where not differentiated (Dibblee, 2007). While the description of this unit contains a reference to it being fossiliferous, no fossiliferous areas or localities of it were noted in any literature or records searched.

3.3.2 Surficial Sediments, estuarine organic and silty clays (Qbm)

This unit is briefly described by Dibblee (2007) as an estuarine organic clay and silty clay, extremely variable, it represents San Francisco Bay Mud and includes areas modified to salt evaporation basins. No fossils were recorded in this unit in any literature or records searched.

3.3.3 Artificial fill (af)

The artificial fill is a loose to very well consolidated gravel, sand, silt, and clay. It contains rock fragments, organic matter, and man-made debris in various combinations. Thickness is variable and may exceed 30 m in places (Brabb, 1998). Some of the unit is compacted and quite firm, but the ubiquitous artificial fill that was placed before 1965 is uncompacted and consists simply of dumped materials (Brabb, 1998). This unit may contain fossils, but due to the lack of stratigraphic control (the fossils are not in situ and as such lack provenience and any scientific significance) it has a lower paleontological sensitivity.

3.4 SOILS BORING ANALYSIS

Parikh Consultants examined the logs of several boreholes within the project area (Parikh, 2012). These logs revealed the following sedimentological profile:

Boring R-09-004, drilled by URS at the northwest side of Adobe Creek, shows that the subsurface conditions consists of approximately 10 feet of artificial fill. High plasticity clays, such as soft to stiff lean/fat clay, known locally as Young Bay Mud underlie the fill and are interbedded with medium dense to dense well-graded sand with silt. Well-graded sand with silt were encountered at depths ranging from about 18 to 26 and 45 to 48 feet below ground surface. The findings are consistent with the Geological and Engineering Aspect of San Francisco Bay Fill, which consists of Younger Bay Mud, sand deposits, and Older Bay Mud (Parikh, 2012).

3.5 PALEONTOLOGICAL SENSITIVITY ANALYSIS

As part of our analysis, the geologic units (i.e., formations, members, or beds) within the study area were classified according to the tripartite scale as laid out in the Caltrans SER (Standard Environmental Reference) documents. The tripartite scale is modeled on the fact that occurrences of paleontological resources are closely tied to the geologic units that contain them. The probability for finding paleontological resources can therefore be broadly predicted from geologic units present near or at the surface. Geologic mapping can thus be used for assessing the potential for the occurrence of paleontological resources. Using the tripartite system, geologic units are classified based on the relative abundance of vertebrate fossils or scientifically significant invertebrate or plant fossils and their sensitivity to adverse impacts, with a higher ranking indicating a higher potential for fossils. The tripartite system is meant to provide baseline guidance for predicting, assessing, and mitigating paleontological resources. The tripartite scale was combined with geologic unit descriptions to determine unit sensitivity in the project area.

No fossils were located in the project area using the Miocene Mammal Mapping project (MIOMAP, 2013).

One potential fossil locality was recorded approximately 2 miles to the southeast of the project, but no records for this site were verifiable. No fossils were recorded in the formations mapped by Thomas Dibblee, Jr., (Figure 3) in the project footprint in the UCMP database.

