cogstone
PALEONTOLOGY - ARCHAEOLOGY - HISTORY

PALEONTOLOGICAL TECHNICAL STUDY FOR THE WINTERS GAS OPERATIONS TECHNICAL TRAINING CENTER PROJECT, WINTERS, YOLO COUNTY, CALIFORNIA

Prepared for:
Pacific Gas & Electric Company
2740 Gateway Oak Drive
Sacramento, CA 95833

Prepared by:
Courtney Richards and Sherri Gust
Cogstone Resource Management Inc.
813 Harbor Boulevard, Suite 321
West Sacramento, CA 95691

Under contract to:
Cardno ENTRIX
701 University Avenue, Suite 200
Sacramento, CA 95825

October 2014

Cogstone Project Number: 3007-01
Type of Study: Paleontological Sensitivity Analysis
Localities: None within 1 mile radius
USGS Quadrangle: Winters 7.5'
Total Area: 35.2 ac (30.5 ac for Project Site; 4.7 ac for Drainage Easement)
Key Words: Pleistocene Riverbank and Modesto Formation undifferentiated, Putah Creek, mammoth, sloth

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

EXECUTIVE SUMMARY

The purpose of this study is to determine the potential Project-related effects on paleontological resources during construction of the proposed Pacific Gas and Electric Company (PG&E) Gas Operations Technical Training Center in the City of Winters, Yolo County, California. The proposed Project is on approximately 35.2-acres that are generally bounded by Interstate-505 to the east, Timber Crest Road to the east, East Grant Avenue to the north, and Putah Creek to the south. This study was required by the City of Winters to meet their responsibility as the lead agency under the California Environmental Quality Act (CEQA).

The Project will involve construction of multiple buildings that will house offices, classrooms, laboratory, dining, and covered training space; outdoor excavation training, commercial driver training, and crane certification areas; at grade vehicle and equipment parking areas; utility village; service yard; a storm water pond in the southeastern portion of the Project area; and an interim storm water drainage channel along the western boundary of the Project area. Excavation for the storm water pond is expected to be approximately nine feet deep and remove 10,000 cubic yards (cy) of material. Excavation for the drainage channel is expected to be approximately six feet deep and remove ~18,000 cy of material. Due to the flat topography of the site, other construction activities for the project are expected to only require excavations between two and three feet in depth.

The project area is mapped as undifferentiated late Pleistocene Modesto Formation and middle Pleistocene Riverbank Formation. According to the geotechnical report for the Project, the upper two to three feet of sediment over the majority of the Project area consists of soils disturbed by agricultural activities. A paleontological records search of the Project area was conducted by the University of California, Museum of Paleontology (UCMP). UCMP replied via email that no fossils are known from the Project area or a one mile-radius. Cogstone conducted additional searches of the UCMP online database, Paleobiology Database, Sierra College, and in scientific journals, technical studies, and State geological survey reports pertaining to the paleontology and geology of the Winters area. These searches were also negative for specimens within the Project area. However, they revealed that Pleistocene vertebrate fossils have been recovered from similar sediments throughout the Sacramento Valley, including the banks of Putah Creek, which borders the Project immediately to the south. Fossils recovered nearby include mammoth, sloth, and saber-toothed cat material.

Most earthmoving activities will be shallow, less than three feet deep, and will mostly be within sediments previously disturbed by agricultural activities. These excavations have little chance of impacting significant resources and monitoring is not recommended. Deeper excavations for the storm water pond and drainage channel have the potential to yield fossils meeting significance criteria and should be monitored if earthmoving activities are deeper than eight feet below the surface. Prior to the start of construction, earthmoving personnel should receive a paleontological sensitivity training detailing the types of fossils that may be encountered and procedures to follow if finds occur.

In the event that unanticipated paleontological resources are discovered during project construction activities, it is PG&E's best management practice that all work shall immediately be halted within 100 feet of the find until it can be evaluated by a Principal Paleontologist.

INTRODUCTION

PURPOSE OF STUDY

The purpose of this study is to determine the potential Project-related effects on paleontological resources during construction of a gas operations technical training center in Winters, California (Figure 1). This work was required by the City of Winters to meet their responsibility as the lead agency under the California Environmental Quality Act (CEQA).

