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January 14, 2019

Greg Lamberg
Compliance Manager
W Power
650 Bercut Drive, Suite A
Sacramento, CA 95811

SUBJECT: Stanton Energy Reliability Center (16-AFC-01C), PAL-3, Paleontological Resources Mitigation and Monitoring Program (PRMMP)

Dear Mr. Lamberg,

In accordance with PAL-3, the CPM has reviewed and approved the Paleontological Resources Mitigation and Monitoring Plan (PRMMP). If you have any questions or concerns, please contact John Heiser, Compliance Project Manager, at (916) 653-8236, or by fax to (916) 654-3882, or via e-mail at John.Heiser@energy.ca.gov.

Sincerely,

John Heiser
Compliance Office Manager
Siting, Transmission, & Environmental Protection Division

CONDITION OF CERTIFICATION PAL-3

Stanton Energy Reliability Center (16-AFC-01)

Paleontological Resources Mitigation and Monitoring Plan

Prepared for
California Energy Commission

November 2018

PALEO WEST archaeology
Orange County Office
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The undersigned is the primary author of this document:

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Accepted by Stanton Energy Reliability Center, LLC

Kara Miles
President, Stanton Energy Reliability Center, LLC

Contents

Acronyms and Abbreviations

bgs	below ground surface
CEC	California Energy Commission
CEQA	California Environmental Quality Act
COC	Condition of Certification
CPM	Compliance Project Manager
CTG	combustion turbine generator
DAR	Daily Activity Report
DOI	U.S. Department of the Interior
EPA	U.S. Environmental Protection Agency
GE	General Electric International, Inc.
LORS	Laws, ordinances, regulations, and standards
MCR	Monthly Compliance Report
MW	megawatt(s)
PFYC	Potential Fossil Yield Classification System
PRM	Paleontological Resources Monitor
PRMMP	Paleontological Resources Monitoring and Mitigation Plan
Project	Stanton Energy Reliability Center
PRPA	The Paleontological Resources Preservation Act
PRR	Paleontological Resources Report
PRS	Paleontological Resources Specialist
SCE	Southern California Edison
SERC	Stanton Energy Reliability Center
STG	steam turbine generator
SVP	Society of Vertebrate Paleontology
WEAP	Worker Environmental Awareness Program

SECTION 1

Purpose and Background

Stanton Energy Reliability Center, LLC (SERC) has prepared this Paleontological Resources Monitoring and Mitigation Plan (PRMMP) for the Stanton Energy Reliability Center (SERC) in the City of Stanton, Orange County, California. This PRMMP has been prepared in accordance with Condition of Certification (COC) PAL-3 in the California Energy Commission's (CEC) SERC Final Decision.[1] The purpose of this PRMMP is to identify mitigation, monitoring, and compliance measures related to paleontological resources to ensure compliance with COC PAL-3 (see Appendix A). SERC agrees with and, when approved by CEC, will implement this PRMMP to satisfy the requirements of PAL-3.

This PRMMP has been developed in accordance with the guidelines of the Society of Vertebrate Paleontology (SVP) (SVP, 2010) and with those requirements identified in Section 3, Laws, Ordinances, Regulations, and Standards (LORS). This PRMMP has been prepared to address all ground disturbing activities associated with the SERC, including remediation, construction and operation.

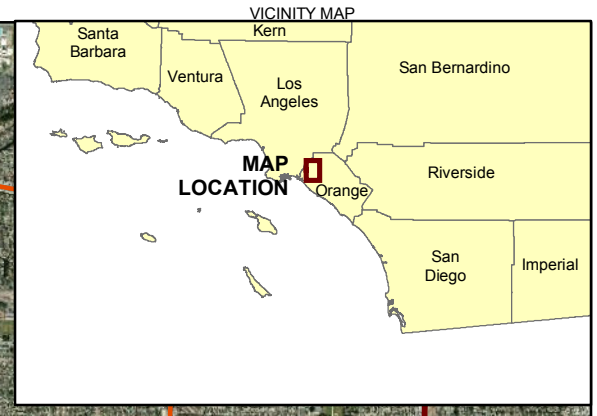
1.1 Project Location and Description

The SERC will be constructed at 10711 Dale Avenue in Stanton, Orange County, California (Figure 1) The project site is within an area zoned industrial, and it is located on two parcels with an approximate 3.98 combined acreage. It is on the Los Angeles coastal plain, approximately 68 feet above mean sea level. The proposed project site is bounded to the north by a vacant lot that serves as a Southern California Edison (SCE) transmission line right-of-way and commercial/light industrial uses; to the east by Dale Avenue and the SCE Barre Peaker power plant and, beyond that, SCE Barre Substation; to the south by Union Pacific Railroad tracks and a commercial storage facility; and to the west by the City of Stanton Corporation Yard.

[1] [INSERT hyperlink to SERC Final Decision]

PROJECT MAP

VICINITY MAP



Source: Esri World Imagery

LEGEND

- Generator Tie-Line
- Natural Gas Pipeline Route
- Project Site

0 0.5 1
Miles

N

Figure 1
Project Location - SERC and offsite Linears
Stanton Energy Reliability Center AFC
Stanton, California

The energy reliability facility will consist of two Hybrid EGT™ General Electric [GE] LM6000-based Electric Gas Turbines (Hybrid EGT™ refers to the LM6000 PC Hybrid EGT, jointly developed by General Electric International, Inc., and Wellhead Power Solutions). The EGT combines a combustion gas turbine generator with a 10 megawatt (MW) integrated battery storage component through a proprietary software system. Stanton will also feature technology that allows the facility to provide synchronous condensing capabilities for voltage support to the electrical grid when needed. SERC will be a nominal 98-MW natural gas-fired EGT plant consisting of the two LM6000 PC natural gas-fired combustion turbine generators (CTGs) and related facilities, with integrated batteries for hybrid operation and clutch gears for synchronous condenser operation. Project elements include the generation equipment, battery array, and interconnections, including offsite linears to natural gas, municipal water supply, and the electrical grid.

A two-battery, 10-MW/5-MW lithium-ion energy storage system will be installed at the SERC site. The system will be operated in conjunction with the power generation plant using the proprietary Hybrid EGT technology, jointly developed by Wellhead and GE. The storage system will consist of three main components: batteries, inverters, and Balance of Plant equipment (e.g., step-up transformers and site controller). Each set of batteries will be installed in a purpose-built battery enclosure to meet safety requirements including providing secondary containment. The function of the energy storage system is to enable the EGT to be used for greenhouse gas–free operating reserve, able to change frequency and voltage regulation. Each CTG is designed to start and ramp up to achieve full capacity within 10 minutes. This fast-start capability is designed to meet the needs of the grid, which is rapidly becoming increasingly dependent on intermittent renewable resources. Each Hybrid EGT also provides various ancillary services, such as spinning reserve, allowing Stanton to readily adapt to changing conditions in the energy and ancillary services markets.

As an energy reliability facility, the SERC is expected to operate during periods of increased need on the grid, such as during times of high electrical load, during periods when the availability of renewable energy generation fluctuates, when baseload plants are offline, or during emergencies. Additional project elements are as follows:

- Interconnection to SCE's Barre Substation via a 0.35-mile-long underground generator tie-line that runs from the SERC site east to the substation
- Natural gas pipeline connection via a new 10- or 12-inch-diameter pipe that will extend 2.75 miles north along Dale Avenue to Southern California Gas Company's Line 1014 in La Palma Avenue
- Process and potable water supply from Golden State Water Company via connections in Dale Avenue and Pacific Street
- Industrial wastewater from facility operations would be discharged to the adjacent sanitary sewer through an agreement with the city of Stanton. Storm water runoff would be treated by low impact development treatment measures such as a filtration basin, source control methods, and/or biofiltration measures prior to its discharge to the Stanton Storm Water Canal, which drains into the Bolsa Chica Channel and, ultimately, to the Pacific Ocean. Temporary construction facilities will include a 2.89-acre worker parking area at the Bethel Romanian Pentecostal Church, 350 feet south of the SERC site, along Dale Avenue.
- The construction laydown area for the gas-fired power plant will be Parcel 2, site of the battery storage system. The battery storage system is to be constructed after construction of the gas turbine facilities is completed.

Project Implementation Schedule

Construction activities at the project site are anticipated to take place from the first quarter of 2019 to the first quarter of 2020. All construction equipment and supplies will be trucked directly to the project site laydown areas.

Construction of the generating facility from site preparation and grading to commissioning and commercial operation is expected to take place from January 2019 to February 2020 (approximately 14 months total). Major project milestones are listed in Table 2-1.

Table 2-1. Major Project Milestones

Activity	Date
Begin construction	January 2, 2019
Startup and test and commissioning	December 15, 2019
Commercial operation	February 26, 2020

During construction, there will be an average and peak workforce of 30 and 60, respectively, of construction craft people and supervisory, support, and construction management personnel on-site. Typically, construction will be scheduled to occur between 7 a.m. and 8 p.m. on weekdays and Saturdays. Additional hours may be necessary to make up schedule deficiencies or to complete critical construction activities (e.g., pouring concrete at night during hot weather, and working around time-critical shutdowns and constraints). During some construction periods and during the startup phase of the project, some project activities will occur 24 hours per day, 7 days per week. However, in accordance with the City of Stanton Noise Ordinance, noisy construction work will not take place on Sundays or federal holidays, or between 8 p.m. and 7 a.m., Monday through Saturday.

SECTION 3

Geology and Paleontological Sensitivity

The physiography and geology of the project area were thoroughly reviewed, and the results were presented in detail in Section 5.8, *Paleontological Resources*, of the SERC *Application for Certification, Volume 1* (SERC, 2016). The SERC lies on the relatively flat coastal plain of the Los Angeles Basin, about 6.5 miles west of the course of the Santa Ana River and 2 miles south of the fault zone running along the base of the Coyote Hills. The Coyote Hills are the nearest area designated as paleontologically sensitive by the County of Orange (2005, pp. VI–113). The project site is currently used for commercial and light-industrial purposes or undeveloped, and a layer of disturbed sediment and fill covers the entire area proposed for the generation station. Below this fill, late Holocene-age alluvial fan deposits have been documented (Morton, 2004).

3.1 Disturbed Sediment/Artificial Fill

The project site is covered by development, disturbed sediment, and artificial fill (SERC, 2016; CEC, 2018). This cover extends to varying depth in the project area; in some areas (e.g., disturbed sediment covering underground utilities or storage tanks) the cover may extend to depths greater than 10 ft below ground surface (bgs). In other areas, it is likely to be restricted to depths of 5 ft or less. While fossil material can be encountered in this material, they would be out of stratigraphic context and likely damaged and, therefore, not scientifically important. This sediment, therefore, has no paleontological sensitivity.

