8.8 Paleontological Resources

Paleontological resources (fossils) are the remains or traces of prehistoric animals and plants. This section assesses the potential that earth-moving activities associated with construction of the proposed SVEP will impact scientifically important fossil remains. Section 8.8.1 discusses the existing environmental setting, including relevant paleontologic records and the geologic context of the project. Section 8.8.2 discusses the potential environmental effects of construction and operation. Section 8.8.3 evaluates any cumulative impacts to paleontological resources resulting from this project when combined with other projects. Section 8.8.4 describes proposed mitigation measures during construction. Section 8.8.5 presents applicable LORS. Section 8.8.6 references agency contacts. Section 8.8.7 discusses permit requirements and schedules. Section 8.8.8 provides a list of references cited.

The analysis presented in this section meets all requirements of the California Energy Commission Appendix B Section (g)(16) and incorporates the Society of Vertebrate Paleontology (SVP) (1995, 1996) standard measures for mitigating adverse construction-related environmental impacts on paleontological resources.

8.8.1 Affected Environment

8.8.1.1 Geographic Location and Physiographic Environment

The project area lies near the northern limit of the Peninsular Ranges physiographic province where major linear geologic structures (faults, folds) and geographic features (mountains, valleys) trend in a generally northwesterly-southeasterly direction. It lies in the central Perris Plain which in turn occupies the central portion of the Perris Block. The Perris Block is an eroded mass of crystalline bedrock lying between Mount San Jacinto and the northern end of the Peninsular Ranges on the east, and the rift valley known locally as the Elsinore Fault Zone on the west (Fenneman, 1931). Beyond the Elsinore Fault Zone lie the Santa Ana Mountains. Areas to the east (the San Jacinto and San Andreas faults) as well as to the west are tectonically quite active, while the Perris Block itself is a crustal block of Cretaceous and older rocks that possesses the attributes of an ancient and stable surface. These include peneplanation of extensive granitic bedrock surfaces, and isolated hills projecting from the plain that which are frequently considered to be erosional remnants, and called monadnocks (Woodford et al., 1971). The Santa Ana Mountains to the west create a barrier between this area and the Pacific Ocean so that, while it is not as hot and arid as the Mojave Desert less than 40 miles to the east across Mount San Jacinto, the climate is semi-arid and distinctly continental with greater temperature extremes than on the coast.

8.8.1.2 Regional and Local Geologic Setting

Woodford et al. (1971) mapped a number of distinct geomorphic surfaces on the Perris Block. The higher surfaces from about 2,500 to 1,700 feet elevation are older, and generally denuded with bare rock outcrops. Some are merely isolated remnants on monadnocks, such as the surface represented by the top of the Lakeview Mountains, about 2 miles northeast of the project site. The youngest and currently active surface is that of the Perris Plain, including the project area, and is called the Paloma Surface by Woodford et al. (1971). The Paloma Surface is an erosional-depositional surface and is characterized by elevations slightly above 1,400 feet. It is mantled with a substantial blanket of Pleistocene alluvium

which is mapped chiefly as alluvial fan sediments of middle to late Pleistocene age (Unit Qof_a of Morton [2003a]). Although unmapped by Morton (2003a,b), Holocene alluvial and eolian sediments are known to blanket the area as well, and constitute a substantial proportion of the "agricultural soils" that can be seen exposed on the surface of the project area (e.g., Applied EarthWorks, 2001). Bedrock outcrops to the south and northeast of the project area are composed of Mesozoic crystalline and metasedimentary rocks.

8.8.1.3 Stratigraphic and Paleontological Resource Inventory

A stratigraphic inventory and a paleontological resource records review were completed to develop a baseline paleontological resource inventory of the project site and surrounding area by rock unit to assess the potential paleontological productivity of each unit. These tasks complied with CEC (2000) and Society of Vertebrate Paleontology (1995) guidelines. The geological and paleontological literature was reviewed to document the number and locations of previously recorded fossil sites, and the types of fossil remains each rock unit has produced. The literature review was supplemented by a records search conducted at the San Bernardino County Museum (SBCM). In addition, the author of this section has participated in previous paleontologic resources recovery activities in the Perris Plain.