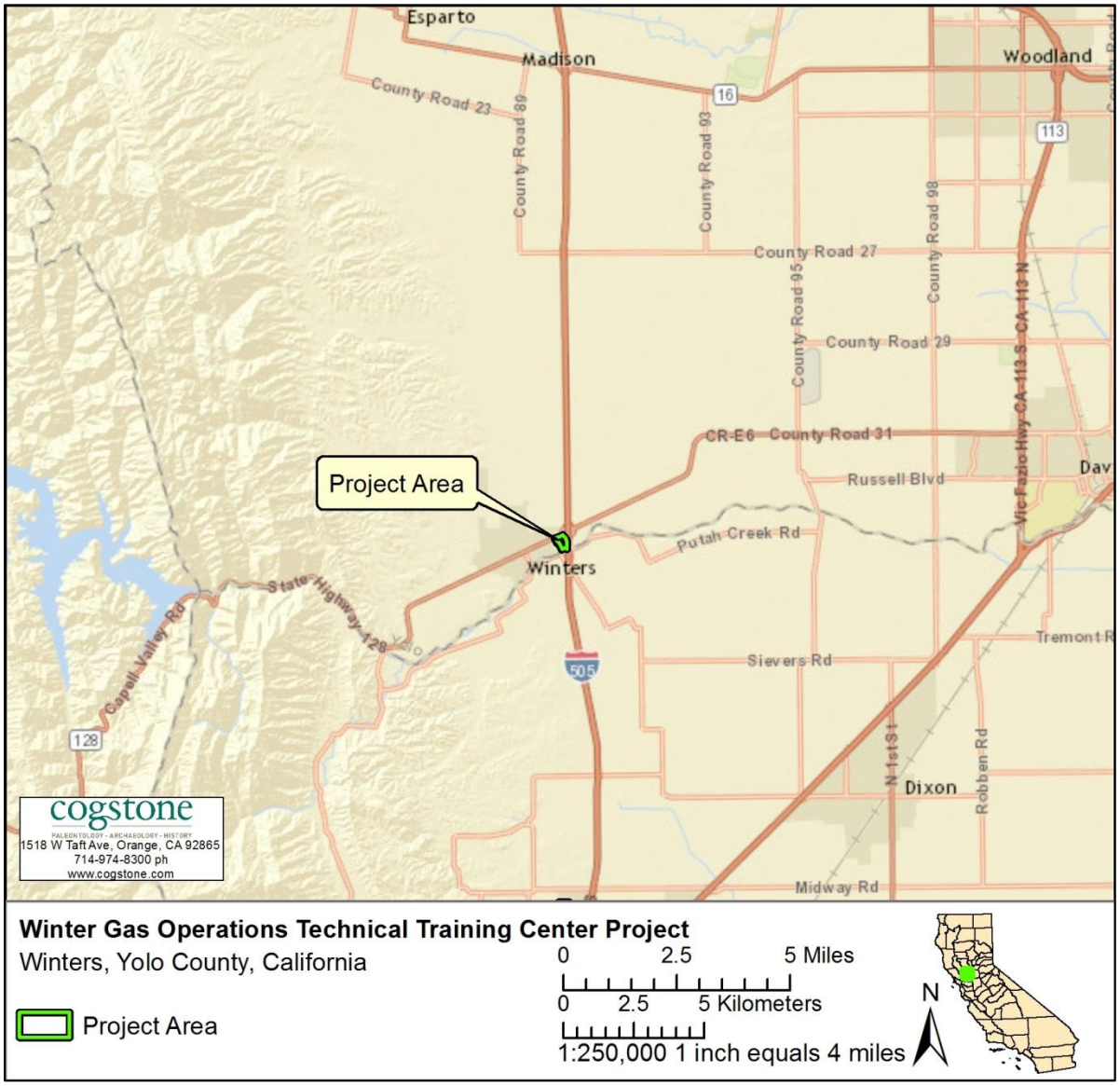

Figure 1. Project Vicinity

PROJECT DESCRIPTION

Pacific Gas and Electric Company (PG&E) proposes to install a Gas Operations Technical Training Center in the City of Winters, Yolo County, California. The proposed Project is on approximately 35.2-acres generally bounded by Interstate-505 to the east, Timber Crest Road to the east, East Grant Avenue to the north, and Putah Creek to the south. The Project is mapped on the United States Geological Survey (USGS) Winters 7.5 Minute topographic quadrangle map, in section 22, Township 8 North, Range 1 West of the Mt. Diablo Base Meridian (Figure 2).

The Project will involve construction of multiple buildings that will house offices, classrooms, laboratory, dining, and covered training space; outdoor excavation training, commercial driver training, and crane certification areas; at grade vehicle and equipment parking areas; utility village; service yard; a storm water pond in the southeastern portion of the Project area; and an interim storm water drainage channel along the western boundary of the Project area. Excavation for the storm water pond is expected to be approximately nine feet deep and remove 10,000 cubic yards (cy) of material. Excavation for the drainage channel is expected to be approximately six feet deep and remove ~18,000 cy of material. Due to the flat topography of the site, other construction activities for the project are expected to only require excavations between two and three feet in depth.

PROJECT PERSONNEL

Cogstone Resource Management Inc. (Cogstone) conducted the paleontological study. Sherri Gust served as the Principal Investigator for the project, supervised all work, and edited this report and prepared the recommendations. Gust is a Qualified Principal Paleontologist and Registered Professional Archaeologist. She has an M.S. in Anatomy (Evolutionary Morphology) from the University of Southern California, a B.S. in Anthropology from the University of California at Davis and over 34 years of experience in California.

Courtney Richards prepared portions of this report. Richards has an M.S. in Biological Sciences with an emphasis in Paleontology from Marshall University, a B.S. in Earth and Space Sciences from the University of Washington, and over 2 years of experience in California. André Simmons prepared the GIS report maps. Simmons has a B.A. in Anthropology from California State University, Fullerton, cross-training in paleontology and over three years of GIS experience. Qualifications of key project personnel are provided (Appendix A).