3.2 Quaternary Alluvial Deposits

Younger Quaternary Alluvium – Below artificial fill, Holocene-age alluvial fan deposits have been mapped (Qyf_a and Qyf_{sa}) (and, therefore, have low paleontological sensitivity. It is assumed that this material extends to a depth of 10 ft (3 m). Below this depth, early Holocene- to Pleistocene-age alluvium is likely to occur. Scientifically important fossils *have* been found in Pleistocene-age alluvium in this region (Los Angeles Metro, 2000; Morton, 2004). Geological mapping of the project area (Morton, 2004) shows that within 2 miles of the laterals and plant site, only younger Quaternary alluvium is found. These younger alluvial sediments are the product of axial stream deposition from the ancestral Santa Ana River and of debris flows issuing from the Coyote Hills to the north. Because most of the sediment being stripped from the hills is relatively unconsolidated, this alluvium is only marginally distinguishable from younger axial channel deposits (Qy_{sa}) that are also mapped in the area, although not within the project's area of potential effect to paleontological resources (Morton, 2004). Other geological units lie over 2 miles from the project area, including its offsite linears.

Older Quaternary Alluvium – Below the artificial fill and younger Quaternary alluvium, it is assumed that older Quaternary alluvium can be found (CEC, 2018). These sediments at depth possess unknown paleontological sensitivity, and deeper excavations (greater than 10 feet) at the SERC project site may encounter them.

3.3 Paleontological Sensitivity

Artificial fill and younger Quaternary alluvial units (Qyf_a, Qyf_{sa}) have no to low paleontological sensitivity. Fill is earth and debris not in primary context, and it does not yield scientifically important fossils. Late Holocene-age sediments are too young to yield fossils that are conventionally considered scientifically important (Miller, 1971; SVP, 2010), although not in the immediate vicinity of the project. It is assumed that this older, Pleistocene-age alluvium underlies the project area. Further, sediments associated with

river deposits (and particularly over-bank deposits) may preferentially preserve fossil remains. Given the wider record and the fact that these fine-grained sediments represent an environment in which fossils may be preserved, older alluvial units expected at depth possess undetermined and potentially high paleontological sensitivity.

SECTION 4

Laws, Ordinances, Regulations, and Standards

4.1 Federal Laws, Ordinances, Regulations, and Standards

Paleontological resources are protected by several federal regulations, including Subtitle D of the Omnibus Public Land Management Act of 2009 (123 STAT. 1172), entitled *Paleontological Resources Preservation* and sometimes called The Paleontological Resources Preservation Act (PRPA). The PRPA provides direction to the U.S. Departments of the Interior (DOI) and Agriculture regarding paleontological resources ownership and management responsibilities. Guidance for implementing the PRPA have been developed and promulgated by the affected agencies, particularly with respect to assessing the scientific and educational significance of fossils on federal land. The Potential Fossil Yield Classification System (PFYC) (DOI, 2016) supersedes and clarifies an earlier version of that guidance (DOI, 2007), and it informs the mitigation measures developed for this project.

Additional federal legislative protection for paleontological resources stems from the Antiquities Act of 1906 (PL 59-209; 16 United States Code 431 et seq.; 34 Stat. 225), which calls for protection of historic landmarks, historic and prehistoric structures, and other objects of historic or scientific interest on federal lands. In addition, the National Environmental Policy Act of 1969 (United States Code, Section 4321 et seq.; 40 Code of Federal Regulations, Section 1502.25), as amended, requires analysis of potential environmental impacts to important historic, cultural, and natural aspects of our national heritage.

4.2 State Laws, Ordinances, Regulations, and Standards

The CEC environmental review process under the Warren-Alquist Act is considered functionally equivalent to that of the California Environmental Quality Act (CEQA) (Public Resources Code Sections 21000 et seq.). CEQA requires that public agencies and private interests identify the environmental consequences of their proposed projects on any object or site of significance to the scientific annals of California (Division I, California Public Resources Code: 5020.1 [b]). The CEQA Guidelines (Public Resources Code Sections 15000 et seq.) define procedures, types of activities, persons, and public agencies required to comply with CEQA. Appendix G in Section 15023 provides an Environmental Checklist of questions to be addressed in order to determine a project's environmental impacts under CEQA. One of the questions to be answered in the Environmental Checklist (Section 15023, Appendix G, Section V, part c) is: "Would the project directly or indirectly destroy a unique paleontological resource or site…?"

The CEQA lead agency having jurisdiction over a project is responsible for ensuring that paleontological resources are protected in compliance with CEQA and other applicable statutes. The CEC is the lead agency with the responsibility to ensure that fossils are protected during SERC construction. California Public Resources Code Section 21081.6, entitled Mitigation Monitoring Compliance and Reporting, requires that the CEQA lead agency demonstrate project compliance with mitigation measures developed during the environmental impact review process. As part of the conditions for licensing SERC, and pursuant to its charge under the Warren-Alquist Act, the CEC included eight COCs that address the mitigation of impacts to paleontological resources during the construction of this Project (Appendix 1).

Appendix A provides the full text of these COCs. Throughout, it is the intent of the CEC to assure that paleontological resources mitigation activities for this project conform to the guidelines of the SVP (2010) (Appendix B).

4.3 Local Laws, Ordinances, Regulations, and Standards

The SERC site is within the City of Stanton and its natural gas pipeline is entirely within Orange County. The City of Stanton has no LORS applicable to paleontological resources but rather incorporates Orange County LORS. The County of Orange requires that a professional paleontologist conduct paleontological resources assessments for discretionary developments, and that discretionary developments be assessed for paleontological resources (County of Orange, 2005). The *Resources Element* of the County of Orange General Plan (County of Orange, 2005, Section VI) requires consideration of a project's potential impact to paleontological resources, and provides a map of the areas within Orange County that may possess paleontological sensitivity. Neither the SERC project site nor its proposed offsite linears are within any of these high-sensitivity areas (County of Orange, 2005, pp. VI–113).

4.4 Professional Standards

The SVP, an international organization of professional paleontologists, has established standard guidelines (SVP, 2010) (Appendix B) that outline general professional practices in the conduct of paleontological resource assessments and surveys, monitoring and mitigation, data collection and fossil recovery, analyses, and curation. Like the PFYC System (DOI, 2016), most practicing paleontologists refer to the SVP (2010) guidelines for applicable criteria and assessment methodologies. While SVP (2010) guidelines address chiefly vertebrate fossil resources, with reference to the PFYC System (DOI, 2016) they can be extended to address other types of fossils of scientific significance, such as invertebrates and paleobotanical specimens.

SECTION 5

Monitoring and Mitigation Procedures

This PRMMP has been prepared in accordance with COC PAL-3 in the CEC's SERC Final Decision, which calls for a PRMMP to lay out procedures for paleontological resources mitigation, including monitoring of ground-disturbing activities with the potential to affect paleontologically sensitive sediment. This PRMMP prescribes paleontological monitoring of excavations with the potential to affect paleontologically sensitive sediment lying at depth in the project area (see Section 3). No monitoring will be required of activities that do not have the potential to disturb paleontologically sensitive sediment.

This PRMMP establishes guidelines for mitigation activities related to paleontological resources and is applicable to all components, phases, and aspects of project construction. Copies of the PRMMP will reside with the Paleontological Resource Specialist (PRS), the Paleontological Resource Monitor(s) (PRM), and SERC Environmental Compliance Manager. This PRMMP shall serve as the basis for all procedures regarding paleontological resources on this project, and the PRS is directly responsible for its implementation.

In general, full-time paleontological monitoring and other mitigation, as deemed appropriate by the PRS, is required for all excavations that extend below disturbed sediment/artificial fill and younger (Holocene; Q_{yf}) alluvial deposits (see Section 4.3 for further details). Paleontological monitoring will be conducted by the PRS or by monitors under the supervision of the PRS and in compliance with the measures described in this PRMMP. Paleontological resources monitoring assignments are subject to approval by the PRS.

5.1 Responsibilities

It is the responsibility of all personnel on-site to notify the PRS or PRM(s) if fossils are discovered in the back dirt or in the excavation. Fossils are not to be removed from the sediment except at the direction of the PRMs or PRS. . If there is doubt as to the nature of the find, only the PRM, in consultation with the PRS and cultural resources specialists as necessary, is qualified to determine whether the find is a paleontological resource or not. All paleontological personnel must qualify under the criteria established in COC PAL-1 (Appendix A).

The PRS will determine the type and level of monitoring required for the project, and that initial determination will be provided in the PRMMP. The amount of paleontological monitoring may be increased, or decreased, depending on the PRS's assessment of the paleontological potential of the sediments exposed at the project site. This adaptive component is important to 1) avoid disturbing paleontologically sensitive sediment in the absence of appropriate monitoring and 2) minimize paleontological monitoring of operations in sediment that has proven to have no, or low paleontological potential. The need to re-evaluate paleontological sensitivity of any geologic unit encountered and the determination of the revised paleontological sensitivity will be at the sole discretion of the PRS in consultation with the PRMs.

The PRMs will conduct field monitoring under the technical direction of the PRS. The PRMs will complete daily monitoring activity reports (DAR) each day that monitoring takes place. The DARs will describe relevant construction excavations, geological units affected, and attendant monitoring activities. Upon completion of ground disturbance at the SERC, a Paleontological Resources Report (PRR) will be prepared under the direction of the PRS in accordance with COC PAL-7 (Appendix A). The PRR will summarize paleontological monitoring activities, the geology of the excavated area, and any fossils encountered during excavation, as well as steps taken to ensure proper treatment and curation of the fossils.

The PRS will provide technical direction to the PRMs, be available to address any communications difficulties with project management, provide active assistance in establishing the significance of any discoveries, and will address questions from CEC Staff regarding paleontological resources and paleontological mitigation

activities. The determination of scientific significance of all fossils discovered during excavation will be at the sole discretion of the PRS, in consultation with the PRMs.

5.2 Project Protocol

Project protocols are the procedures employed in the conduct of mitigation activities. For SERC excavations, project protocols are as follows:

- **Project Standards:** The PRMMP will function as the formal guide for all monitoring and mitigation activities related to paleontological resources for the project. The PRMMP will be used as the basis for decision making if on-site changes in activities related to paleontological monitoring are proposed. Should the PRMMP be mute on a particular issue or question, the interpretation of the PRS in conformance with SVP guidelines (Appendix B) will provide the sole actionable guidance to resolve that issue.
- **Progress Reporting:** DARs and monthly paleontological resources compliance reports will be prepared from the time paleontological resources monitoring begins and will continue for the duration of project-related excavations that require paleontological resources monitoring, and compiled by either the PRS or a designated qualified paleontologist. A DAR will be completed by the lead PRM for each day monitored, describing relevant construction excavations, geological units affected, attended monitoring activities, and any discoveries made. All substantive communications with construction personnel regarding the location and scheduling of ground-disturbing activities will be recorded by the monitors and included in the DARs. If fossils are discovered, the DAR will also contain information regarding sampling, discovery localities, and the disposition of additional notes associated with the find. This document will serve as an internal record of monitoring activities. The monthly compliance reports will be provided by the PRS to the SERC Environmental Compliance Manager and will include a summary of monitoring activities, copies of all DARs for the reporting period, brief descriptions of any finds made, notes on any problems encountered, and follow-through actions and/or recommendations.
- **Monitoring:** Paleontological resources monitoring will occur whenever, in the opinion of the PRS, excavations occur that have the potential to affect paleontologically sensitive sediment. Due to the depth of the surficial layer of disturbed sediment/artificial fill and low-sensitivity Holocene sediments at this site, ground-disturbing activities of less than 10 feet bgs will not require paleontological resources monitoring. Shallower excavations may be spot-checked at the discretion of the PRS to better determine the depth of sediments of unknown to high paleontological sensitivity. Activities that produce no backdirt and make no exposures of sediment, such as pile driving or sonic drilling, will not be monitored. All boring logs associated with such drilling will be made available to the PRS.