A field reconnaissance was conducted on September 8, 2005, and included the project site as well as the right-of-way (ROW) for the non-reclaimable waste water line, as well as the ground between the project site and the Valley Substation. Reconnaissance was conducted by Dr. W. Geoffrey Spaulding a qualified paleontologist and a recognized authority on the Quaternary paleoenvironments of the American west. The project area is extensively disturbed by agricultural activities as well as the development of transportation facilities (roads and a railroad). Bare ground is visible, although at less than 5 percent due to agricultural stubble in the project site. However, to the north of the site between the railroad and the Valley Substation recent bulldozing for an unrelated project has left good exposures of sediment.

8.8.1.3.1 Paleontological Resource Assessment Criteria

The paleontological sensitivity of the project area can be assessed by identifying the paleontological potential of stratigraphic units within the project area through records search and literature review. Since the distribution of stratigraphic units can be identified through geologic mapping, parts of the project that have varying paleontologic sensitivity (high, low, or no sensitivity) for paleontological resources can be delineated, if such variability exists, and appropriate impact assessments and mitigation recommendations formulated based on these data.

A paleontologically sensitive rock or stratigraphic unit is a sedimentary deposit that has a high potential to yield fossils that may be unique or scientifically important. Well-studied and documented fossil-bearing units may still yield unique or significant paleontological resources to the extent that fossil faunas and floras frequently consist of many rare taxa, as well as a few common ones. The paleontological sensitivity of a stratigraphic unit is based on the abundance or density of fossil specimens previously recovered from that unit, and the proximity of those records to the project site. Paleontologic field reconnaissance can inform these assessments where exposures of specific rock units are available for field inspection.

An individual fossil specimen may be considered unique or scientifically significant if it is (1) identifiable, (2) complete, (3) well preserved, (4) age diagnostic or suitable for dating, (5) useful in paleoenvironmental reconstruction, (6) a type or topotypic specimen, (7) a member of a rare species, and/or (8) a skeletal element different from, or a specimen more complete than, those now available for its species. For example, identifiable vertebrate marine and terrestrial fossils are generally considered scientifically important because they are relatively rare. The value or importance of different fossil groups varies, depending on the age and depositional environment of the rock unit that contains the fossils, their rarity, the extent to which they have already been identified and documented, and the ability to recover similar materials under more controlled conditions such as part of a research project. For example, marine invertebrates (radiolarians, dinoflagelates, diatoms) as well as other microfossils (pollen and spores, ostracods) may be important to specialized paleoenvironmental studies, but as isolated samples they are generally not considered a unique or significant paleontological resource.

The following tasks were completed to establish the paleontologic sensitivity and distribution of each rock unit exposed at or near the project site:

- The stratigraphic inventory was completed and the stratigraphic units at and near the project site were identified
- The paleontological sensitivity of each stratigraphic unit in the vicinity of the project site was assessed, based on the fossil remains previously documented within that unit

Since the 19th Century southern California has been known for its rich Late Pleistocene paleontologic record, chiefly due to the spectacular remains that have been recovered from the La Brea Tar pits, approximately 70 miles west-northwest of the SVEP. These remains are preserved in asphalt seeps, and no asphalt seeps are known in the vicinity of the SVEP. However, their mode of preservation (anaerobically and without mineral replacement of the bone, or "fossilization") is important to note in that this is frequently also the case for other Late Quaternary (late Pleistocene and Holocene) fossil records from the area. Therefore, the potential for fossilization *per se* is not a criterion to be used for assessing paleontologic sensitivity in this area.