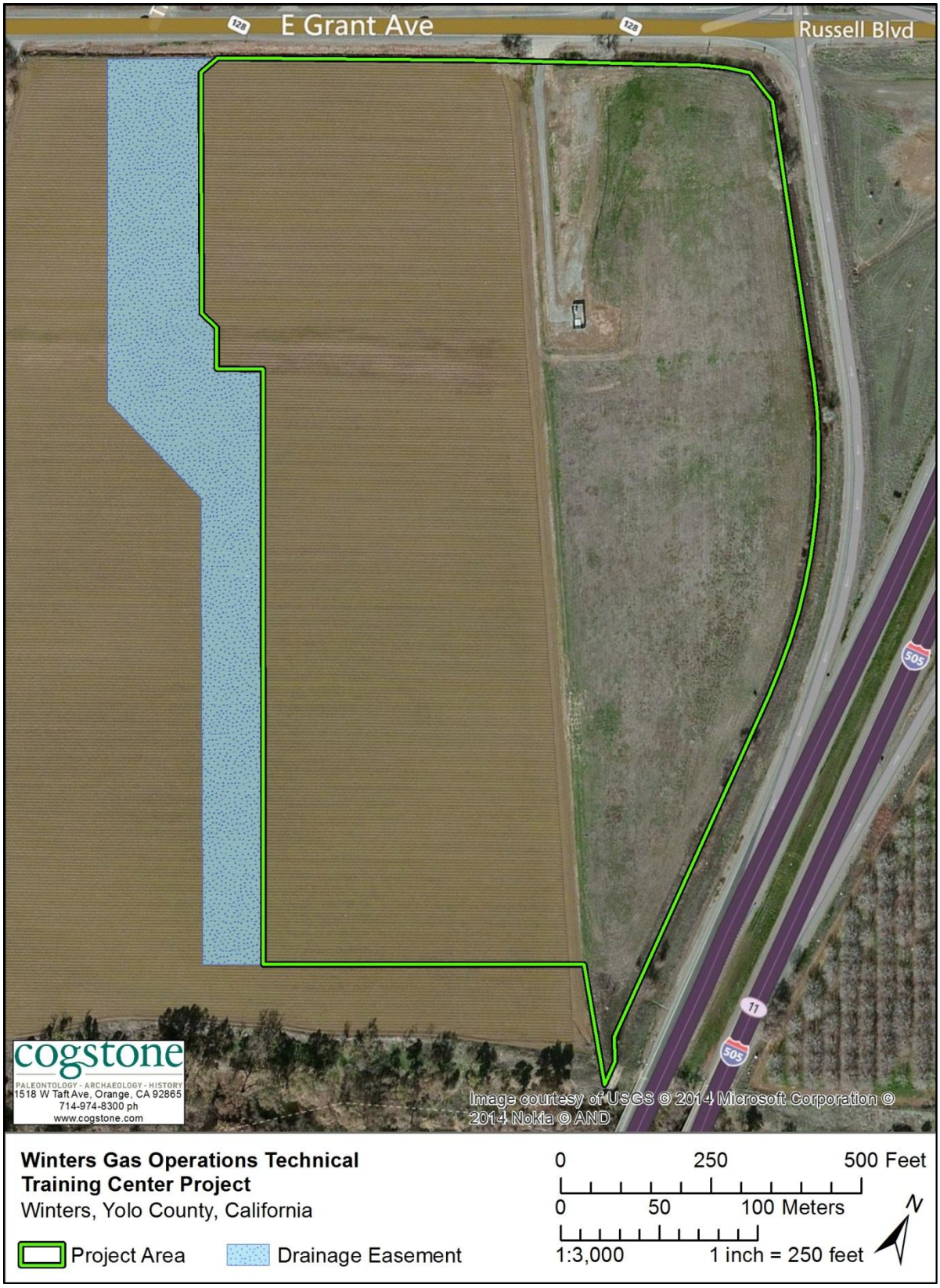

Figure 2. Location Map

REGULATORY ENVIRONMENT

This project is subject to state and local legislation and guidelines regarding paleontological resources. This protection covers all vertebrate fossils (animals with backbones) and any unique paleontological locality.

STATE LAWS AND REGULATIONS

CALIFORNIA ENVIRONMENTAL QUALITY ACT

California Environmental Quality Act (CEQA) (Chapter 1, Section 21002) states that: It is the policy of the state that public agencies should not approve projects as proposed if there are feasible alternatives or feasible mitigation measures available which would substantially lessen the significant environmental effects of such projects, and that the procedures required are intended to assist public agencies in systematically identifying both the significant effects of proposed projects and the feasible alternatives or feasible mitigation measures which will avoid or substantially lessen such significant effects. CEQA Guidelines (Article 1, Section 15002(a)(3)) states that CEQA is intended to: Prevent significant, avoidable damage to the environment by requiring changes in projects through the use of alternatives or mitigation measures when the governmental agency finds the changes to be feasible.

Paleontological resources are explicitly afforded protection by CEQA, specifically in Appendix G, Section V(c), which addresses the potential for adverse impacts to unique paleontological resources, sites, or geological features. Under CEQA, the treatment of paleontological resources is usually conducted in accordance with guidance from the Society for Vertebrate Paleontology, the Bureau of Land Management, United States Forest Services, or other agencies. Treatment usually consists of identification, assessment, and mitigation for potential impacts to significant paleontological resources.

PUBLIC RESOURCES CODE

Public Resources Code (PRC) Section 5097.5 states that no person shall knowingly and willfully excavate upon, or remove, destroy, injure or deface any historic or prehistoric ruins, burial grounds, archaeological or vertebrate paleontological site, including fossilized footprints, inscriptions made by human agency, or any other archaeological, paleontological or historical feature, situated on public lands, except with the express permission of the public agency having jurisdiction over such lands. Violation of this section is a misdemeanor. As used in this section, "public lands" means lands owned by, or under the jurisdiction of, the state, or any city, county, district, authority, or public corporation, or any agency thereof.

BACKGROUND

REGIONAL GEOLOGY

The project area is located in the Sacramento Valley within the Great Valley Geomorphic Province. The Great Valley Province is a long, narrow northwest-trending alluvial valley that lies between the Sierra Nevada Range to the east and the Coast Ranges to the west (Wagner 2002). The Sacramento Valley is located in the northern portion of the Great Valley and is bounded by the Klamath Mountains to the north and the Stockton Arch to the south. This region formed as a forearc basin during the subduction of the Pacific plate underneath the North American plate. Valley sediments range from Jurassic to Holocene in age and record a history of alternating marine and terrestrial depositional environments (McPherson and Garven 1999).

STRATIGRAPHY

The project area is mapped as undifferentiated late Pleistocene Modesto Formation and middle Pleistocene Riverbank Formation (Figure 3; Wagner et al. 1981). Although referred to as formations, these stratigraphic units are not lithostratigraphic formations, but allostratigraphic units in current usage (see North American Commission on Stratigraphic Nomenclature 1983). According to the geotechnical report for the Project, the upper two to three feet of sediment over the majority of the Project area consists of soils disturbed by agricultural activities. The geotechnical borings reveal that the Modesto and Riverbank sediments in the Project area primarily consist of fine grained sediments to depths of at least 20 feet (Wallace Kuhl & Associates 2014; pg. 4).

MODESTO FORMATION

Modesto Formation is described as late Pleistocene (126,000 – 11,700 years ago) river terrace deposits, which has been divided into an informal upper and lower member. Both members lack erosion as they are some of the most recent terrace deposits in the area. Although both members consist of clays, sands, silts, and gravels typical of river deposits, the lower member contains soils of the pedogenic unit B horizon (Blake et al. 1999). At the type section the Modesto Formation consists of lenticular beds of silt and sand which are commonly crossbedded, suggesting that the sediments represent coalescing alluvial fans (Davis and Hall 1959).

RIVERBANK FORMATION

The terrestrial Riverbank Formation was formed during the middle Pleistocene (781,000 to 126,000 years ago). It forms arkosic alluvial terraces and fans consisting of weathered, reddish gravel, sand and silt with some mafic igneous rock fragments. In the Sacramento Valley, the

Riverbank is broken into informal upper and lower members, which correspond with the upper and middle members of the San Joaquin Valley to the south (Helley and Harwood 1985).

The upper member of the Riverbank Formation is more widespread than the lower. It forms dissected, unconsolidated, dark-brown to red alluvial fans of gravel, sand, and silt with minor clay in the northwest and southeast regions of the Sacramento Valley. Like the upper member, the lower has exposures in the northwest and southeast areas of the valley, but is most extensive in and around the city of Sacramento. The lower member is more dissected and arkosic than the upper member and lacks clay (Helley and Harwood 1985). The Riverbank Formation is interpreted as glacial outwash from the Sierra Nevada Range (Atwater and Marchand 1980).