  Determination of whether monitoring will occur within contaminated, but otherwise undisturbed, soils associated with the SERC will be based on the nature of the contamination and risk posed to the PRMs, not the scientific importance of any fossils present. In consultation with appropriate HAZMAT professionals, the PRS will determine if the contamination is too severe to allow for monitoring, and will make appropriate recommendations to the SERC Environmental Compliance Manager and the CEC Compliance Project Manager (CPM).
- **Spot Checks:** Because one aim of efficient resource monitoring is cost-effectiveness, PRMs will not be on-site at all times during project implementation. Therefore, spot-checks of activities onsite may be conducted by a PRM at the sole discretion of the PRS.
- **Noncompliance and Other Incidents:** Should the PRS or monitors identify any incidents of noncompliance with the guidelines and instructions provided in this PRMMP or the Work Environmental Awareness Program (WEAP), the on-site construction manager will be immediately notified. If noncompliance continues without correction, the project superintendent or appropriate construction managers and the SERC Environmental Compliance Manager will be notified. Reportable incidents

include noncooperation that substantively interferes with the PRM's discharge of duties, activities contrary to the requirements of the PRMMP, or harassment or abusive behavior.

- **The Paleontological Resources Awareness Module of the WEAP Training:** As noted in COC PAL-5, all managers, supervisors, and construction workers involved with ground-disturbing activities and environmental monitoring will be required to take WEAP training. A WEAP with a paleontological resources module has been prepared for the project to facilitate training of construction personnel. This training module includes fossils that may be found during project excavations and their recognition, their scientific importance, statutes protecting those resources, and the role of paleontological monitors in facilitating the avoidance of these resources.
- **Changes:** Changes to the measures and procedures stipulated in the PRMMP can only be made by the PRS or with the written concurrence of the PRS. Any substantive change of monitoring (like cancellation of scheduled work for a full day or longer) from the accepted schedule be proposed in a letter or email to the PRS at least 2 working days prior to the effective date of the change, and be included in the monthly compliance report. The most common reason to change monitoring scope is the re-evaluation of the paleontological sensitivity of sediment at the site as site-specific knowledge increases during monitoring. When possible, the PRS will notify the PRM of any changes to this PRMMP 5 working days prior to implementing the changes.
- **Notification of Plans and Scheduling:** The PRS will be provided with all project plans that include excavation prior to the start of ground-disturbing activities. Changes to these plans that will affect the number of PRMs or days monitored will be communicated to the PRS as early as possible but no later than 2 business days prior to the implementation of the changes to the schedule or scope. The notification of change will be provided to the PRS, with a copy to be included in the monthly paleontological resources compliance report. The PRMs on-site will be responsible for maintaining communications about daily activities and coordinating with construction supervisors regarding minor changes to daily activities.
- **Notification of Paleontological Discoveries:** In the event of a fossil discovery, excavations in the immediate vicinity of the find will stop immediately, and the PRM will contact the PRS promptly. If no PRM is present when a fossil discovery is made, the construction worker making the find must immediately notify their supervisor, who will in turn notify the PRM or the PRS. Notification *must* be provided to a PRM or the PRS even if it is uncertain whether the find is in fact a fossil. If unanticipated discoveries of paleontological resources are made, **construction activities in the area of the discovery will cease immediately.** Construction activities with no potential to affect the discovered resource may continue uninterrupted provided appropriate monitoring continues. The avoidance flagging on discovery areas will be easily visible to equipment operators
- **Coordination:** The PRM designated by the PRS will consult with the project superintendent or appropriate construction managers at least once a week to confirm the areas to be excavated during the week. This coordination will be ongoing until the end of ground disturbance in paleontologically sensitive areas.

  The PRS or their designee will coordinate with the project superintendent or appropriate construction manager to have a front-end loader or similar equipment for bulk sediment sampling available where appropriate. This equipment does not need to be dedicated to paleontological resources mitigation; rather, the objective is to ensure that appropriate equipment is available should the need arise and that the project superintendent and construction managers are aware of that potential need.
- **Health and Safety:** The PRS, PRMs, and other personnel engaged in paleontological monitoring and mitigation activities will comply with all applicable California Occupational Safety and Health Administration regulations and project-specific safety procedures and requirements. All appropriate personal protective equipment will be worn while on-site. The most common limitation this places on

paleontological resources mitigation is the prohibition against entering excavations greater than 5 ft bgs without special equipment, such as shoring, which obscures exposed stratigraphy.

5.3 Construction Monitoring

If uncertainty exists regarding whether a specific sedimentary unit or activity area is paleontologically sensitive or not, excavations there shall be monitored by a PRM until the PRS, in consultation with the PRM(s), is satisfied that the unit in question is not paleontologically sensitive. Determination of paleontological sensitivity, and monitoring protocol appropriate to those sediments being disturbed, is at the sole discretion of the PRS.

5.3.1 Where Monitoring Will Occur

Full-time monitoring will be required for all excavations during SERC construction that extend to depths greater than 10 feet bgs and affect undisturbed strata. Monitoring by a PRM also will be required at the beginning of construction excavations extending below 3 feet depth. Full time monitoring of excavations between 3 and 10 feet depth will continue until the PRS is satisfied that sediments between surficial fill and deeper strata (that is, between 3 and 10 feet depth) are indeed of low paleontological sensitivity. Subsequent to this determination, full time monitoring will be restricted to depths below 10 feet, or below whatever depth the PRS determines marks the separation between low sensitivity sediments above, and sediments with unknown to high paleontological sensitivity below.

Examples of typical excavations that occur entirely within disturbed sediment, and therefore will not require monitoring, include removal of utilities and tanks, conventional foundation installation, and potholing. Final determination of where monitoring will occur will be made by the PRS, and spot-checks of activities on-site, whether or not excavations are on-going, will be at the discretion of the PRS. Excavations at any depth may be spot-monitored, at the sole discretion of the PRS, by a PRM or the PRS.

To ensure adequate monitoring coverage at all times, if the project footprint or the layout of ancillary facilities changes, or if new ground-disturbing activities are proposed, the SERC Environmental Compliance Manager will notify the PRS promptly and supply map data of these changes at least 10 working days prior to that new construction.

Due to the depth of sediments of unknown and potentially moderate to high paleontological sensitivity, and to the narrow gauge of the pipe and therefore relatively narrow trench, inspection of the side walls and floors of pipeline trenches will probably not be possible. Therefore, monitoring of trenching will predominantly consist of analysis of the back-dirt from these deep excavations. Undisturbed soil from greater than 10 feet bgs may not be removed from the site or used as back-fill until cleared by the PRM or PRS.

5.3.2 Sampling: When and How Much

In general, paleontological resources monitoring will be limited to observing excavated sediment for fossils. However, if in the opinion of the PRS, in consultation with the PRM(s), potentially fossiliferous sediments have been encountered, test sampling will be conducted by the PRM. Test sampling consists of removing a small amount of sediment (typically 200 pounds but, due to the size of the excavations and geological variability, the actual size may be smaller) and analyzing it for microvertebrate fossils.[2] This is typically accomplished by passing the sediment through a series of sieves with a minimum screen size of 30 mesh and a maximum of 4 mesh. In most cases, screening is accomplished by wet-sieving to ensure that microfossils

[2] Microvertebrate fossils are typically smaller than about a centimeter (0.4 inch) and can be important not only to the paleontology of smaller animals but also to paleoenvironmental reconstruction.

are not obscured by aggregated sediment. However, the method used to analyze the sample will depend on the nature of the sediments.

If initial screening reveals microvertebrate or paleobotanical remains, the PRM will arrange to obtain a larger sample. The size will depend on the geology of the site and the excavation plans. Fossils not removed from the sediment and not subject to further construction disturbance are considered to be adequately protected; therefore, sampling will not extend beyond 3 feet from the limits, vertically or horizontally, of the original excavation that encountered the fossil. This sample will be transported to a stockpile area removed from construction activities and outside of any environmentally sensitive areas and will be processed by the PRM.

5.4 Discovery Procedures

5.4.1 Discovery of Fossils during Construction

If a paleontological resource is discovered during demolition or soil remediation excavations, **activity in the immediate vicinity of the discovery must cease immediately**. For fossils found in back-dirt, this means that the entire stockpile of back-dirt will be roped off for avoidance. No material may be added to or removed from the pile except at the discretion of the PRS, and no vehicles may operate on the pile until it is released. If a fossil is discovered by someone other than a PRM, the fossil will be left in place and a PRM will be promptly notified. The PRM will then notify the PRS to initiate consultation on the significance of the find. The PRS will confirm that the construction project superintendents or appropriate construction managers and the SERC Environmental Compliance Manager have been notified.

If the fossils discovered in the back-dirt indicate that additional fossils may be found in the excavation, or fossils are identified in the excavation walls, the PRS will coordinate with the construction supervisor(s) to develop a plan to ensure that the fossils can be safely removed. Because such plans will depend on the type of excavation, nearby construction activities, soil types, and other location-specific information, no attempt to summarize the requirements for such a plan is attempted here. However, the plan will ensure that the PRMs may operate safely in the excavations, in accordance with the California Occupational Safety and Health Administration requirements. Alternatively, the excavation may be back-filled sufficiently to cover all fossils with a minimum of 1 foot of soil, and the excavation abandoned.

The PRM and PRS will first consult to confirm that the discovered resource is paleontologically significant. If it is determined that the find is *not* paleontologically significant, construction supervisory personnel will be notified that construction activities can resume in the area. If the discovery is determined to be that of scientifically significant fossil(s), scientifically controlled recovery of the material will commence. Fossil recovery will consist of the following activities:

- Assignment of a unique locality number. Normally, this will be the initials of the PRM or PRS followed by the two-digit designation for the month, then year, then a unique sequential number.
- Sketching a map of the location on a metric scale and documenting the fossil locality with a global positioning system unit. An estimate of the depth will be obtained from the equipment operators.
- Recording stratigraphic (bedding type, thickness, and contacts) and lithologic (color, sorting, texture, structures, and grain size) descriptions, and position in relation to any geologic markers present.
- Documenting the appearance of the fossil *in situ* by photographs.
- Removing fossils using standard paleontological techniques.
- Probing remaining soil with a shovel or screening to determine whether additional fossil materials lie at shallow (less than 18 inches) depth below the fossil.