8.8.1.3.2 Paleontological Resource Assessment by Rock Unit

Stratigraphic Inventory

This section includes a stratigraphic inventory of rock units that occur in the region, but are unlikely to be encountered in the immediate vicinity of the project, as well as those units that may be disturbed by project-related excavations. It also provides an assessment of their paleontologic sensitivity based on the results of the literature review, records search, and field reconnaissance.

Surficial Sediments

No evidence of paleontologic potential was noted on the ground surface. Field reconnaissance revealed the surface of the project area to be thoroughly disturbed as a consequence of agricultural activities and the construction of roadways, a railroad, and associated drainage facilities. These activities have disturbed the top 4 feet of the soil column throughout the project area, including off-site laterals. This includes all surficial sediment that is middle to late Holocene in age, unmapped by Morton (2003a,b), but

documented by others (Applied EarthWorks, 2001). The base of these Holocene sediments is usually marked by an unconformity at about four to 5 feet below the original ground surface. Due to extensive disturbance, and due to the fact that scientifically significant fossils are not know to occur in these sediments, their paleontologic sensitivity is low.

Pleistocene Alluvium

As noted above, the sediments throughout the project site and the off-site laterals have been identified as arenaceous "old alluvial fan deposits" of middle to late Pleistocene age (Morton, 2003a). These older surficial deposits are capped by a moderately- to well-developed reddish soil. Mantling the lower slopes of the Mount Brannon monadnock approximately 0.5 mile southwest of the project site are "very old alluvial fan deposits" of early to middle Pleistocene age (Morton, 2003a). These are compositionally very similar deposits to those which underlie the project site, but with better developed soils and fewer clasts.

Quaternary alluvium is often devoid of fossil remains due to its high-energy depositional regime, and the subaerial nature of that deposition which generally precludes rapid burial. Organic remains are left exposed to the elements and degrade rapidly before they can be buried. However, fluvial and paludal sediments often yield well-preserved fossil remains in this region, and these sedimentary facies are known to occur at depth in equivalent "old alluvial fan deposits" mapped by Morton (2003b) in the Winchester Quadrangle about 6 miles to the southeast (see below). Therefore, sediments that likely occur at depth beneath the project site possess high paleontologic sensitivity.

Rocks of the Peninsular Ranges Batholith

Cretaceous granitic and older Mesozoic to Paleozoic metasedimentary rocks comprise the highlands in the vicinity of the study area, including the Mount Brannon monadnock less than a mile to the southwest. They range from igneous granodiorite, tonalite and gabbro, to metasedimentary phyllite, greywacke and metasandstone. These rocks also are the source of the alluvium of the study area. These igneous rocks possess no paleontologic sensitivity and, because the metasedimentary rocks here are not known to produce fossils, they possess low paleontologic sensitivity.

8.8.1.3.3 Paleontological Inventory Results

An inventory of the paleontologic resources associated with Quaternary alluvium in this area is presented below, and the paleontologic importance of these resources is assessed. The archival search conducted for this inventory documented two paleontologic sites within approximately 0.5 mile of the project site (SBCM 5.6.626 and SBCM 5.6.671-5.6.683) ; Scott, 2005) although each yielded only microvertebrate remains (rabbits, rodents, lizards) of dubious scientific importance. A map of these locations is in Appendix 8.8A filed separately under a request for confidentiality.

During the 1990s, excavations for the Diamond Valley Lake (also known as the Eastside Reservoir) project, about 6 miles to the southeast of the SVEP, showed that fluvial and paludal facies exist in the alluvium of the Perris Plain. In addition, these stratigraphic units produced abundant and significant vertebrate and plant fossils from alluvial units similar to those in the vicinity of the SVEP (Morton, 2003b). Fossils recovered from these Pleistocene sediments represent extinct taxa including mammoths, mastodons, ground sloths, dire wolves, short-faced bears, saber-toothed cats, large and small horses, large and small