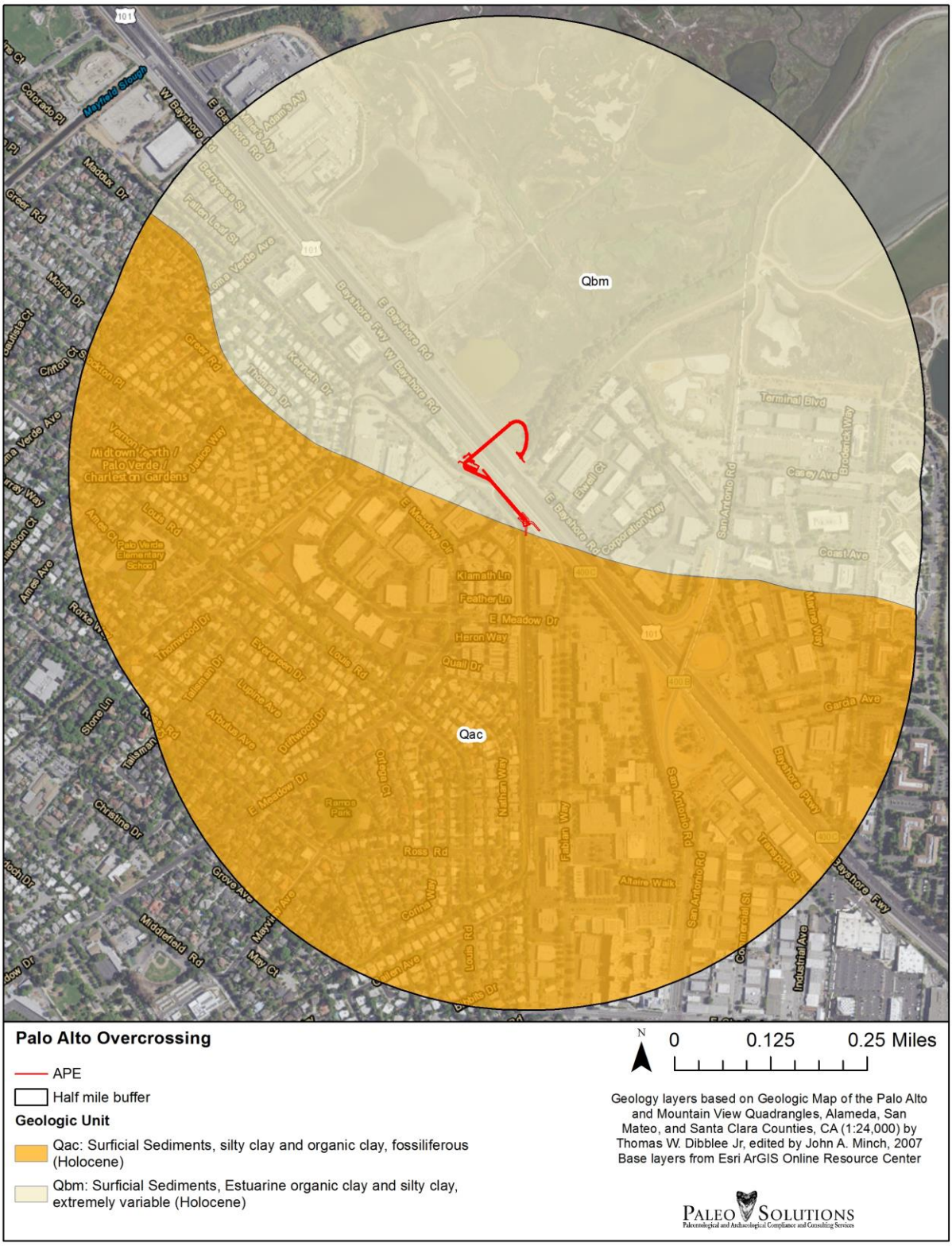

Figure 3. Geologic Map of the Highway 101 Overcrossing at Adobe Creek Project Site.

3.5.1 Caltrans Significance Criteria

Generally, scientifically significant paleontological resources are identified sites or geologic deposits containing individual fossils or assemblages of fossils that are unique or unusual, diagnostically or stratigraphically important, and add to the existing body of knowledge in specific areas, stratigraphically, taxonomically, or regionally. Particularly important are fossils found *in situ* (undisturbed) in primary context (e.g., fossils that have not been subjected to disturbance subsequent to their burial and fossilization). As such, they aid in stratigraphic correlation, particularly those offering data for the interpretation of tectonic events, geomorphological evolution, paleoclimatology, the relationships between aquatic and terrestrial species, and evolution in general. Discovery of *in situ* fossil bearing deposits is rare for many species, especially vertebrates. Terrestrial vertebrate fossils are often assigned greater significance than other fossils because they are more rare than other types of fossils. This is primarily due to the fact that the best conditions for fossil preservation include little or no disturbance after death and quick burial in oxygen depleted, fine-grained, sediments. While these conditions often exist in marine settings, they are relatively rare in terrestrial settings (e.g., as a result of pyroclastic flows and flashflood events). This has ramifications on the amount of scientific study needed to adequately characterize an individual species and therefore affects how relative sensitivities are assigned to formations and rock units.

Note that significance may also be stated for a particular rock unit, predicated on the research potential of fossils suspected to occur in that unit. Such significance is often stated as "sensitivity" or "potential." In most cases decisions about how to manage paleontological resources must be based on this potential because the actual situation cannot be known until construction excavation for the project is underway. Caltrans uses the following tripartite scale (Caltrans, 2012).