- A log will be maintained listing samples and specimen collections, pertinent information associated with that material, and their disposition. The log will include the sampling date, identification or specimen number, location and project component, and the name of the PRM(s) who took the collection. If fossils are removed from the site, their removal and destination will be noted in the log. A copy of the log will be included in the monthly compliance report.
- A fossil locality form will be completed for each paleontological locality discovered.

To remove the overburden above a paleontological find, heavy equipment may be used to excavate to a depth no less than 1 foot above the discovered resource. If a fossil is discovered in the wall of a trench or other excavation, then the wall may be pulled back up to a distance of 3 feet to completely expose the discovery. Because the intent of recovery is to salvage paleontological resources that would otherwise be destroyed, exposure of fossils that would otherwise be undisturbed is not warranted.

5.4.2 Avoidance of Fossil Discovery and Sampling Sites during Construction

The site of a fossil discovery, or active sampling quarry, will be cordoned off using lathe and distinctly colored tape, or avoidance-colored plastic mesh fencing and steel T-posts, to protect it and the paleontologists investigating the find from ongoing construction activities. Construction excavation activities may occur elsewhere on the project site, provided that PRMs are present to monitor that activity where needed.

The construction manager or project superintendent will ensure construction personnel do not enter the area of the paleontological find, or loiter in the vicinity in such a manner as to interfere with the recovery of the discovered resource, create a safety hazard, or to distract the paleontologists investigating the find. The PRS may request that construction supervisors clear the area of unauthorized personnel, if necessary. Neither the paleontologists working to study and remove the find, nor the PRMs, will be responsible for other personnel congregating in the vicinity of the find.

Depending on the nature of the find, cordoned-off areas may include back-dirt piles, and piles of sampled sediment awaiting processing for microvertebrates. The fossil discovery site will be released back to construction as soon as possible after recovery activities have been completed and concurrence has been given by the PRS.

After fossils are recovered from a construction site, the director of the recovery efforts will consult with the PRS to ensure that reasonable measures have been taken to recover the subject fossil resources. Release of fossil sites and sediment associated with paleontological resource recovery will be at the sole discretion of the PRS. Once the PRS approves, the excavated area will be back-filled, if necessary, and the staking or fencing around the site will be removed. The project superintendent or construction manager will be notified that recovery has been completed and that construction activities may resume in the area.

5.5 Recovery of Discovered Paleontological Resources

Fossils that are large enough to be visible to the naked eye are called macrofossils. These fossils tend to be large enough to be easily recognized and may include mammal bones, fish bones, or marine or terrestrial invertebrate remains. Upon discovery of these fossils, the PRM will temporarily cordon off the discovery site for avoidance, as described above. Recovery of the fossils can involve a range of techniques depending on the specimen and circumstance, including “pluck, bag, and label,” hand quarrying, excavation and plaster-jacketing, and large-scale quarrying. The “pluck, bag, and label” technique will be used when isolated specimens are encountered. If the specimens are in situ, recovery can involve exploratory probing around a partially exposed fossil specimen to determine its dimensions, the application of consolidants (Acryloid™, Butvar®, Vinac®, or suitable substitute) to physically strengthen the fossil, and removal of the specimen in a block of sedimentary matrix. Hand quarrying typically consists of excavating fossil-rich sedimentary rock

layers without establishment of a geographic grid framework but nevertheless maintaining stratigraphic control.

Fragile fossils recovered by hand quarrying are stabilized as described above, or by plaster jacketing for specimens generally larger than a foot in length, or presenting special circumstances requiring jacketing. Plaster jacketing is used when vertebrate fossils require special handling because of their size or fragility. The process begins by isolating a partially exposed specimen from the temporary exposure in a matrix-supported sedimentary pedestal. The pedestal is then slightly undercut at its base to form an overhanging lip and a layer of damp newsprint or tissue paper is placed on the surface of the block. Strips of burlap fabric or newspaper are then soaked in wet plaster-of-Paris and laid across the matrix block to dry. Depending upon the volume of the block, one, two, or more layers of plaster-soaked burlap strips are formed on the block. Especially large blocks can be reinforced with wooden or rebar splints. Once the plaster hardens, the supporting pedestal is undercut and the block turned over. Hand tools are then used to remove any excess sedimentary matrix from the bottom of the block and a plaster and burlap cap constructed on the bottom of the block using the same techniques described above. When the layers of plaster have hardened, the plaster jacket is labeled with a field number and north arrow and removed from the field. Heavy equipment is often needed to transport the block to a truck.

5.6 Laboratory Procedures and Fossil Preparation

Fossil remains collected during the monitoring and salvage portion of the mitigation program will be cleaned, repaired, and/or screen washed, as described below. The extent of these preparations will be at the direction of the PRS, with a focus on ensuring that the remains can be identified once curated.

As a general rule, most preparation, reconstruction, and study of fossil material occurs *after* that material is deposited in a museum, and is conducted by paleontologists with particular research goals in mind, and may occur long after project completion.

5.6.1 Microfossil Screen Washing and Picking

If the PRS determines microfossil sampling is appropriate, microfossils will be recovered by screen washing bulk samples of fossil-bearing sediment in the field. Consolidated material will be broken into 2- to 3-centimeter cubes to facilitate air-drying of the sediment. Once dry, the sediment will be placed into a 5-gallon bucket full of water and is left to soak for no less than 15 minutes with stirring. The slurry will then be poured onto nested stainless steel screens. Manual agitation of the screens will be used to gently move the fine clays and silts through the mesh and concentrate the coarser sand and fossil material on the screens. The screened material will be placed in the sun to dry. Once dry, the material will be transferred into plastic bags or 5-gallon buckets and labeled with all pertinent site locality data. For more consolidated material, multiple screen-washings or the addition of a nonhazardous biodegradable disaggregating agent may be required.

The screen-washed material will be transported to a laboratory facility and then sorted to identify microfossils in a process called “picking.” Picking is most efficiently accomplished using a stereo-dissecting microscope with adequate lighting in a laboratory setting. Alternatively, heavy liquid separation may be used to facilitate the picking process, at the discretion of the PRS. Heavy liquid separation is a faster way to separate fossils from the surrounding sediment, but the PRS will need to approve of the safety procedures and chemicals utilized in this process before implementation of this method.

If the PRS determines that data of scientific utility may be recovered by doing so, bulk sediment samples for microfossils will be collected in labeled 1-gallon zip-top plastic bags and delivered to the final repository at the end of monitoring, without further processing. The samples will be stratigraphically well-documented, but no attempt will be made to analyze them for microfossils (e.g., pollen, ostracods, dinoflagelates, or diatoms). Such analysis typically takes place in controlled laboratory conditions as part of a carefully conceived research design.

5.6.2 Macrofossil Preparation for Curation

Preparation of vertebrate fossils and plant fossils such as petrified wood involves the removal of the surrounding sedimentary matrix using various mechanical methods, including pneumatic air scribes, micro sandblasters, and simple hand tools (e.g., hammers, chisels, brushes, dental picks, and pin vises). However, as stated previously, this is typically performed in a controlled laboratory setting; during field operations, preparation will be minimal.

At the direction of the PRS, fossils will be cleaned to a level that permits identification for curatorial purposes and to a level needed for scientific study of diagnostic specimens. Fossil preparation may also involve consolidation of weak or porous specimens by the application of specialized media, including polyvinyl acetate resins (e.g., Vinac®), acrylic resins (e.g., Acryloid™), or polyvinyl butyral resins (e.g., Butvar®). Repair of damaged specimens will require the use of adhesives including cyanoacrylate glues (e.g., Zap™), polyvinyl acetate emulsions (e.g., carpenter's glue), and polyvinyl butyral resins. Curation preparation will also include placing specimens in clean, clearly labelled bags suitable for museum processing and generation of specimen tags and curation inventory lists.

5.6.3 Cataloguing and Identification

Once cleaned, individual specimens or taxon lots will be identified to the lowest taxonomic level practical (family, genus, and/or species). The purpose of this analysis is to provide a preliminary assessment of the fossil discoveries; detailed taxonomic analyses typically take place later in the museum where the fossils have been curated and are not considered part of the PAL-3 mitigation effort. The specimens will then be assigned unique numbers and entered into a database. A specimen number may represent a single fossil specimen or a batch of specimens belonging to a single species or locality. Catalogue numbers are typically written on individual specimens using India ink on a patch of white acrylic paint or on the container holding the specimen (e.g., a glass vial holding a rodent tooth or a bag holding numerous fragmentary fossils). However, the specific method for numbering the specimens will depend on the nature of the specimens and the requirements of the curating institution and will be determined by the PRS. Curation also involves placement of taxon lots into archival trays with labels containing relevant curatorial information.

5.7 Permanent Curation

In accordance with COC PAL-8, fossils that may be collected during implementation of this PRMMP will be consigned to the Los Angeles County Museum of Natural History, or another fully accredited fossil repository in California. Also in accordance with COC PAL-8, the project proponent, or the designated owner of the fossil material, will execute appropriate legal documentation transferring the material to the institution, and relinquishing all claims to the fossil material. The project proponent will be responsible for the completion of this transfer. The repository will then assume the responsibility to maintain and make available the fossil collections in perpetuity as part of the public trust. Subject to the execution of an appropriate curation agreement, any fossil materials that might be recovered would be curated at the Los Angeles County Museum of Natural History, Balboa Park, through its Vertebrate Paleontology Department (Contact Name: Samuel A. McLeod; Telephone Number: 213-763-3325).

SECTION 6

Final Report

In accordance with COC PAL-7, a final PRR will be completed and submitted to the CPM for approval within 90 days of the conclusion of ground-disturbing activities with the potential to affect paleontologically sensitive sediment. However, PAL-3 mitigation activities WILL NOT be considered completed until the acceptance of the PRR by the final repository and the CEC. This report will present the results of the paleontological monitoring and mitigation carried out under this PRMMP and will be consistent with appropriate guidelines for paleontological resources mitigation reports and the requirements of the repository providing curation. This report will include discussions of the methods used, stratigraphic sections exposed, fossils collected, preliminary assessments of the significance of the recovered fossils, and any other relevant information regarding the recovery of the fossils and their nature. A completed inventory of salvaged, prepared, and curated fossils will be part of the final report. If no fossils are discovered, the PRR will include discussions of the methods used, stratigraphic sections exposed, and a statement that no fossils were found.

Paleontological resources monitoring and mitigation activities will conclude with the acceptance of the PRR and, if fossil material has been recovered, a letter from the accredited institution stating that the specimens have been received and accepted. The final PRR will be submitted to the CEC CPM for CEC Staff review and approval.

SECTION 7

References

California Energy Commission (CEC). 2018. *Final Staff Assessment for Stanton Energy Reliability Center*. Docket Number 16-AFC-01. Electronic document, https://efiling.energy.ca.gov/GetDocument.aspx?tn=223726.