camels, and bison (Jefferson, 1991; Reynolds and Reynolds, 1991; Woodburne, 1991; Springer and Scott, 1994; Scott, 1997; Springer et al., 1999). Plant remains from the same sediments have been instrumental in reconstructing the glacial-age paleoenvironments of this presently semi-arid region, and include the fossils of ponderosa pine, three different species of manzanita, and the logs of cedar or juniper (Anderson et al., 2002; Springer et al., 1998). Therefore, the Quaternary alluvium that characterizes the subsurface of the Perris Plain has high potential to contain significant nonrenewable paleontologic resources. Older Pleistocene alluvial sediments elsewhere throughout the Inland Empire region have been reported to yield significant fossils of plants and extinct animals from the Ice Age (Jefferson, 1991; Reynolds and Reynolds, 1991; Woodburne, 1991; Springer and Scott, 1994; Scott, 1997; Springer et al., 1998, 1999; Anderson et al., 2002).

8.8.2 Environmental Consequences

The potential environmental effects from construction and operation of the SVEP on paleontological resources are presented in the following sections.

8.8.2.1 Significance Criteria

Appendix G of CEQA addresses significance criteria with respect to paleontological resources (Public Resources Code Sections 21000 et seq.). Appendix G(V)(c) asks if the project will "directly or indirectly destroy a unique paleontological resource or site or unique geologic feature."

In its standard guidelines for assessment and mitigation of adverse impacts to paleontological resources, the SVP (1995) established three categories of sensitivity for rocks potentially containing paleontological resources: high, low, and undetermined. To these categories is generally added that of "no sensitivity" as it is applied to such rock units as granite or basalt that, due to their igneous (molten) origin, do not ever contain fossils.

Areas where fossils have been previously found are considered to have a high sensitivity and a high potential to produce fossils. In areas of high sensitivity that are likely to yield unique or scientifically important paleontological resources, full-time monitoring is typically recommended during project-related disturbance of those sediments.

Strata that have not been known to produce fossils in the past, but that are unlikely to do so due to their geologic history, typically are considered to have low sensitivity. Monitoring is not recommended during project construction, although spot checks by the project paleontologist may be recommended to confirm that excavations continue in low-sensitivity sediments.

Sediments that have not had any previous paleontological resource surveys or yielded any fossil finds, but that are generally unaltered material deposited in low-energy environments, are considered to possess undetermined sensitivity. After reconnaissance surveys, observation of exposed cuts, and possibly sub-surface testing, a qualified paleontologist can determine whether such a unit should be categorized as having high or low sensitivity.

8.8.2.2 Project Assessment

Fossil sites occur within 1 mile of the SVEP project, although the significance of the microvertebrate remains from these sites is dubious. However, the paleontologic records

from similar sediments in the Domenigoni and Diamond Valleys about 6 miles to the southeast are highly significant, and speak to the paleontologic potential of the current project site.

Near-surface sediments are disturbed and are Holocene alluvium and eolian sediments of low paleontologic sensitivity. Therefore, within 5 feet of the surface there is no more than a low potential for construction activities to encounter paleontologic remains, and the scientific value of these remains would likely be negligible due to the disturbed nature of the sediment and its young age. However, Pleistocene sediments of high paleontologic sensitivity lie at depth beneath these surficial sediments. Pleistocene alluvium in similar geologic contexts as the project site has yielded scientifically important fossil remains, primarily due to the high potential of encountering fine-grained fluvial or paludal facies where fossils may be well preserved.

8.8.2.2.1 Sun Valley Energy Project Construction

This section identifies the potential adverse impacts on the paleontological resources resulting from construction phase effects of the SVEP including off-site laterals that have been identified for this project. Construction-related activities expected to impact paleontologic resources are those that would disturb previously undisturbed sediment of high paleontologic potential; excavation activities such as trenching and grading, as well as drilling, tunneling, and boring to depth greater than 5 feet below the current land surface. Construction activities that would result in no disturbance of sediment at depth, from laying foundations to construction of the superstructure and landscaping, would not impact paleontologic resources.