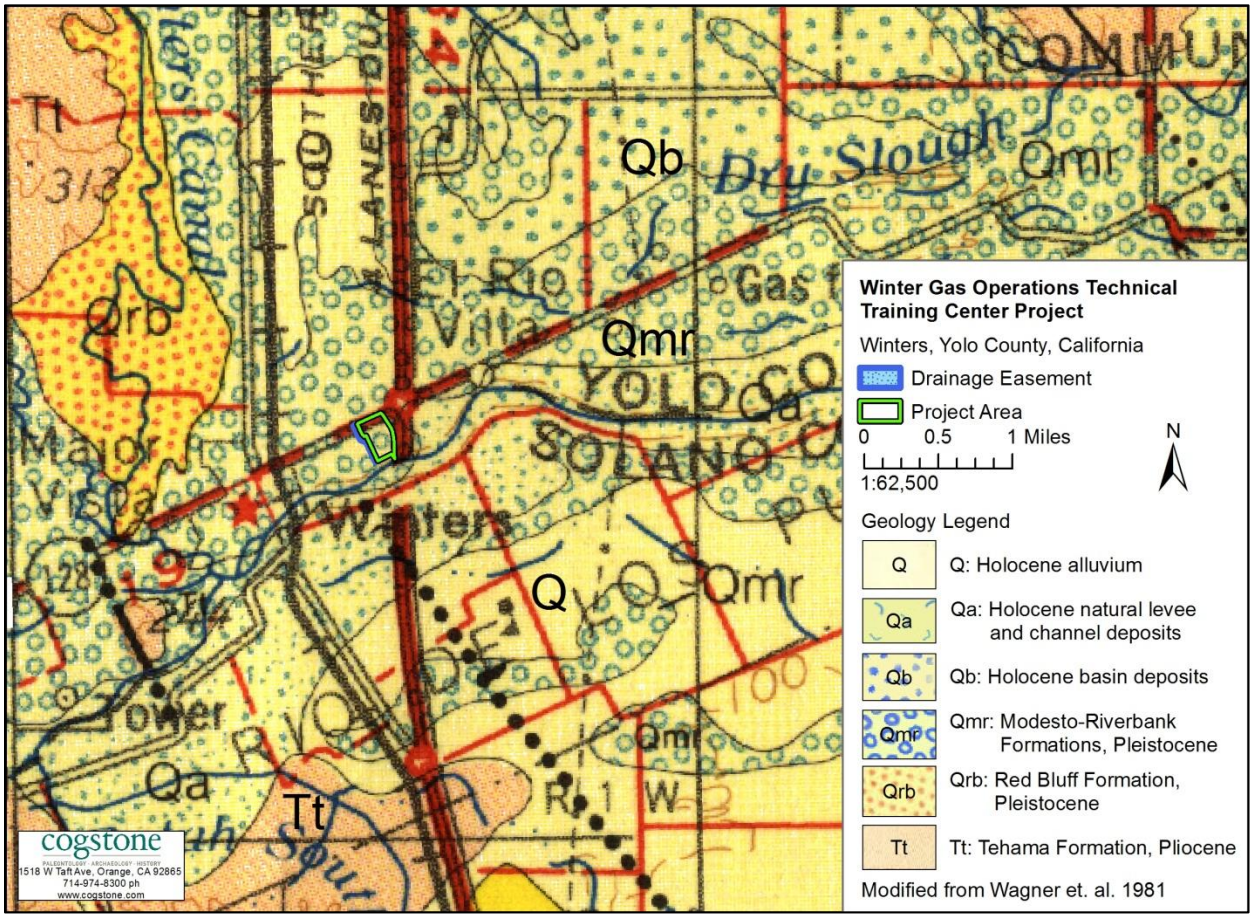

Figure 3. Project Geology

KNOWN RESOURCES

A paleontological records search of the Project area was conducted by the University of California, Museum of Paleontology (UCMP). UCMP replied via email that no fossils are known from the Project area or a one mile-radius. The closest recorded UCMP locality is located 3.5 miles north of the Project in the Pliocene (5.33-2.59 million years ago) Tehama Formation, which is not mapped in the Project area (Finger 2014). Cogstone conducted additional searches of the UCMP online database, Paleobiology Database, Sierra College, and in scientific journals, technical studies, and State geological survey reports pertaining to the paleontology and geology of the Winters area. These searches were also negative for specimens within the Project area. However, they revealed that Pleistocene vertebrate fossils have been recovered from similar sediments throughout the Sacramento Valley, including the banks of Putah Creek, which boarders the Project immediately to the south (UCMP 2014; PBDB 2014; SCPD 2014; Jefferson 1991; Dundas and Cunningham 1993).

Partial skeletons of two sloths (*Paramylodon harlani*) and a mammoth (*Mammuthus columbi*) were collected from the north bank of Putah Creek six miles to the east of the project area (UCMP V76199). This is one of six fossil localities located along the Creek in this area (UCMP V5430, V6911, V69182-V69184). In addition to mammoth and sloth material, a saber-toothed cat (*Smilodon*) canine was recovered from one of the Putah Creek localities (UCMP V5430; Dundas and Cunningham 1993; Jefferson 1991; UCMP 2014). Microfossils, including rodents (Rodentia) and snake (Serpentes), have also been recovered from the Modesto Formation in other parts of Yolo County (UCMP 2014). Depth of fossil recovery was not recorded with the exception of the sloth and mammoth material from UCMP V76199. That material was recovered from the bottom of the approximately 30 foot deep gully that Putah Creek is situated within (Dundas and Cunningham 1993).

PALEONTOLOGICAL SENSITIVITY

Paleontological resources are considered to be significant if they are scientifically judged to provide important data concerning key research interests in the study of taxonomy, evolution, biostratigraphy, paleoecology, or taphonomy (PG&E 2013). Best current professional practice to characterize paleontological sensitivity utilizes the federal Potential Fossil Yield Classification (PFYC) system (Appendix B) which has a multi-level scale based on demonstrated yield of fossils. Vertebrate fossils are known to occur intermittently but with low predictability in the Modesto and Riverbank Formations resulting in a PYFC ranking of 3a or moderate (Table 1).