County of Orange, 2005. *County of Orange General Plan, Chapter VI, Resources.* Electronic document, https://www.ocgov.com/civicax/filebank/blobdload.aspx?blobid=40235.

Los Angeles Metro. 2000. *Encyclopedic Report Details Numerous Subway Fossil Finds*. Electronic document, http://www.metro.net/news/simple_pr/encyclopedic-report-details-numerous-subway-fossil/.

Miller, W. E. 1971. *Pleistocene vertebrates of the Los Angeles Basin and vicinity (exclusive of Rancho La Brea).* Los Angeles County Museum of Natural History, Science Series 10:1–124.

Morton, D. M. 2004. Preliminary Digital Geologic Map of the Santa Ana 30' x 60' Quadrangle, Southern California. U. S. Geological Survey Open-File Report 99-172. Lakewood, Colorado.

PaleoBiology Database, 2013. Locality search. Electronic document, http://paleodb.org/.

Society of Vertebrate Paleontology (SVP). 2010. *Standard Procedures for the Assessment and Mitigation of Adverse Impacts to Paleontologic Resources.* Impact Mitigation Guidelines Revision Committee, Society of Vertebrate Paleontology. Electronic document, https://vertpaleo.org/68/68c554bb-86f1-442f-a0dc-25299762d36c.pdf.

Stanton Energy Reliability Center (SERC). 2016. *Stanton Energy Reliability Center (TN214206-18) Application for Certification Vol. 1*. Dated October 26, 2016. Electronic document, at: https://efiling.energy.ca.gov/GetDocument.aspx?tn=214206-18, Accessed October 8, 2018.

U.S. Department of the Interior (DOI) Bureau of Land Management. 2007. *Potential Fossil Yield Classification System*: BLM, Instruction Memorandum 2008–009. Washington, D.C.

U.S. Department of the Interior (DOI) Bureau of Land Management. 2016. *Potential Fossil Yield Classification (PFYC) System for Paleontological Resources on Public Lands.* Instructional Memorandum 2016–124. Washington, D.C.

Appendix A
Paleontological Resources Conditions of Certification

PAL-1 The project owner shall provide the CPM with the resume, qualifications, and contact information of its Paleontological Resources Specialist (PRS) for review and approval. The PRS's resume shall include the names and phone numbers of references. The resume shall also demonstrate to the satisfaction of the CPM the appropriate education and experience to accomplish the required paleontological resource tasks.

As determined by the CPM, the PRS shall meet the minimum qualifications for a Qualified Professional Paleontologist as defined in the Standard Procedures for the Assessment and Mitigation of Adverse Impacts to Paleontological Resources by the Society of Vertebrate Paleontology (SVP, 2010). The experience of the PRS shall include the following:

1. Institutional affiliations, appropriate credentials, and college degree (M.S, Ph.D., or equivalent).
2. Ability to recognize and collect fossils in the field.
3. Local geological and biostratigraphic expertise.
4. Proficiency in identifying vertebrate and invertebrate fossils.
5. At least three years of paleontological resources mitigation and field experience in California and at least one year of experience leading paleontological resource mitigation and field activities.

The project owner shall ensure that the PRS obtains qualified paleontological resource monitors to monitor as he or she deems necessary on the project. Paleontologic resource monitors (PRMs) shall have the equivalent of the following qualifications:

- BS or BA degree in geology or paleontology and a minimum of one year of relevant experience monitoring in California; or
- AS or AA in geology, paleontology, or biology and a minimum of four years' relevant experience monitoring in California; or
- Enrollment in upper division classes pursuing a Bachelor's or more advanced degree in the field of geology or paleontology and a minimum of three years relevant monitoring experience in California.

If the approved PRS is replaced prior to completion of project mitigation and submittal of the paleontological resources report (PRR), the project owner shall obtain CPM approval of the replacement PRS. The project owner shall keep resumes on file for qualified paleontological resources monitors (PRMs). The PRM's resume shall include the names and contact information of references. If a PRM is replaced, the resume of the replacement PRM shall also be provided to the CPM for review and approval.

Verification:

1. At least 60 days prior to the start of ground disturbance, the project owner shall submit a resume and statement of availability of its designated PRS for on-site work to the CPM, whose approval must be obtained prior to initiation of ground disturbing activities.

2. At least 30 days prior to ground disturbance, the PRS or project owner shall provide a letter with resumes naming anticipated PRM's for the project. The letter shall state that the identified PRM's meet the minimum qualifications for paleontological resource monitoring as required by this COC. If additional PRM's are needed during the project, the PRS shall provide additional letters and resumes to the CPM. The letter shall be provided to the CPM for approval no later than one week prior to the monitor's beginning on-site duties.

3. Prior to any change of the PRS, the project owner shall submit the resume of the proposed new PRS to the CPM for review and approval.

PAL-2 The project owner shall provide to the PRS and the CPM, for approval, maps and drawings showing the footprint of the power plant, construction lay-down areas, and all related facilities. Maps shall identify all areas of the project where ground disturbance is anticipated. If the PRS requests enlargements or strip maps for linear facility routes, the project owner shall provide copies to the PRS and CPM. The site grading plan and the plan and profile drawings for the utility lines would be acceptable for this purpose. The plan drawings must show the location, depth, and extent of all ground disturbances and be at a scale between 1 inch = 40 feet and 1 inch = 100 feet. If the footprint of the project or its linear facilities change, the project owner shall provide maps and drawings reflecting those changes to the PRS and CPM.

If construction of the project proceeds in phases, maps and drawings may be submitted prior to the start of each phase. A letter identifying the proposed schedule of each project phase shall be provided to the PRS and CPM. Before work commences on affected phases, the project owner shall notify the PRS and CPM of any construction phase scheduling changes.

At a minimum, the project owner shall ensure that the PRS or PRM consults weekly with the project superintendent and construction field manager to confirm area(s) to be worked the following week, until ground disturbance is completed.

Verification:

1. At least 30 days prior to the start of ground disturbance, the project owner shall provide the maps and drawings to the PRS and CPM.

2. If there are planned changes to the footprint of the project, revised maps and drawings shall be provided to the PRS and CPM at least 15 days prior to the start of ground disturbance.

3. If there are changes to the scheduling of the construction phases, the project owner shall submit a letter to the CPM within five days of identifying the changes.

PAL-3 The project owner shall ensure that the PRS prepares a PRMMP and submits the PRMMP to the CPM for review and approval. Approval of the PRMMP by the CPM shall occur prior to any ground disturbance. The PRMMP shall function as the formal guide for monitoring, collecting, sampling, and reporting activities, and may be modified with CPM approval. The PRMMP shall be used as the basis of discussion when on-site decisions or changes are proposed. Copies of the PRMMP shall include all updates and reside with the PRS, each PRM, the project's on-site manager, and the CPM.

The PRMMP shall be developed in accordance with the guidelines of the Society of Vertebrate Paleontology (SVP, 2010) and shall include, but not be limited to, the following:

Procedures for and assurance that the performance and sequence of project-related tasks, such as any literature searches, pre-construction surveys, worker environmental training, fieldwork, flagging or staking, construction monitoring, mapping and data recovery, fossil preparation and collection, identification and inventory, preparation of final reports, and transmittal of materials for curation will be performed according to PRMMP procedures.

1. Identification of the person(s) expected to assist with each of the tasks required by the PRMMP and these conditions of certification.

2. A thorough discussion of the anticipated geologic units expected to be encountered, the location and depth of the units relative to the project when known, and the known sensitivity of those units based on the occurrence of fossils either in that unit or in correlative units.

3. An explanation of why sampling is needed, a description of the sampling methodology, and how much sampling is expected to take place in which geologic units. Include descriptions of different sampling procedures that shall be used for fine-grained and coarse-grained units.

4. A discussion of the locations of where the monitoring of project construction activities is deemed necessary, and a proposed plan for monitoring and sampling at these locations.

5. A discussion of procedures to be followed: (a) in the event of a significant fossil discovery, (b) stopping construction, (c) resuming construction, and

   (d) how notifications will be performed.

6. A discussion of equipment and supplies necessary for collection of fossil materials and any specialized equipment needed to prepare, remove, load, transport, and analyze large-sized fossils or extensive fossil deposits.

7. Procedures for inventory, preparation, and delivery for curation into a retrievable storage collection in a public repository or museum that meet the Society of Vertebrate Paleontology's standards and requirements for the curation of paleontological resources.

8. Identification of the institution that has agreed to receive data and fossil materials collected, requirements or specifications for materials delivered for curation and how they will be met, and the name and phone number of the contact person at the institution.

9. A copy of the paleontological resources conditions of certification.

10. A copy of the daily monitoring log form.

Verification:

At least 30 days prior to ground disturbance, the project owner shall provide a copy of the PRMMP to the CPM. Approval of the PRMMP by the CPM shall occur prior to any ground disturbance. The PRMMP shall include an affidavit of authorship by the PRS and acceptance of the PRMMP by the project owner evidenced by a signature.

PAL-4 Prior to ground disturbance the project owner and the PRS shall prepare a CPM-approved Worker Environmental Awareness Program (WEAP).

The WEAP shall address the possibility of encountering paleontological resources in the field, the sensitivity and importance of these resources, and legal obligations to preserve and protect those resources. The purpose of the WEAP is to train project workers to recognize paleontologic resources and identify procedures they must follow to ensure there are no impacts to sensitive paleontologic resources. The WEAP shall include:

1. A discussion of applicable laws and penalties under the law.

2. Good quality photographs or physical examples of fossils expected to be found in units of high paleontologic sensitivity at, or near, the site.

3. Information that the PRS or PRM has the authority to stop or redirect construction in the event of a discovery or unanticipated impact to a

paleontological resource.

4. Instruction that employees are to stop or redirect work in the vicinity of a find and to contact their supervisor and the PRS or PRM.

5. An informational brochure that identifies reporting procedures in the event of a discovery.

6. A WEAP certification of completion form signed by each worker indicating that he/she has received the training.

7. A sticker that shall be placed on hard hats indicating that environmental training has been completed.

8. The project owner shall submit the training script and, if the project owner is planning to use a video for training, a copy of the training video, with the set of reporting procedures for workers to follow that will be used to present the WEAP and qualify workers to conduct ground disturbing activities that could impact paleontologic resources.

Verification:

1. At least 30 days prior to ground disturbance, the project owner shall submit to the CPM for review and comment the draft WEAP, including the brochure and sticker. The submittal shall also include a draft training script and the set of reporting procedures for workers to follow.
2. At least 15 days prior to ground disturbance, the project owner shall submit to the CPM for approval the final WEAP and training script. If the project owner is planning to use a video for training, a copy of the training video shall be submitted following final approval of WEAP and training script.

PAL-5 No worker shall excavate or perform any ground disturbance activity prior to receiving CPM-approved WEAP training by the PRS, unless specifically approved by the CPM.