Excavations within 5 feet of the current surface would affect previously disturbed sediments, or alluvium and eolian sediment that is of middle to late Holocene age and therefore of low paleontologic sensitivity. Therefore, ground disturbing activities within 5 feet of the surface would have no impact to paleontologic resources. It is expected that older Pleistocene alluvium of high paleontologic sensitivity occurs at depth. Therefore, subsequent determination of the depth to the base of undisturbed sediments throughout the site is recommended. This information should be used to refine an understanding of the areas and activities that will require mitigation monitoring.

No variation in stratigraphy was noted in either the geological maps or during the field review to suggest differences in the sensitivity of subsurface sediments along the off-site linears for this project. Therefore, the potential to adversely affect non-renewable paleontologic resources is the same as that for the generation station itself. Excavations to depths exceeding 5 feet will affect paleontologic resources, while activities at shallower depths will affect previously disturbed sediments or sediments of middle to late Holocene age, and therefore will not affect significant paleontologic resources.

8.8.2.2.2 Operation

Project operation will not cause additional ground disturbance, and therefore will not affect paleontological resources.

8.8.3 Cumulative Impacts

If paleontological resources were encountered during SVEP-related ground disturbance, the potential cumulative adverse impacts on paleontological resources will be low, as long as the mitigation measures proposed in Section 8.8.5 are implemented to recover any significant paleontological resources. When properly implemented, these mitigation measures will effectively recover the scientific value of significant fossils encountered during SVEP construction. Thus, the proposed SVEP will not cause or contribute to significant adverse cumulative impacts to paleontological resources. Additionally, scientifically controlled recovery of paleontological resources from this and other projects contributes to a beneficial cumulative impact through the realization of increased scientific knowledge of the paleontology of southern California, an area with paleoecosystems apparently as unique during the Pleistocene as they were during the historic period (e.g., Stock, 1972; Springer and Scott, 1994).

8.8.4 Proposed Mitigation Measures

It is expected that older alluvium of high paleontologic sensitivity occurs at depth. Therefore, subsequent refinement of the depth to older alluvium throughout the site is recommended. This information should be used to identify areas and activities that may require mitigation monitoring, if any.

This section describes measures that Edison Mission Energy proposes to reduce or mitigate potential project-related adverse impacts to significant paleontological resources, should any such resources be discovered during construction. No impact to paleontological resources would occur as a consequence of operation, so no mitigation is proposed for the operational phase of the project.

- **Paleontological Resources Monitoring and Mitigation Plan (PRMMP)—**Before construction, the project proponent will retain a qualified paleontologist to design and implement the PRMMP during project-related, earth-moving activities for deep excavation at the power plant site. The PRMMP will summarize the known extent and depth of paleontologically sensitive sediments in the project area, and then provide protocol for refining that knowledge. This will include working with the project geologist and/or geotechnical specialists to determine the depth to paleontologically sensitive sediment. If it appears that such sediment will be encountered, the PRMMP will provide the protocol monitoring and as well as discovery plans for construction. Prescriptions will be provided for preconstruction coordination, discovery procedures, sampling and data recovery, reporting, and museum curation for specimens and data recovered.

- **Paleontological Monitoring—**Qualified paleontologic monitors will be present during excavations where it will disturb sediment of high paleontologic potential. Monitoring will not take place in areas where the ground has been previously disturbed, in areas underlain by artificial fill, or in areas where undisturbed sediment will be buried, but will not otherwise be disturbed.

- **Construction Personnel Education—**If it is determined during preparation of the PRMMP (see above) that paleontologically sensitive sediments will be disturbed by construction, before starting construction personnel involved with earth-moving

activities will be informed of the possibility of encountering fossils, how to recognize them, and proper notification procedures. This worker training will be developed in a formal module to be included and presented during worker education.

Implementation of these mitigation measures will reduce the severity of significant environmental impacts of project earth-moving activities on paleontological resources to an insignificant level by allowing for the recovery of fossil remains and associated specimen data and corresponding geologic and geographic site data that otherwise might have been destroyed by construction and unauthorized fossil collecting.