Table 1. Potential Fossil Yield of Geological Deposits

PFYC ranking	5: very high	4: high	3a: moderate-patchy	3b: moderate-undemonstrated	2: low	1: very low
Rock Units						
Modesto Formation			X			
Riverbank Formation			X			

IMPACT ANALYSIS

DEFINITION OF SIGNIFICANCE FOR PALEONTOLOGICAL RESOURCES

Only qualified, trained paleontologists with specific expertise in the type of fossils being evaluated can determine the scientific significance of paleontological resources. Fossils are considered to be significant if one or more of the following criteria apply:

1. The fossil is a type specimen or member of a rare species;
2. The fossil is complete, or it includes an element different from, or more complete than, those already known for its species;
3. The fossils provide information on the evolutionary relationships and developmental trends among organisms, living or extinct;
4. The fossils provide data useful in determining the age(s) of the rock unit or sedimentary stratum, including data important in determining the depositional history of the region and the timing of geologic events therein;
5. The fossils provide data regarding the development of biological communities or interaction between paleobotanical and paleozoological biotas;
6. The fossils demonstrate unusual or spectacular circumstances in the history of life;
7. The fossils are unusually, uniquely, or exceptionally well preserved;
8. The fossils are in short supply and/or in danger of being depleted or destroyed by the elements, vandalism, or commercial exploitation, and are not found in other geographic locations.

As so defined, significant paleontological resources are determined to be fossils or assemblages of fossils that are scientifically judged to provide important data concerning key research interests in the study of taxonomy, evolution, biostratigraphy, paleoecology, or taphonomy (PG&E 2013; Scott and Springer 2003; Scott et al. 2004). Significant fossils can include remains of large to very small aquatic and terrestrial vertebrates or remains of plants and animals previously not represented in certain portions of the stratigraphy. Assemblages of fossils that might aid stratigraphic correlation, particularly those offering data for the interpretation of tectonic events, geomorphologic evolution, and paleoclimatology are also critically important (Scott and Springer 2003; Scott et al. 2004)

SIGNIFICANCE EVALUATION

The potential to impact any fossils varies with depth of impacts, previous disturbance, lithology and presence of non-fossiliferous sediments. Logistics of excavation also affect the possibility of recovering scientifically significant fossils since information on exact location, vertical elevation, rock unit of origin, and other aspects of context are critical.

Most earthmoving activities will be shallow, less than three feet deep, and will mostly be within sediments previously disturbed by agricultural activities. These excavations have little chance of impacting significant resources. Deeper excavations for the storm water pond and drainage channel have potential to yield fossils meeting significance criteria; especially if those excavations are more than eight feet deep.

CONCLUSIONS AND RECOMMENDATIONS

No paleontological resources are known within the Project or a one mile radius. However, similar Pleistocene sediments in the vicinity of the Project area, including the banks of Putah Creek, and throughout the Sacramento Valley have produced significant paleontological resources. Additionally, the geotechnical borings reveal that the Modesto and Riverbank sediments in the Project area primarily consist of fine grained sediments to depths of at least 20 feet (Wallace Kuhl & Associates 2014; pg. 4), which increases the chance of fossil preservation. Shallow excavations will not require paleontological monitoring. Deeper excavations, currently limited to the storm water pond and drainage channel, should be monitored if earthmoving activities are deeper than eight feet below the surface. Prior to the start of construction, earthmoving personnel should receive a paleontological sensitivity training detailing the types of fossils that may be encountered and procedures to follow if finds occur.

In the event that unanticipated paleontological resources are discovered during project construction activities, it is PG&E's best management practice that all work shall immediately be halted within 100 feet of the find until it can be evaluated by a Principal Paleontologist.

REFERENCES CITED

Atwater, B.F. and D.E. Marchand
1980 Preliminary maps showing Late Cenozoic deposits of the Bruceville, Elk Grove, Florin, and Galt, 7.5-minute quadrangles, Sacramento and San Joaquin Counties, California. U.S. Geological Survey Open-File Report OF-80-849.

Blake, M.C., D.S. Harwood, E.J. Helley, W.P. Irwin, A.S. Juyko, and D.L. Jones
1999 Geologic Map of the Red Bluff 30' x 60' Quadrangle, California. *United States Geological Survey Map* I-2542 (1:100,000 scale).

BLM
2009 Paleontological Resources Preservation Act. Online at: http://www.blm.gov/pgdata/etc/medialib/blm/wo/Planning_and_Renewable_Resources/coop_agencies/paleontology_library/paleon_legis.Par.45651.File.dat/PL-111-011-prpa.pdf

Davis, S. N. and F.R. Hall
1959 Water quality of eastern Stanislaus and northern Merced Counties, California. *Stanford University Publication*, Geological Science 6(1): 112.

Dundas, R. G. and L. M. Cunningham
1993 Harlan's Ground Sloth (*Glossotherium harlani*) and a Columbian Mammoth (*Mammuthus columbi*) from Stevenson Bridge, Yolo County, California. *PaleoBios* 15(3): 47-62.

Finger, K.
2014 University of California, Museum of Paleontology records search for the PG&E Winters Gas Training Facility Project, City of Winters, Yolo County, California. Email results on file at Cogstone, Orange.

Helley, E. J. and D. S. Harwood
1985 Geologic map of the late Cenozoic deposits of the Sacramento Valley and northern Sierran Foothills, California. *United States Geological Survey Miscellaneous Field Studies Map* MF-1790, (1:62,500 scale). Online at http://pubs.usgs.gov/mf/1985/1790/

Jefferson, G.T.
1991 A Catalogue of late Quaternary Vertebrates from California: Part two, Mammals. *Natural History Museum of Los Angeles Technical Report* #7.

McPherson, B. and G. Garven
1999 Hydrodynamics and overpressure mechanisms in the Sacramento Basin, California. American Journal of Science 299: 429-466.

PBDB
2014 Online database search of the Paleobiology Database.

PG&E
2013 Paleontological Resources Standards and Procedures. *Pacific Gas and Electric Company*. September 2013.

Scott, E. and K. Springer
2003 CEQA and fossil preservation in southern California. *The Environmental Monitor* Winter: 4-10, 17.

Scott, E., K. Springer, and J.C. Sagebiel
2004 Vertebrate paleontology in the Mojave Desert: the continuing importance of 'follow through' in preserving paleontologic resources, p. 65-70, in M. W. Allen and J. Reed (eds.), *The human journey and ancient life in California's Deserts: Proceedings from the 2001 Millennium Conference*. Maturango Museum Publication No. 15, Ridgecrest, California, USA.

SCPD
2014 Search of the Sierra College Paleontological Database.

UCMP
2014 Online database search with the University of California, Museum of Paleontology.