Prior to project ground disturbance the following workers shall be WEAP trained by the PRS in-person: project managers, construction supervisors, foremen, and all general workers involved with or operate ground-disturbing equipment or tools. Following the start of ground disturbing activities and after the initial WEAP training conducted prior to ground disturbance, a

CPM- approved video or in-person training may be used for new employees. If a video is used a qualified trainer shall be present to monitor training and respond to questions. The training program may be combined with other training

programs prepared for cultural and biological resources, hazardous materials, or other areas of interest or concern. A WEAP certification of completion form shall be used to document who has received the required training.

Verification:

1. In the Monthly Compliance Report (MCR), the project owner shall provide copies of the WEAP certification of completion forms with the names of those trained, trainer identification, and type of training (in-person and/or video) offered that month. The MCR shall also include a running total of all persons who have completed the training to date.

2. If the project owner requests an alternate paleontological WEAP trainer, the resume and qualifications of the trainer shall be submitted to the CPM for review and approval prior to installation of an alternate trainer. Alternate trainers shall not conduct WEAP training prior to CPM authorization.

PAL-6 The project owner shall ensure that the PRS and PRM(s) monitor, consistent with the PRMMP, all construction-related grading and excavation in areas where potential fossil-bearing materials have been identified, both at the site and along any constructed linear facilities associated with the project. In the event that the PRS determines full-time monitoring is not necessary in locations that were identified as potentially fossil-bearing in the PRMMP, the project owner shall notify and seek the concurrence of the CPM. The PRS may not further delegate the responsibility for determining whether full-time monitoring is necessary.

The project owner shall ensure that the PRS and PRM(s) have the authority to stop or redirect construction if paleontological resources are encountered. The project owner shall ensure that there is no interference with monitoring activities unless directed by the PRS. Monitoring activities shall be conducted as follows:

1. Any change of monitoring from the accepted schedule in the PRMMP shall be proposed in a letter or email from the PRS and the project owner to the CPM prior to the change in monitoring and be included in the monthly compliance report. The letter or email shall include the justification for the change in monitoring and be submitted to the CPM for review and approval.

2. The project owner shall ensure that the PRM(s) keep a daily monitoring log of paleontological resource activities; copies of these logs shall be submitted with the monthly compliance report. The name and contact information of PRM(s) and PRS who were making field observations will be included in the daily log. The PRS may informally discuss paleontological resource monitoring and mitigation activities with the CPM at any time.

3. The project owner shall ensure that the PRS notifies the CPM within 24

hours of the occurrence of any incidents of non-compliance with any paleontological resources conditions of certification. The PRS shall recommend corrective action to resolve the issues or achieve compliance with the conditions of certification.

4. For any significant paleontological resources encountered, either the project owner or the PRS shall notify the CPM within 24 hours, or Monday morning in the case of a weekend event. In the event construction has been stopped because of a paleontological find, such notification will be effected as soon as practical, but not later than 24- hours after a stop work order has been issued.

5. For excavations planned in material that is classified as having a moderate to high paleontological sensitivity prior to construction additional precautions may be required. Should excavation methods be proposed that would preclude effective monitoring and examination of paleontological resources encountered during excavation, appropriate mitigation involving education of the public about the lost resources will be proposed in the PRMMP.

The project owner shall ensure that the PRS prepares a summary of monitoring and other paleontological activities to be included in each MCR. The summary shall include the name(s) of PRS or PRM(s) active during the month, general descriptions of training and monitored construction activities, and general locations of excavations, grading, and other activities. A section of the report shall include the geologic units or subunits encountered, descriptions of samplings within each unit, and a list of identified fossils**.**

Negative findings, when no fossils are identified, shall also be reported. A final section of the report shall address any issues or concerns about the project relating to paleontologic monitoring, including any incidents of non- compliance or any changes to the monitoring plan that have been approved by the CPM. If no monitoring took place during the month, the report shall include an explanation in the summary as to why monitoring was not conducted.

Verification:

1. A copy of the daily monitoring log of paleontological resource activities shall be included in the monthly compliance report (MCR).

2. The project owner shall ensure that the PRS submits the summary of monitoring and paleontological activities in the MCR. When feasible, the CPM shall be notified 15 days in advance of any proposed changes in monitoring different from that identified in the PRMMP, which will require concurrence between the PRS and CPM. If there is any unforeseen change in monitoring, the notice shall be given as soon as possible prior to implementation of the change.

PAL-7 The project owner shall ensure preparation of a Paleontological Resources Report (PRR) by the designated PRS. The PRR shall be prepared following completion of ground-disturbing activities. The PRR shall include an analysis of the collected fossil materials and related information, and shall be submitted to the CPM for approval.

The report shall include, but not be limited to, a description and inventory of recovered fossil materials; a map showing the location of paleontological resources encountered; and the PRS' description of sensitivity and significance of those resources; and indicate if and how fossil material was curated in accordance with **PAL-3**.

Any portions of this report that involve any independent judgment or analysis of the earth's crust, and the rocks and other materials which compose it, must be done by or under the responsible charge of a California licensed Professional Geologist.

Verification:

Within 90 days after completion of ground-disturbing activities, including landscaping, the project owner shall submit the PRR under confidential cover to the CPM.

PAL-8 The project owner, through the designated PRS, shall ensure that all components of the PRMMP are adequately performed, including collection of fossil material, preparation of fossil material for analysis, analysis of fossils, identification and inventory of fossils, preparation of fossils for curation, and delivery for curation of all significant paleontological resource materials encountered and collected during project construction. The project owner shall pay all curation fees charged by the museum for fossil material collected and curated as a result of paleontological mitigation. The project owner shall also provide the curator with documentation showing the project owner irrevocably and unconditionally donates, gives, and assigns permanent, absolute, and unconditional ownership of the fossil material.

Verification:

Within 60 days after the submittal of the PRR, the project owner shall submit documentation to the CPM identifying the entity that will be responsible for curating collected specimens. This documentation shall also show that fees have been paid for curation and the owner relinquishes control and ownership of all fossil material.

Appendix B
Society of Vertebrate Paleontology Guidelines

Standard Procedures for the Assessment and Mitigation of Adverse Impacts to Paleontological Resources

Society of Vertebrate Paleontology
Impact Mitigation Guidelines Revision Committee

Abstract
Fossils are nonrenewable paleontological resources that are subject to impacts from land development. Procedures are presented for evaluating the potential for impacts of a proposed action on paleontological resources and for mitigating those impacts. Impact mitigation includes pre-project survey and salvage, monitoring and screen washing during excavation to salvage fossils, conservation and inventory, and final reports and specimen curation. The objective of these procedures is to offer standard methods for assessing potential impacts to fossils and mitigating these impacts.

Introduction
Fossils are nonrenewable paleontological resources that are afforded protection by federal, state, and local environmental laws and regulations. The Paleontological Resources Preservation Act (PRPA) of 2009 calls for uniform policies and standards that apply to fossils on all federal public lands. All federal land management agencies are required to develop regulations that satisfy the stipulations of the PRPA. Section 6302 of the PRPA mandates that federal agencies "*shall manage and protect paleontological resources on Federal land using scientific principles and expertise.*" Thus, federal agencies need the help of the professional paleontological community in the formulation and implementation of these PRPA-mandated policies and regulations. The potential for destruction or degradation of paleontological resources on both public and private lands selected for development under the jurisdiction of various governmental planning agencies is recognized. The standard procedures below are intended to be applicable to both private and public lands under the jurisdiction of local, city, county, regional, state, and federal agencies. Protection of paleontological resources includes: (a) assessment of the potential for land to contain significant paleontological resources which could be directly or indirectly impacted, damaged, or destroyed by proposed development and (b) formulation and implementation of measures to mitigate these adverse impacts, including permanent preservation of the site and/or permanent preservation of salvaged fossils along with all contextual data in established institutions.

Assessment of the Paleontological Potential of Rock Units
Rock units are described as having (a) high, (b) undetermined, (c) low, or (d) no potential for containing significant paleontological resources.

High Potential
Rock units from which vertebrate or significant invertebrate, plant, or trace fossils have been recovered are considered to have a high potential for containing additional significant paleontological resources. Rocks units classified as having high potential for producing paleontological resources include, but are not limited to, sedimentary formations and some volcaniclastic formations (e. g., ashes or tephras), and some low-grade metamorphic rocks which contain significant paleontological resources anywhere within their geographical extent, and sedimentary rock units temporally or lithologically suitable for the preservation of fossils (e. g., middle Holocene and older, fine-grained fluvial sandstones, argillaceous

and carbonate-rich paleosols, cross-bedded point bar sandstones, fine-grained marine sandstones, etc.). Paleontological potential consists of both (a) the potential for yielding abundant or significant vertebrate fossils or for yielding a few significant fossils, large or small, vertebrate, invertebrate, plant, or trace fossils and (b) the importance of recovered evidence for new and significant taxonomic, phylogenetic, paleoecologic, taphonomic, biochronologic, or stratigraphic data. Rock units which contain potentially datable organic remains older than late Holocene, including deposits associated with animal nests or middens, and rock units which may contain new vertebrate deposits, traces, or trackways are also classified as having high potential.

Undetermined Potential
Rock units for which little information is available concerning their paleontological content, geologic age, and depositional environment are considered to have undetermined potential. Further study is necessary to determine if these rock units have high or low potential to contain significant paleontological resources. A field survey by a qualified professional paleontologist (see "definitions" section in this document) to specifically determine the paleontological resource potential of these rock units is required before a paleontological resource impact mitigation program can be developed. In cases where no subsurface data are available, paleontological potential can sometimes be determined by strategically located excavations into subsurface stratigraphy.

Low Potential
Reports in the paleontological literature or field surveys by a qualified professional paleontologist may allow determination that some rock units have low potential for yielding significant fossils. Such rock units will be poorly represented by fossil specimens in institutional collections, or based on general scientific consensus only preserve fossils in rare circumstances and the presence of fossils is the exception not the rule, e. g. basalt flows or Recent colluvium. Rock units with low potential typically will not require impact mitigation measures to protect fossils.

No Potential
Some rock units have no potential to contain significant paleontological resources, for instance high-grade metamorphic rocks (such as gneisses and schists) and plutonic igneous rocks (such as granites and diorites). Rock units with no potential require no protection nor impact mitigation measures relative to paleontological resources.

Discussion
It is extremely important to distinguish between archaeological and paleontological resources (see "definitions" section in this document) when discussing the paleontological potential of rock units. The boundaries of an archaeological resource site define the areal/geographic extent of an archaeological resource, which is generally independent from the rock unit on which it sits. However, paleontological sites indicate that the containing rock unit or formation is fossiliferous. Therefore, the limits of the entire rock unit, both areal and stratigraphic, define the extent of paleontological potential.