8.8.5 Laws, Ordinances, Regulations, and Standards

Paleontological resources are classified as non-renewable scientific resources and are protected by several federal and state statutes, most notably by the 1906 Federal Antiquities Act and other subsequent federal legislation and policies and by the State of California's environmental regulations (CEQA, Section 15064.5). Professional standards for assessment and mitigation of adverse impacts on paleontological resources have been established for vertebrate fossils by the Society of Vertebrate Paleontology (1995, 1996). Design, construction, and operation of the SVEP, including pipelines and ancillary facilities, will be conducted in accordance with all LORS applicable to paleontological resources. Federal and state LORS applicable to paleontological resources are summarized in Table 8.8-1 and discussed briefly below, along with SVP professional standards.

TABLE 8.8-1
Applicable LORS Regarding Paleontological Resources

LORS	Applicability	AFC Reference	Project Conformity
Antiquities Act of 1906	Not applicable	-	-
CEQA, Appendix G	Fossil remains may be encountered by earth-moving activities	Section 8.8.1 through Section 8.8.5	yes
Public Resources Code, Sections 5097.5/5097.9	Not applicable	-	-

8.8.5.1 Federal LORS

Federal protection for significant paleontological resources would apply to the SVEP if any construction or other related project impacts take place on federally managed lands, or if certain federal entitlements were required. 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 land. The project does not cross such lands, and no federal entitlement is required that would involve paleontologic resources mitigation requirements. Federal requirements would apply if a Federal agency obtained ownership of project lands during the term of the project license.

8.8.5.2 State LORS

Paleontologic resources are a limited, nonrenewable, very sensitive scientific and educational resource and, in California, are afforded protection under the state environmental legislation (California Office of Historic Preservation, 1983).

CEQA (Public Resources Code: 21000 et seq.) requires public agencies and private interests to identify the environmental consequences of their proposed projects on any object or site significant to the scientific annals of California (Division I, Public Resources Code: 5020.1[b]).

Guidelines for the Implementation of CEQA, as amended March 29, 1999 (Title 14, Chapter 3, California Code of Regulations: 15000 et seq.) define procedures, types of activities, persons, and public agencies required to comply with CEQA and includes definitions of significant impacts on a fossil site (Section 15023, Appendix G [5.c]).

Public Resources Code, Section 5097.5 (Stats. 1965, c. 1136, p. 2792) defines any unauthorized disturbance or removal of fossil site or remains on public land as a misdemeanor.

Warren-Alquist Act (Public Resources Code 25000 et seq.) requires CEC to evaluate energy facility siting in unique areas of scientific concern (Section 25527). The CEC's guidelines for paleontological resources assessment follow the professional standards as set forth by the SVP (1995 and 1996). These standards call for assessing the scientific importance of paleontologic resources in an area of potential environmental effect, mitigating significant adverse construction-related environmental impacts on these resources, and with conditions for acceptance of an impact mitigation program fossil collection by a museum repository.

8.8.5.3 Local LORS

There are no Riverside County LORS that would apply to paleontologic resources.

8.8.6 Involved Agencies and Agency Contacts

Because the proposed SVEP will not be located on federal land and will not receive federal funding, there are no applicable federal LORS and no federal agencies with jurisdiction to enforce LORS related to paleontological resources. Therefore, no federal agency contacts were included in the Application for Certification.

State LORS include the Warren-Alquist Act, the Public Resources Code, and CEQA. The agency with jurisdiction over these LORS is the CEC. With the exception of the CEC, there are no state or local agencies that have responsibility for administering LORS related to paleontological resources.

8.8.7 Permits Required and Permit Schedule

No state or county agency requires a paleontological collecting permit to recover fossil remains discovered by construction-related earth moving on either state or private land in the project site. The project does not cross or occupy federal land.

8.8.8 References

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