- High Potential - Rock units which, based on previous studies, contain or are likely to contain significant vertebrate, significant invertebrate, or significant plant fossils. These units include, but are not limited to, sedimentary formations that contain significant nonrenewable paleontological resources anywhere within their geographical extent, and sedimentary rock units temporally or lithologically suitable for the preservation of fossils. These units may also include some volcanic and low-grade metamorphic rock units. Fossiliferous deposits with very limited geographic extent or an uncommon origin (e.g., tar pits and caves) are given special consideration and ranked as highly sensitive. High sensitivity includes the potential for containing: 1) abundant vertebrate fossils; 2) a few significant fossils (large or small vertebrate, invertebrate, or plant fossils) that may provide new and significant taxonomic, phylogenetic, ecologic, and/or stratigraphic data; 3) areas that may contain datable organic remains older than Recent, including Neotoma (sp.) middens; or 4) areas that may contain unique new vertebrate deposits, traces, and/or trackways. Areas with a high potential for containing significant paleontological resources require monitoring and mitigation.
- Low Potential - This category includes sedimentary rock units that: 1) are potentially fossiliferous, but have not yielded significant fossils in the past; 2) have not yet yielded fossils, but possess a potential for containing fossil remains; or 3) contain common and/or

widespread invertebrate fossils if the taxonomy, phylogeny, and ecology of the species contained in the rock are well understood. Sedimentary rocks expected to contain vertebrate fossils are not placed in this category because vertebrates are generally rare and found in more localized stratum. Rock units designated as low potential generally do not require monitoring and mitigation. However, as excavation for construction gets underway it is possible that new and unanticipated paleontological resources might be encountered. If this occurs, a Construction Change Order (CCO) must be prepared in order to have a qualified Principal Paleontologist evaluate the resource. If the resource is determined to be significant, monitoring and mitigation is required.

- No Potential - Rock units of intrusive igneous origin, most extrusive igneous rocks, and moderately to highly metamorphosed rocks are classified as having no potential for containing significant paleontological resources. For projects encountering only these types of rock units, paleontological resources can generally be eliminated as a concern when the PEAR is prepared and no further action taken.

Any paleontological resource that is considered to be of scientific interest, including most vertebrate fossil remains and traces, and certain rare or unusual invertebrate and plant fossils; by definition, a significant paleontological resource is considered to be scientifically important because it is a rare or previously unknown species, it is of high quality and well-preserved, it preserves a previously unknown anatomical or other characteristic, provides new information about the history of life on earth, or has identified educational or recreational value. Paleontological resources that may be considered to not have paleontological significance include those that lack provenience or context, lack physical integrity because of decay or natural erosion, or that are overly redundant or are otherwise not useful for research.

For the purpose of this project, scientifically significant fossils are generally defined as those that are older than 10,000 years and identifiable to taxon and/or element, and thus are potentially useful for scientific research purposes. However, unidentifiable fossils may also be collected if they are potentially useful to the overall analysis. For example, an unidentifiable bone fragment may be suitable for radiocarbon dating depending upon the preservation state of the bone. Rock or sediment samples may also be collected if they provide information necessary for depositional and paleoenvironmental interpretations.

Based on the results of the paleontological literature review, the geologic map review, the records search performed by Paleo Solutions at the University of California Museum of Paleontology at Berkeley (UCMP), and the Caltrans SER guidelines, each of the geologic units within the project area were ranked according to the tripartite scale (Table 1). The tripartite rankings were then used to prepare a paleontological sensitivity map (Figure 4).

Units mapped as recent (Holocene- Qbm, Qac) units are classed as low sensitivity, as generally these units are too young to contain fossiliferous materials.

Figure 4. Paleontological Resource Sensitivity Map of the Highway 101 Overcrossing at Adobe Creek Project Site.

Table 1. Paleontological Resource Potential Rankings (SER tripartite) of units found within the project area.

Unit	Map Abbreviation	Age	Typical Fossils	SER Tripartite ranking
Surficial Sediments, silty organic clays	Qac	Holocene	None	Low
Surficial Sediments, estuarine organic and silty clays	Qbm	Holocene	None	Low
Artificial fill	n/a	Holocene	None	Low/None

4.0 Impact Assessment and Applicant's Proposed Measures

4.1 PALEONTOLOGICAL RESOURCES

4.1.1 Impacts

Paleontological sensitivity is closely tied to geology. The project footprint lies on Recent (Holocene) sediments and artificial fill that have a low paleontological sensitivity.

As shown in Figures 3 and 4, the project footprint lies upon low sensitivity geologic units (Qac, Qbm) and are unlikely to contain significant fossils. Reducing impacts to below significance on paleontological resources that may be found at the work areas for this project is discussed below.