It is also important to ascertain if the paleontological resources are uniformly distributed throughout a rock unit or if they are confined as localized concentrations to specific members or facies. Using this information, paleontologists can develop maps which suggest areas that are likely to contain paleontological resources. These maps (Paleontological Resource Potential Maps) form the basis for preliminary planning decisions on which areas require a detailed paleontological resource impact assessment by a qualified professional paleontologist and which areas do not. Lead agency evaluation of a proposed project relative to such paleontological resource potential maps should trigger a "request for

opinion" from a qualified professional paleontologist, state paleontological clearing house, or an accredited institution with an established paleontological repository housing paleontological resources from the region of interest.

The determination of the paleontological resource potential of an area proposed for development is first founded on a review of pertinent geological and paleontological literature, geological maps, and on records in fossil locality databases of paleontological specimens deposited in institutions (e. g., museums and universities). This preliminary review may clearly indicate that particular rock units have known high potential. If the paleontological resource potential of a rock unit cannot be delimited from the literature search and specimen records, a field survey by a qualified professional paleontologist will be necessary to determine the fossiliferous potential and the distribution or concentrations of fossils within the extent of the rock units present in a specific project area. The field survey may need to extend outside the defined project limits to areas where the relevant rock units are better exposed. If the rock units in an area are determined to have a high potential for containing paleontological resources, a program to mitigate impacts to fossil resources must be developed. In areas containing rock units with high potential, a preconstruction survey (intensive reconnaissance) may be necessary to locate surface concentrations of fossils which might require salvage in advance of excavations to avoid delays to construction schedules.

Measures to Mitigate Adverse Impacts from Development

Measures for adequate protection or salvage of significant paleontological resources are applied to areas determined to contain rock units that have either a high or undetermined potential for containing significant fossils. The Paleontological Resource Preservation Act of 2009 establishes a uniform code for decision-making on all federal lands. Specific mitigation measures generally need not be developed for areas of low paleontological potential. Developers (public and private) and contractors should be made aware, however, that if there is not an on-site monitor it will be necessary to contact a qualified professional paleontologist if fossils are unearthed in the course of excavation. This contingency should be planned for in advance. In order to save time and project delays, in the advance planning phases of a project the developer should contact a qualified professional paleontologist and arrange for the salvage of any unanticipated fossils. The paleontologist will then salvage the fossils and assess the necessity for further mitigation measures, if applicable. Decisions regarding the intensity of the paleontological resource impact mitigation program will be made by the project paleontologist on the basis of the significance of the paleontological resources, and their biostratigraphic, biochronologic, paleoecologic, taphonomic, and taxonomic attributes, not on the ability of a project proponent to fund the paleontological resource impact mitigation program.

In areas determined to have high or undetermined potential for significant paleontological resources, an adequate program for mitigating the impact of development must include:

1. an intensive field survey and surface salvage prior to earth moving, if applicable;

2. monitoring by a qualified paleontological resource monitor (see "definitions" section in this document) of excavations in previously undisturbed rock units;

3. salvage of unearthed fossil remains and/or traces (e. g., tracks, trails, burrows, etc.);

4. screen washing to recover small specimens, if applicable;

5. preparation of salvaged fossils to a point of being ready for curation (i. e., removal of enclosing matrix, stabilization and repair of specimens, and construction of reinforced support cradles where appropriate);

6. identification, cataloging, curation, and provision for repository storage of prepared fossil specimens; and

7. a final report of the finds and their significance.

All phases of mitigation must be supervised by a qualified professional paleontologist who maintains the necessary paleontological collecting permits and repository agreements. All field teams will be supervised by a paleontologist qualified to deal with the significant resources that might be encountered. The lead agency must assure compliance with the measures developed to mitigate impacts of excavation. To assure compliance at the start of the project, a statement that confirms the site's paleontological potential, confirms the repository agreement with an established public institution, and describes the program for impact mitigation, must be deposited with the lead agency and contractor(s) before any ground disturbance begins. In many cases, it will be necessary to conduct a salvage program prior to grading to prevent damage to known paleontological resources and to avoid delays to construction schedules. The impact mitigation program must include preparation, identification, cataloging, and curation of any salvaged specimens. All field notes, photographs, stratigraphic sections, and other data associated with the recovery of the specimens must be deposited with the institution receiving the specimens. Since it is not professionally acceptable to salvage specimens without preparation and curation of specimens and associated data, costs for this phase of the program must be included in the project budget. The mitigation program must be reviewed and accepted by the lead agency. If a mitigation program is initiated early during the course of project planning, construction delays due to paleontological salvage activities can be minimized or even completely avoided.

Standard Procedures
These standard procedures for paleontological resource impact assessment and mitigation are designed to apply to areas containing rock units with high, low, and undetermined paleontological resource potential.

Assessment before Construction Starts
An adequate preconstruction paleontological resource impact assessment is the key to developing an adequate paleontological resource impact mitigation program. Only a professional paleontologist is qualified to prepare a paleontological resource impact assessment. An adequate assessment of potential impacts typically includes all the following elements:

1. Literature Search—A review of the pertinent paleontological, geological, geotechnical, and environmental literature provides an information baseline for evaluating the extent of previous paleontological work in an area. Such a review also provides a fundamental basis for formulating mitigation plans and for understanding the significance of paleontological resources. The preconstruction assessment should also include examination of geotechnical reports, borehole logs, and geologic cross sections to address whether project excavations will impact rock units with high potential.

2. Records Search—A review of institutional localities and specimen records provides a means for determining the extent of previous fieldwork and fossil recovery in, and adjacent to, an area of interest. This task can be accomplished either by sending a written request for information to the relevant institution(s) or visiting the institution to review the records directly. A simple, on-line search of an institution's records is often incomplete and inadequate for determining the number and extent of known fossil localities in an area.

3. Consultation with Others—The preconstruction assessment should include consultation with geologists and paleontologists knowledgeable about the paleontological resource potential of rock units present in the vicinity of the proposed project.

4. Field Survey—The assessment should include a field survey by a qualified professional paleontologist and approved staff, as needed, to determine the paleontological potential of each rock unit, to re-examine any known fossil localities on or near the project, to search for unknown fossil localities, and to delimit the specific boundaries of rock units within the project area.

5. Reports—A paleontological resource impact assessment report and a project-specific paleontological resource impact mitigation program should be prepared based upon data gathered during the assessment.

6. Agency Confirmation—Prior to ground disturbance, the lead agency should review the paleontological resource impact assessment and proposed mitigation program to determine the adequacy of the proposed program.

7. Repository Agreement—The project paleontologist should have a repository agreement arranged prior to the start of earth-moving for the project.

8. Pre-excavation meetings—The project paleontologist should hold pre-excavation meetings with representatives of the lead agency, the developer or project proponent, and contractors to

explain the importance of fossils, the laws protecting fossils, the need for mitigation, the types of fossils that might be discovered during excavation work, and the procedures that should be followed if fossils are discovered. Defining the process of salvaging fossils will reduce project delays.

Paleontological Resource Mitigation Plan

Prior to any ground disturbance at the project site, a paleontological resource mitigation plan should be prepared by a qualified professional paleontologist, who then will implement the plan as the project paleontologist, program supervisor, and principal investigator. The paleontological resource mitigation plan establishes the ground rules for the entire paleontological resource mitigation program. Excavations at the project site may reveal conditions unanticipated when the paleontological resource mitigation plan was prepared. These conditions may require additional tasks not described in the previously prepared project impact mitigation plan. The project paleontologist should be the person who makes these project-specific modifications to the paleontological resource mitigation program in consultation with representatives of the lead agency and project proponent.

Adequate Monitoring

For excavations in rock units of known high potential, the project paleontologist or paleontological monitor will need to be present initially during 100% of the earth-moving activities. After 50% of excavations are complete in either an area or rock unit and no fossils of any kind have been discovered, the level of monitoring can be reduced or suspended entirely at the project paleontologist's discretion. For excavations in rock units with high or undetermined potential, it is never acceptable to have excavation monitoring done by construction workers, engineers, or persons who are not qualified paleontological resource monitors (see "definitions" section below). For excavations in rock units determined by a qualified professional paleontologist to have low potential, non-paleontologists may monitor for fossils. If potential paleontological resources are discovered during excavations in a rock unit with low potential, all ground disturbance in the vicinity of the find should stop immediately until a qualified professional paleontologist can assess the nature and importance of the find and recommend appropriate salvage, treatment, and future monitoring and mitigation.

Paleontologists who monitor excavations must be experienced in locating and salvaging fossils, and collecting necessary associated critical data. The paleontological resource monitor must be able to document the stratigraphic context of fossil discovery sites. Paleontological resource monitors must be properly equipped with tools and supplies to allow rapid removal of specimens. The monitor must be empowered to temporarily halt or redirect the excavation equipment away from fossils to be salvaged. Some lead agencies require that paleontological monitors be approved prior to performing any field work.

To reduce potential delays to excavation schedules, provision must be made in the mitigation program for additional assistants to monitor or help in removing large or abundant fossils. If many pieces of heavy equipment are in use simultaneously but at diverse locations, each location will need to be individually monitored.

Macrofossil Salvage

Many specimens recovered from excavations are readily visible to the eye and large enough to be easily recognized and removed. Upon discovery of such macrofossils, the monitor will flag the fossiliferous area for avoidance until the project paleontologist can evaluate the resource and develop plans for removal/salvage of these specimens. Some fossil specimens may be fragile and require consolidation

with archival quality media (e. g., Acryloid, Butvar, or Vinac) before moving. Others may require protection by encasing them within a plaster jacket before removal to a laboratory for later preparation and conservation. Occasionally specimens encompass all or much of a skeleton and will require moving either as a whole or in multiple blocks for later preparation. Such specimens require time to excavate and strengthen with a hardening solution before removal and the patience and understanding of the contractor to recover the specimens properly. It is thus important that contractors and developers are fully aware of the importance and fragility of fossils for their recovery to be undertaken with the optimum chances of successful extraction.

Avoidance and Site Protection

In exceptional instances the process of preconstruction assessment or construction monitoring itself may reveal a fossil occurrence of such importance that salvage or removal is unacceptable to all concerned parties. In such cases, the project design may need to be modified to avoid, protect and/or exhibit the fossil occurrence, e. g., in the floor or wall of a museum or as a basement exhibit in a mall. Under such circumstances, the site may be declared and dedicated as a protected resource of public value. Associated fossil fragments salvaged from such a site should be placed in an approved institutional repository. Federal land managers have the ability to set aside such exceptional areas providing documentation supports special management considerations.