Wagner, D. L.
2002 California Geomorphic Provinces. *California Geologic Survey Note 36*. Website: http://www.consrv.ca.gov/cgs/information/publications/cgs_notes/note_36/note_36.pdf

Wagner, D. L., C.W. Jennings, T.L. Bedrossian, and E.J. Bortungo
1981 Geologic Map of the Sacramento Quadrangle, California. Scale 1.250,000. *California Division of Mines and Geology*.

Wallace Kuhl & Associates
2014 Geotechnical Engineering Report, PG&E Training Facility, Winters, California. Prepared for PG&E Corporate Real Estate, Strategy & Services.

APPENDIX A: QUALIFICATIONS

SHERRI GUST

Project Manager & Principal Investigator

EDUCATION

1994 M. S., Anatomy (Evolutionary Morphology), University of Southern California, Los Angeles
1979 B. S., Anthropology (Physical), University of California, Davis

SUMMARY QUALIFICATIONS

Gust has more than 34 years of experience in California, acknowledged credentials for meeting national standards, and is a certified/qualified principal archaeologist and paleontologist in all California cities and counties that maintain lists. Gust is an Associate of the Natural History Museum of Los Angeles County in the Vertebrate Paleontology and Rancho La Brea Sections. She is a Member of the Society of Vertebrate Paleontology, Society for Archaeological Sciences, Society for Historical Archaeology, the Society for California Archaeology and others. She has special expertise in the identification and analysis of human, animal and fossil bone.

SELECTED PROJECTS

Exposition Light Rail Transit Phase II, Exposition Rail Construction Authority/Los Angeles County Metropolitan Transportation Authority, sub to URS Corporation, Los Angeles. Conducted paleontological assessment, including a field survey, for the extension of the Expo Light Rail system for 8 miles from Culver City to Santa Monica involving construction of seven stations. Managed paleontological and archaeological monitoring during construction. Quaternary old alluvial fan sediments deposited during the middle to late Pleistocene, between 800,000 to 11,000 years ago, were present in about a third of the project alignment. A vertebrate fossil locality known within the alignment was updated with the Natural History Museum. Principal Archaeologist and Paleontologist. 2009-Present

Purple Line Extension (Westside Subway) Final EIS/EIR and Mitigation Plans, Los Angeles County Metropolitan Transportation Authority, Los Angeles. The project involves construction of seven stations from the existing Purple Line at Wilshire/Western Avenue along Wilshire Boulevard to the Veterans Administration Hospital in Westwood for 8.6 miles. Completed the paleontology section and prepared the Paleontological Mitigation Plan (PMP) for the Final EIS/EIR. Prepared a separate Paleontological Mitigation Plan and MOA with the Natural History Museum for the Wilshire/Fairfax Station Exploratory Shaft. Supervised paleontological monitoring during shaft excavation. Completed supplemental Archaeology and Architectural Survey Reports for the FEIS/EIR. Project Manager/Principal Paleontologist. 2011-Present

California State University, Long Beach, On-Call Archaeological Services, Long Beach, Los Angeles County. Manages archaeological archaeological and Native American monitoring tasks for California State University, Long Beach. Principal Investigator for Archaeology. 2011-present

Bloomington Affordable Housing, Related Companies, San Bernardino County Department of Land Use Services, San Bernardino County. The proposed project is to develop and construct a 196-unit affordable housing apartment complex and community amenities. Oversaw cultural and paleontological record searches, Native American Sacred Lands file search, consultation with Native American tribes and individuals, and pedestrian field survey of the nine-acre project area or area of potential effect. Principal Investigator. 2013

Arbor Green Affordable Housing Project, Affirmed Housing Group, Carson, Los Angeles County. Provided project supervision and quality control during archaeological mitigation monitoring and prepared portions of Cultural Resources Monitoring Compliance Report. Arbor Green consists of a 40-unit, three-story affordable family housing development on a 1-acre parcel. Principal in Charge. 2013

Fort Irwin, U.S. Army National Training Center/GSA Region 9, San Bernardino County. Cultural Resources Inventory Survey and National Register Evaluation of Archaeology Sites. Supervised cultural resources inventory of 58 sq. km east of Goldstone in four survey blocks. Prepared overview of literature, research design and field evaluation guidelines. Directed survey, site recording and site evalution to Section 106 standards. Principal Investigator/Project Manager. 2012-2013

COURTNEY RICHARDS

Paleontologist and Assistant Field Director

EDUCATION

2011	M.S., Biological Sciences, Marshall University
2006	B.S., Earth and Space Science, University of Washington

SUMMARY QUALIFICATIONS

Richards is a qualified paleontologist with research, field, and laboratory experience. She earned her Bachelor's degree in Earth and Space Science at the University of Washington and her Master's degree in Biological Sciences with a paleontology focus at Marshall University. Richards has published papers on dinosaur and marine reptile paleontology research. Richards has personal expertise in fossil salvage, stratigraphy, fossil preparation, database analysis and identification. She has over two years of professional experience in California.

SELECTED PROJECTS

Purple Line Extension (Westside Subway), Exploratory Shaft, Los Angeles County Metropolitan Transportation Authority, Los Angeles. Assistant Field Director. Supervised and conducted paleontological monitoring and recorded stratigraphy during pre-construction drilling and excavation to a depth of 75' for a 36' by 18' exploratory shaft located in the La Brea Zone. 2012-present

SR 91 HOV Project, Caltrans District 8, Riverside County. Paleontology Technician. Performed paleontological monitoring of sensitive sediments during HOV lane construction along a 6-mile segment of SR-91 in Riverside County. 2012-present

SANDAG San Diego River Bridge Double Track Project, San Diego County. Paleontology Technician. Conducted a pedestrian survey and co-authored the subsequent paleontological technical report for the proposed construction of a new double track bridge across the San Diego River and the alignment of the track to each side of the bridge along a 1.1-mile long segment of the LOSSAN railroad corridor. 2013

Pioneer High School Project, Los Angeles County. Report Contributor. Prepared paleontology and geology sections of a combined archaeological and paleontological resources assessment report for a stadium improvement project at Pioneer High School in Whittier, CA. 2013

East San Fernando Valley Transit Corridor, Los Angeles County Metropolitan Transportation Authority, Los Angeles County. Paleontology Technician. Conducted a paleontological survey; co-authored paleontological assessment and existing condition reports for Metro's proposed project to construct a light railway and new bus lines from Sylmar to Sherman Oaks in the eastern portion of the San Fernando Valley. 2012-present

Jackson Valley Rehabilitation Project, Caltrans District 10, Amador County. Paleontology Technician. Performed paleontological monitoring of sensitive sediments during road widening along SR-88 near Ione, CA and co-authored the Paleontological Mitigation Plan and final monitoring report. 2012-2013

Merced Freeway Project, Caltrans District 10. Assistant Field and Lab Director. Alternated 2 week rotations performing direction of fossil recovery and field preparation of fossils for 5-mile segment of State Route 99 south of Merced. Some 128 localities and 1667 fossils recovered in five months of excavation for detention basins. Prepared fossils in lab and supervised matrix washing and microfossil sorting. Contributed to final report including preparation of stratigraphic columns. 2012.