Impact PAL-1. Damage to Paleontological Resources from Disturbance to Previously Undisturbed Sensitive Sediment or Sedimentary Rock
Trenching, grading, drilling, or any other earthmoving activities underlain by geologic units designated as low sensitivity (Figures 3 and 4), are not expected to cause significant impacts on paleontological resources. Implementation of APM PAL-1 APM PAL-2 and APM PAL-3 would ensure that these impacts are less than significant.

> ***APM PAL-1. Workforce Education***
> Prior to construction, environmental training would be provided to workers regarding the protection of paleontological resources and procedures to be implemented in the event fossil remains are encountered by ground-disturbing activities. This training may be combined with other environmental training for the project, provided that the program elements pertaining to paleontological resources are provided by a qualified instructor meeting applicable professional standards.

APM PAL-2. Stop-Work and Late Discovery Procedures
In the event that previously unidentified paleontological resources are uncovered during implementation of the project, all ground disturbing work would be temporarily halted or diverted away from the discovery to another location. Caltrans' paleontological resources specialist or his/her designated representative would inspect the discovery and determine whether further investigation is required. If the discovery is significant, but can be avoided, and no further impacts would occur, the resource would be documented in the appropriate paleontological resource records and no further effort would be required. If the resource is significant, but cannot be avoided and may be subject to further impact, Caltrans and the Lead Paleontologist would evaluate the significance of the resources, and implement data recovery excavation or other appropriate treatment measures, in coordination with the landowner, as recommended by a qualified paleontologist.

APM PAL-3. Paleontological Monitoring of Work in Areas where Fossils are Discovered
The project area has been subject to paleontological literature and fossil locality searches. Based on the results of these analyses, no monitoring in low sensitivity formations is recommended. Should any scientifically significant fossils be discovered and salvaged during construction and any subsequent monitoring, they must be prepared to the point of curation, identified to element and the lowest possible taxonomic level, and transferred to an approved paleontological repository for permanent storage. The results of any paleontological monitoring program shall be detailed in a Final Paleontological Mitigation Report (PMR).

Because these mitigation measures would not disturb or disrupt the natural environment, they would not result in or create additional adverse impacts.

4.1.2 Residual Impacts After Mitigation

The implementation of the included mitigation measures would substantially reduce potential adverse impacts on scientifically significant paleontological resources. Such mitigation measures have been proven to be effective in reducing adverse effects on fossils resulting from surface disturbing projects on land throughout the western United States. However, even in the most effective paleontological mitigation plan, inadvertent damage to paleontological resources does occur. This damage occurs at the point at which the fossils are uncovered by excavation equipment, and in cases in which fossils are not identified by paleontological monitors during excavation. The damage caused by construction equipment can typically be repaired in a paleontological laboratory. However, damage to fossils that are not identified by paleontological monitors represents an unavoidable adverse impact.

5.0 REFERENCES

Brabb, E.E., Graymer, R.W., Jones, D.L., 1998, Geology of the Onshore Part of San Mateo County, California: A Digital Database, United States Geological Survey (USGS) Open File Report 98-137.

California Department of Transportation (Caltrans) (2012, June 4), Standard Environmental Reference (SER), Retrieved March 21st 2013, http://www.dot.ca.gov/ser/index.htm.

Dibblee, T.W. Jr., 2007, Geologic map of the Palo Alto and Mountain View quadrangles, Alameda, San Mateo, and Santa Clara Counties, California: Dibblee Geological Foundation, Map [DF-350], scale 1:24000.

Miocene Mammal Mapping Project (MioMap), University of California, Berkeley: Online Database. Accessed March, 2013. Available: http://www.ucmp.berkeley.edu/miomap/miomap_home_page.htm

Norris, R. M., and Webb, R.W., 1976, *Geology of California.* New York: John Wiley & Sons.

Parikh Consultants, 2012, Preliminary Foundation Report, Highway 101 Overcrossing and reach Trail at Adobe Creek/Palo Alto Baylands, Santa Clara County, California. 25pp.

Society of Vertebrate Paleontology (SVP), 1995. ―Assessment and Mitigation of Adverse Impacts to Nonrenewable Paleontologic Resources – Standard Guidelines.‖ Society of Vertebrate Paleontology News Bulletin, Vol. 163, pp. 22-27.

Stoffer, P. 2002. Rocks and geology in the San Francisco Bay Area: In U.S. Geological Survey, Bulletin 2195, 58 pp. Available: http://geopubs.wr.usgs.gov/bulletin/b2195/b2195.pdf

University of California, Berkeley, Paleontology Museum (UCMP): Online Database. Accessed October, 2012. Available: http://ucmpdb.berkeley.edu/