Microfossil Salvage

Many significant vertebrate fossils (e. g., small mammal, bird, reptile, amphibian, or fish remains) are too small to be readily visible within the sedimentary matrix and are referred to as "microvertebrates". Small fossils also include non-vertebrate paleoenvironmental indicators (e. g., foraminifers, small gastropods, and plant seeds). Fine-grained sedimentary horizons (e. g., mudstones and paleosols) most often contain such fossils, which are typically recovered through a process of bulk matrix sampling followed by screen washing through 20 and/or 30 mesh screens. If indicators of potential microvertebrate fossils are found (e. g., plant debris, abundant mollusks, clay clasts, carbonate-rich paleosols, or mudstones) screening of a "test sample" (0.4 cubic yard/meter, ~600 lbs) may produce significant returns and indicate whether or not a larger sample needs to be screen washed. An adequate sample (standard sample) consists of approximately 4.0 cubic yards/meters (6,000 lbs or 2,500 kg) of matrix from each site, horizon, or paleosol. However, the uniqueness of the microvertebrate fossils recovered may justify screen washing even larger amounts. With this possibility in mind, two standard samples (~8.0 cubic yards/meters) or more as determined by the project paleontologist should be collected when the discovery is first made and set aside in case processing of a larger sample is later determined to be necessary. The developer must recognize that funding must be available to process these bulk matrix samples, thereby reducing volume to facilitate cost-effective storage of fossil specimens.

To avoid construction delays, samples of matrix may need to be removed from the project site and processed elsewhere. Chemicals (e. g., detergents, weak acids, orange oil, etc.) may be necessary to facilitate the breakdown of matrix. In some cases the concentrate will need to be further processed using heavy liquids (e. g., zinc bromide, polytungstate, or tetrabromide) to remove mineral grains and create a concentrate enriched with microvertebrate bones and teeth. The concentrate should be directly examined under a microscope to locate and remove individual microfossils.

Samples

To place fossils within a temporal context, dating of rock units may be necessary. If available, samples of volcanic ash and organic carbon should be collected for radiometric and/or thermoluminescence dating.

When appropriate, oriented samples should also be collected for paleomagnetic analysis. In addition, samples of fine-grained matrices should be collected from measured stratigraphic sections for microfossil (e. g., pollen, spores, dinoflagellates, ostracodes, diatoms, foraminifers, etc.) analyses. Other matrix samples may need to be collected and retained with the samples submitted to the repository institution for future analysis, for clast source analysis, or as witness to the source rock unit and possibly for procedures not yet envisioned. The project paleontologist should determine which of these samples should be immediately processed and which samples can be stored for later processing. Many museums will not accept such rock or sediment samples for curation and storage.

Preparation

Salvaged specimens must be prepared for identification and curation (not exhibition). This means removal of all or most of the enclosing sediment to reduce the specimen volume, increase surface area for the application of consolidants/preservatives, provide repairs and stabilization of fragile/damaged areas on a specimen, and allow identification of the fossils. Large specimens may require construction of reinforced plaster or fiberglass cradles. Removal of excess matrix from macrofossils during the preparation process will facilitate identification, reduce storage space, and reduce the cost of storage. Project paleontologists need to be aware that many museums will not accept specimens that are not fully prepared for permanent curation.

Identification and Cataloging

Specimens must be identified by competent qualified paleontological specialists to the lowest taxonomic level possible. Ideally, identification of individual specimens will be to genus and species and to skeletal element. Specimens must be cataloged and a complete list of specimens to be accessioned into the collections must be prepared for the curator of the repository institution. Batch identification and batch numbering (e. g., “mammals, 75 specimens”) is unacceptable.

Analysis

Although academic research questions should dictate the field methods and types of data recorded, the overall goal of a paleontological resource mitigation program is not to conduct research but rather to discover and salvage significant fossil remains, record relevant stratigraphic and taphonomic data, and curate and permanently house the salvaged fossil remains for future study. However, before salvaged specimens are curated, either the project paleontologist or a competent qualified paleontological specialist should determine the significance and importance of the salvaged specimens and this information should be included in the final report.

Storage

Adequate curation and storage of salvaged specimens in an approved repository institution is an essential goal of the paleontological mitigation program. Adequate storage must include curation of individual specimens into the collections of a recognized, not-for-profit repository with a permanent curator, such as a museum or a university (institution). A complete set of GPS data, field notes, photographs, locality forms, and stratigraphic sections must accompany the fossil collections. Specimens must be stored in a fashion that allows retrieval of specific, individual specimens by future researchers.

Specific requirements of the designated repository must be established prior to the start of the project, field salvage work, and laboratory analysis. Adequate advance notice of funds required by the repository for curation is needed for the benefit of project funding. Costs of the project should cover the necessary curatorial supplies such as, but not limited to, trays, vials, foam, and storage cabinets or shelves to provide for the appropriate curation of the specimens.

Reporting

1) Interim report
At the close of the excavation phase of a project, an interim report should be prepared. This interim report should summarize exceptional fossil discoveries, note areas where monitoring occurred and fossils were collected, and list tasks remaining for preparation, identification, and curation of the salvaged specimens. In the interim report, the preconstruction repository agreement should be appended and any additional repository considerations and costs should be described.

2) Final report
After preparation, identification, analysis of significance, and curatorial inventory of the salvaged specimens is complete, a final report must be prepared by the project paleontologist including a summary of the field and laboratory methods, site geology and stratigraphy, faunal/floral list(s), and a brief statement of the significance and relationship of the fossils discovered to similar fossils found elsewhere The final report should emphasize the discovery of any new or rare taxa, or paleoecological or taphonomic significance. A complete set of field notes, geologic maps, stratigraphic sections, and a list of identified specimens must be included in or accompany the final report. This report should be finalized only after all aspects of the mitigation program are completed, including preparation, identification, cataloging, and curatorial inventory.

The final report (with any accompanying documents) and repository curation of specimens and samples constitute the goals of a successful paleontological resource mitigation program. Full copies of the final report should be deposited with both the lead agency and the repository institution with the request that all locality data remain confidential and not made available to the general public.

Compliance
From the beginning of the project, the lead agency should assure compliance with measures to protect fossil resources by:

1. requesting during initial planning phases an assessment and program for impact mitigation that is consistent with these SVP Standard Procedures;

2. ensuring the adequacy of the proposed mitigation measures;

3. acknowledging arrangements for salvaged specimens to be permanently housed in an institutional paleontological repository;

4. ensuring that the paleontological resource mitigation program is supervised by a qualified professional paleontologist;

5. ensuring that all monitoring for paleontological resources is performed by qualified paleontological resource monitors;

6. inspecting the monitoring program in the field periodically during project construction;

7. ensuring that specimens are prepared, identified, cataloged, and properly curated;

8. requiring an interim and final report before issuing final occupancy permits or equivalent documents; and

9. ensuring that the final report is complete and adequately describes the methods and results of the mitigation program.

The project paleontologist should be responsible for:

1. assessing potential impacts to paleontological resources and developing a program for impact mitigation during initial planning phases;

2. obtaining a repository agreement, and ensuring repository acceptance of specimens;

3. ensuring implementation of the mitigation measures; and

4. preparing the interim and final reports.

Acceptance of the final report by the lead agency signifies completion of the program of mitigation for the project. Review and approval of the final report by a qualified professional paleontologist designated by the lead agency will determine the effectiveness of the program and adequacy of the report. Inadequate performances in either area comprise noncompliance, and may result in the lead agency removing the project paleontologist from its list of qualified professional paleontological consultants.

Definitions

A QUALIFIED PROFESSIONAL PALEONTOLOGIST (Principal Investigator, Project Paleontologist) is a practicing scientist who is recognized in the paleontological community as a professional and can demonstrate familiarity and proficiency with paleontology in a stratigraphic context. A paleontological Principal Investigator shall have the equivalent of the following qualifications:

1. A graduate degree in paleontology or geology, and/or a publication record in peer reviewed journals; and demonstrated competence in field techniques, preparation, identification, curation, and reporting in the state or geologic province in which the project occurs. An advanced degree is less important than demonstrated competence and regional experience.
2. At least two full years professional experience as assistant to a Project Paleontologist with administration and project management experience; supported by a list of projects and referral contacts.
3. Proficiency in recognizing fossils in the field and determining their significance.
4. Expertise in local geology, stratigraphy, and biostratigraphy.
5. Experience collecting vertebrate fossils in the field.

PALEONTOLOGICAL RESOURCE MONITORS shall have the equivalent of the following qualifications:

1. BS or BA degree in geology or paleontology and one year experience monitoring in the state or geologic province of the specific project. An associate degree and/or demonstrated experience showing ability to recognize fossils in a biostratigraphic context and recover vertebrate fossils in the field may be substituted for a degree. An undergraduate degree in geology or paleontology is preferable, but is less important than documented experience performing paleontological monitoring, or
2. AS or AA in geology, paleontology, or biology and demonstrated two years experience collecting and salvaging fossil materials in the state or geologic province of the specific project, or
3. Enrollment in upper division classes pursuing a degree in the fields of geology or paleontology and two years of monitoring experience in the state or geologic province of the specific project.

4. Monitors must demonstrate proficiency in recognizing various types of fossils, in collection methods, and in other paleontological field techniques.

ASSOCIATED CRITICAL DATA includes adequate field notes, sketches of stratigraphic sections, geologic maps, and site and specimen photos. Associated critical data may also include samples of organic carbon and volcanic ash for radiometric dating, oriented samples for paleomagnetic analysis, samples for microfossil analysis, and samples for determining the sediment source.

A **PALEONTOLOGICAL REPOSITORY** is a not-for-profit museum or university approved by the lead agency and employing a permanent curator responsible for paleontological records and specimens. Such an institution assigns accession, locality, and/or catalog numbers to individual specimens that are stored and conserved to ensure their preservation under adequate security against theft, loss, damage, fire, pests, and adverse climate conditions. Specimens will be stored in a stable environment away from flammable liquids, corrosive chemicals, organic materials subject to mildew, and sources of potential water damage. Specimens must have all modifications, preparation techniques, etc. documented and linked with the specimen. The repository will also archive lists of collected specimens, and any associated field notes, maps, photographs, diagrams, or other data. The repository must have procedures for tracking specimens removed from storage for study, preparation, exhibit, or loan. The repository must make its collections of cataloged specimens available for study by qualified researchers.

ARCHAEOLOGICAL RESOURCES are human remains and items or artifacts associated with human cultures. If paleontological resources are determined to be in close stratigraphic association with human remains or human manufactured items, or if fossils can be demonstrated to be intentionally modified by humans, they are also considered archaeological resources.

SIGNIFICANT PALEONTOLOGICAL RESOURCES are fossils and fossiliferous deposits, here defined as consisting of identifiable vertebrate fossils, large or small, uncommon invertebrate, plant, and trace fossils, and other data that provide taphonomic, taxonomic, phylogenetic, paleoecologic, stratigraphic, and/or biochronologic information. Paleontological resources are considered to be older than recorded human history and/or older than middle Holocene (i. e., older than about 5,000 radiocarbon years).

A **LEAD AGENCY** is the agency responsible for addressing impacts to resources that a specific project might cause, and for ensuring compliance with approved mitigation measures.

PALEONTOLOGICAL POTENTIAL is the potential for the presence of significant paleontological resources. All sedimentary rocks, some volcanic rocks, and some low-grade metamorphic rocks have potential to yield significant paleontological resources. Paleontological potential is determined only after a field survey of a rock unit in conjunction with a review of available literature and relevant paleontological locality records.