ANDRÉ-JUSTIN C. SIMMONS
Archaeologist and Cross-Trained Paleontologist

EDUCATION

2010 B.A., Anthropology and History, California State University, Fullerton, graduated *cum laude*

2007 A.A., History, Citrus College, Glendora, CA

SUMMARY QUALIFICATIONS

Mr. Simmons is a qualified archaeologist and cross-trained paleontologist with experience in survey, monitoring, faunal analysis, excavation, and laboratory preparation and analysis. His key research interests include architecture and use of space among Paleoindians, the American Southwest, early historic and prehistoric California, and historical Mexico. He is GIS proficient and assists with digitizing and mapping with the use of advanced Trimble software. Simmons has more than 24 hours of paleontology training and has more than three years of experience as an archaeological and paleontological monitor for Cogstone.

SELECTED PROJECTS

Exposition Light Rail Phase 2 Project, Los Angeles County. Archaeology & Paleontology Technician. Conducted archaeological and paleontological monitoring along a 6.6-mile segment of the historic electric railroad known as the Santa Monica Air Line that is being replaced with a new light rail line. 2012-present

SR 91 HOV Project, Caltrans District 8, Riverside County. Paleontology Technician. Conducted paleontological monitoring of sensitive sediments during HOV lane construction along a 6 mile segment of State Route 91 in the City of Riverside. 2013-present

Vista Monitoring Project, San Diego County. Archaeological & Paleontological Technician. Conducted archaeological and paleontological monitoring during excavation for a new low income housing development located in Vista. 2014

Pioneer High School Project, Los Angeles County. GIS & Archaeology Technician. Conducted a cultural resources records search, prepared GIS maps, and authored a resources assessment report for a stadium improvement project at Pioneer High School in Whittier. 2013

SANDAG San Diego River Bridge Double Track Project, San Diego County. GIS & Archaeology Technician. Conducted a pedestrian survey and prepared GIS report maps for the proposed construction of a new double track bridge across the San Diego River and the alignment of the track to each side of the bridge along a 1.1-mile long segment of the LOSSAN railroad corridor. 2013

Jackson Avenue Bridge Project, Riverside County. Archaeology & Paleontology Technician. Conducted cultural and paleontological monitoring during construction of a new bridge traversing Warm Springs Creek in the City of Murrieta, pursuant to the mitigation measures listed in the Mitigated Negative Declaration and associated Mitigation Monitoring Plan for the Project. 2013.

Avalon Matsu Residential Development Project, Los Angeles County. Archaeology & Paleontology Technician. Conducted archaeological and paleontological resources mitigation monitoring during excavation for a residential condominium development project located on a 1.7-acre parcel in the City of Carson. 2013

WECC Path 42, Southern California Edison, Riverside County. GIS**,** Archaeology & Paleontology Technician. Created GIS maps and conducted a cultural resources records search and field survey for a 14.5 mile transmission line segment near Thousand Palms. 2012-2013

Eldorado-Ivanpah Transmission Project, Southern California Edison, Eldorado, NV to Ivanpah, CA. Paleontological Technician. Performed paleontological monitoring for project that involves construction of 195 miles of new transmission lines and associated fiber optic lines across BLM and private lands. 2012-2013

APPENDIX B. POTENTIAL FOSSIL YIELD CLASSIFICATION SYSTEM

POTENTIAL FOSSIL YIELD CLASSIFICATION SYSTEM

The Potential Fossil Yield Classification System **(**PFYC) System was developed by the United States Department of Agriculture (USDA) Forest Service and refined by the BLM (2007). It is utilized here as a best professional practice. Occurrences of paleontological resources are closely tied to the geologic units (i.e., formations, members, or beds) that contain them. The probability for finding paleontological resources can be broadly predicted from the geologic units present at or near the surface. Therefore, geologic mapping can be used for assessing the potential for the occurrence of paleontological resources.

Using the PFYC 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 class number indicating a higher potential. This classification is applied to the geologic formation, member, or other distinguishable unit, preferably at the most detailed mapable level. It is not intended to be applied to specific paleontological localities or small areas within units. Although significant localities may occasionally occur in a geologic unit, a few widely scattered important fossils or localities do not necessarily indicate a higher class; instead, the relative abundance of significant localities is intended to be the major determinant for the class assignment.

The PFYC system is meant to provide baseline guidance for predicting, assessing, and mitigating paleontological resources. The classification should be considered at an intermediate point in the analysis, and should be used to assist in determining the need for further mitigation assessment or actions.

The descriptions for the classes below are written to serve as guidelines rather than as strict definitions. Knowledge of the geology and the paleontological potential for individual units or preservational conditions should be considered when determining the appropriate class assignment. Assignments are best made by collaboration between land managers and knowledgeable researchers.

CLASS 1 – VERY LOW. Geologic units that are not likely to contain recognizable fossil remains. The probability for impacting any fossils is negligible. Assessment or mitigation of paleontological resources is usually unnecessary. The occurrence of significant fossils is non-existent or extremely rare. This class includes:

- Units that are igneous or metamorphic, excluding reworked volcanic ash units.
- Units that are Precambrian in age or older.

Class 1 Management notes:

(1) Management concern for paleontological resources is generally low.
(2) Assessment or mitigation is usually unnecessary except in rare or isolated circumstances.

CLASS 2 – LOW. Sedimentary geologic units that are not likely to contain vertebrate fossils or scientifically significant nonvertebrate fossils. The probability for impacting vertebrate fossils or scientifically significant invertebrate or plant fossils is low. Assessment or mitigation of paleontological resources is not likely to be necessary. Localities containing important resources may exist, but would be

rare and would not influence the classification. These important localities would be managed on a case-by-case basis. This class includes:

- Vertebrate or significant invertebrate or plant fossils not present or very rare.
- Units that are generally younger than 10,000 years before present.
- Recent aeolian deposits.
- Sediments that exhibit significant physical and chemical changes (i.e., diagenetic alteration).

Class 2 Management notes:

(1) Management concern for paleontological resources is generally low.
(2) Assessment or mitigation is usually unnecessary except in rare or isolated circumstances.

CLASS 3 – MODERATE OR UNKNOWN. Fossiliferous sedimentary geologic units where fossil content varies in significance, abundance, and predictable occurrence; or sedimentary units of unknown fossil potential. This classification includes a broad range of paleontological potential. It includes geologic units of unknown potential, as well as units of moderate or infrequent occurrence of significant fossils. Management considerations cover a broad range of options as well, and could include pre-disturbance surveys, monitoring, or avoidance. Surface-disturbing activities will require sufficient assessment to determine whether significant paleontological resources occur in the area of a proposed action, and whether the action could affect the paleontological resources. These units may contain areas that would be appropriate to designate as hobby collection areas due to the higher occurrence of common fossils and a lower concern about affecting significant paleontological resources. This class includes:

- Formations with sporadic known occurrences of vertebrate fossils - often marine in origin.
- Vertebrate fossils and scientifically significant invertebrate or plant fossils known to occur intermittently; predictability known to be low.
- Poorly studied and/or poorly documented formations. Potential yield cannot be assigned without ground reconnaissance.

Class 3 Management notes:

(1) Management concern for paleontological resources is moderate; or cannot be determined from existing data.
(2) Surface-disturbing activities may require field assessment to determine appropriate course of action.

CLASS 3A – MODERATE POTENTIAL. Units are known to contain vertebrate fossils or scientifically significant nonvertebrate fossils, but these occurrences are widely scattered. Common invertebrate or plant fossils may be found in the area, and opportunities may exist for hobby collecting. The potential for a project to be sited on or impact a significant fossil locality is low, but is somewhat higher for common fossils.

CLASS 3B – UNKNOWN POTENTIAL. Units exhibit geologic features and preservational conditions that suggest significant fossils could be present, but little information about the paleontological resources of the unit or the area is known. This may indicate the unit or area is poorly studied, and field surveys may uncover significant finds. The units in this Class may eventually be placed in another Class when

sufficient survey and research is performed. The unknown potential of the units in this Class should be carefully considered when developing any mitigation or management actions.

CLASS 4 – HIGH. Geologic units containing a high occurrence of significant fossils. Vertebrate fossils or scientifically significant invertebrate or plant fossils are known to occur and have been documented, but may vary in occurrence and predictability. Surface disturbing activities may adversely affect paleontological resources in many cases. The probability for impacting significant paleontological resources is moderate to high, and is dependent on the proposed action. Mitigation considerations must include assessment of the disturbance, such as removal or penetration of protective surface alluvium or soils, potential for future accelerated erosion, or increased ease of access resulting in greater looting potential. If impacts to significant fossils can be anticipated, on-the-ground surveys prior to authorizing the surface disturbing action will usually be necessary. On-site monitoring or spot-checking may be necessary during construction activities. This class includes:

- Extensive soil or vegetative cover; bedrock exposures are limited or not expected to be impacted.
- Areas of exposed outcrop are smaller than two contiguous acres.
- Outcrops from cliffs of sufficient height and slope so that impacts are minimized by topographic conditions.
- Other characteristics are present that lower the vulnerability of both known and unidentified paleontological resources.

Class 4 Management notes:

(1) Management concern for paleontological resources in Class 4 is moderate to high, depending on the proposed action.
(2) A field survey by a qualified paleontologist is often needed to assess local conditions.
(3) Management prescriptions for resource preservation and conservation through controlled access or special management designation should be considered.
(4) Class 4 and Class 5 units may be combined as Class 5 for broad applications, such as planning efforts or preliminary assessments, when geologic mapping at an appropriate scale is not available. Resource assessment, mitigation, and other management considerations are similar at this level of analysis, and impacts and alternatives can be addressed at a level appropriate to the application.

CLASS 4A – HIGH AND EXPOSED. Unit is exposed with little or no soil or vegetative cover. Outcrop areas are extensive with exposed bedrock areas often larger than two acres. Paleontological resources may be susceptible to adverse impacts from surface disturbing actions. Illegal collecting activities may impact some areas.

CLASS 4B – HIGH AND UNEXPOSED. These are areas underlain by geologic units with high potential but have lowered risks of human-caused adverse impacts and/or lowered risk of natural degradation due to moderating circumstances. The bedrock unit has high potential, but a protective layer of soil, thin alluvial material, or other conditions may lessen or prevent potential impacts to the bedrock resulting from the activity.

CLASS 5 – VERY HIGH. Highly fossiliferous geologic units that consistently and predictably produce vertebrate fossils or scientifically significant invertebrate or plant fossils, and that are at risk of human-caused adverse impacts or natural degradation. The probability for impacting significant fossils is high. Vertebrate fossils or scientifically significant invertebrate fossils are known or can reasonably be expected to occur in the impacted area. On-the-ground surveys prior to authorizing any surface disturbing activities will usually be necessary. On-site monitoring may be necessary during construction activities. This class includes:

- Extensive soil or vegetative cover; bedrock exposures are limited or not expected to be impacted.
- Areas of exposed outcrop are smaller than two contiguous acres.
- Outcrops from cliffs of sufficient height and slope so that impacts are minimized by topographic conditions.
- Other characteristics are present that lower the vulnerability of both known and unidentified paleontological resources.

Class 5 Management notes:

(1) Management concern for paleontological resources in Class 5 areas is high to very high.
(2) A field survey by a qualified paleontologist is usually necessary prior to surface disturbing activities or land tenure adjustments. Mitigation will often be necessary before and/or during these actions.
(3) Official designation of areas of avoidance, special interest, and concern may be appropriate.

CLASS 5A – VERY HIGH AND EXPOSED. Unit is exposed with little or no soil or vegetative cover. Outcrop areas are extensive with exposed bedrock areas often larger than two contiguous acres. Paleontological resources are highly susceptible to adverse impacts from surface disturbing actions. Unit is frequently the focus of illegal collecting activities.

CLASS 5B – VERY HIGH AND UNEXPOSED. These are areas underlain by geologic units with very high potential but have lowered risks of human-caused adverse impacts and/or lowered risk of natural degradation due to moderating circumstances. The bedrock unit has very high potential, but a protective layer of soil, thin alluvial material, or other conditions may lessen or prevent potential impacts to the bedrock resulting from the activity. [BLM 2007]