7.16 PALEONTOLOGICAL RESOURCES

Paleontological resources (fossils) are the remains or traces of prehistoric plants and animals. Fossils are important scientific and educational resources because of their use in (1) documenting the presence and evolutionary history of particular groups of now extinct organisms, (2) reconstructing the environments in which those organisms lived, (3) and in determining the relative ages of the strata in which they occur and of the geologic events that resulted in the deposition of the sediments that buried them.

This section summarizes the potential environmental impacts on paleontological resources that may result from proposed project construction. This paleontological resources inventory and impact assessment was prepared by Dr. Lanny H. Fisk, Ph.D., PG, a California registered Professional Geologist (PG) and Senior Paleontologist with PaleoResource Consultants (PRC). This evaluation meets California Energy Commission (CEC) requirements (2007) and the standard measures for mitigating adverse construction-related environmental impacts on significant paleontological resources established by the Society of Vertebrate Paleontology (SVP) (SVP, 1995, 1996). The confidential paleontological resources impact assessment is provided under separate cover (Appendix T).

7.16.1 Affected Environment

7.16.1.1 Geographic Location

The proposed project site consists of 37 acres located north of I-10 along the north side of Powerline Road and west of Karen Avenue, adjacent on the east to SCE's existing Devers substation in northwestern Riverside County, California. The location is approximately 33°56'20"N latitude and 116°34'19"W longitude in the northwest quarter of the southeast quarter of Section 4, T. 3 S., R. 4 E. northwest of North Palm Springs and southwest of Desert Hot Springs. The property is situated at approximately 1,080 feet above mean sea level. The local general topographic gradient is toward the southeast.

The site is located in the northern end of the Salton Basin, which is divided by the Salton Sea into the Coachella Valley to the north and the Imperial Valley to the south. The Coachella Valley comprises roughly the northern one-third of a major north-northwest oriented structural and topographic depression variously called the Valley of the Ancient Lake (Blake, 1858), the Colorado Desert (Stearns, 1879; Preston, 1893; Fenneman, 1931), Salton Trough (Jahns, 1954; Muffler and White, 1969; Crowell and Baca, 1979; Waters, 1983; McKibben, 1993), Salton Sea Trough (Muffler and Doe, 1968), Salton Sink (Mendenhall, 1909a, 1909b; Kennan, 1917; Threet, 1978), Salton Basin (Buwalda and Stanton, 1930; Wilke, 1980; Gobalet, 1992, 1994), Salton Sea Basin (Stanley, 1962), Cahuilla Basin (Blake, 1914; Free, 1914; MacDougal, 1914), Imperial Basin (Rigsby, 1984; Dibblee, 1984), or Imperial Depression (Longwell, 1954). The Salton Trough Physiographic Province (Jahns, 1954) is located between the Peninsular Range Physiographic Province on the west and the Basin and Range Physiographic Province on the east. All proposed project components are located on the U.S. Geological Survey (USGS) Desert Hot Springs 7.5-minute (1:24,000 scale) quadrangle.

The site lies within the northwestern portion of the Coachella Valley, which extends southward to the Salton Sea. The local topography varies from nearly level land surfaces to low hills within a dissected alluvial fan. The general project area is bounded on the west by the San Bernardino Mountains, on the north and east by the Little San Bernardino and Cottonwood Mountains, and on the south by a gently sloping alluvial fan. Most of the project area is an unimproved desert alluvial surface with relatively sparse vegetation.

7.16.1.2 Regional Geologic Setting

The geology in the vicinity of the proposed project site has been mapped or described by numerous workers, including Blake (1858), Mendenhall (1909b), Brown (1920, 1923), Dibblee (1954, 1982, 1984),

Longwell (1954), Merriam and Bandy (1965), Proctor (1968), Van de Kamp (1973), Morton (1977), Crowell and Baca (1979), Sabins et al. (1980), Waters (1983), Rigsby (1984), McKibben (1993), and Dorsey (2006), among others. Surficial geologic mapping of the project site and vicinity has been provided at a scale of 1:750,000 by Jennings et al. (1977); at a scale of 1:500,000 by Jenkins (1938); at a scale of 1:250,000 by Brown (1923) and Rogers (1965); at a scale of 1:62,500 by Dibblee (1982); and at a scale of 1:24,000 by Dibblee and Minch (2004). The information in these geologic maps as well as published and unpublished reports form the basis of the following discussion. Individual maps and publications are incorporated into this report and referenced where appropriate. The site-specific geology of the proposed project site is discussed in Section 7.16.1.5. The aspects of geology pertinent to this report are the types, distribution, and age of sediments immediately underlying the proposed project area and their probability of producing fossils during proposed project construction.

The alluvial deposits accumulated in the Coachella Valley consist of a thick sequence of fine- to coarse-grained sediments deposited by the White River, Mission Creek, and local streams, which drain off the foothills of the surrounding mountain ranges (Crowell and Baca, 1979; Dorsey, 2006). These deposits generally grade basin-ward through gradually decreasing grain sizes from coarse boulder to cobble gravel in the foothills to clay-rich silt on the Salton Sea plain. Geological materials composing this thick sediment accumulation have been subdivided into stratigraphic units based on differences in lithology and age. In the immediate project vicinity, sediments composing the White River and Mission Creek alluvial fans and underlying marine sediments have been divided into several formally and informally named stratigraphic units, from oldest to youngest: the marine Pliocene Imperial Formation, nonmarine Pleistocene alluvial fan deposits known informally as either the "Ocotillo Conglomerate" or "Cabezon Fanglomerate," and unnamed Holocene alluvial fan and desert dune deposits. Although the Imperial Formation is not present at or near the surface of either the proposed project site or along the right-of-ways (ROW) of the proposed linear features, it is found exposed at the surface one mile southeast of the proposed natural gas pipeline ROW and three miles west of the proposed plant site. Thus, the Imperial Formation may underlie the entire proposed project area and could be impacted by deep excavations. Each of these stratigraphic units is discussed further below.

7.16.1.3 Resource Inventory Methods

To develop a baseline paleontological resource inventory of the project site and surrounding area, and to assess the potential paleontological productivity of each stratigraphic unit present in the vicinity, the published as well as available unpublished geological and paleontological literature was reviewed, and stratigraphic and paleontologic inventories were compiled, synthesized, and evaluated (see below). The number and locations of previously recorded fossil sites from stratigraphic units exposed in and near the project site and the types of fossil remains each stratigraphic unit has produced were greatly aided by including previous environmental impact assessment documents and paleontological resource impact mitigation program final reports. Previous surveys of Quaternary land mammal fossils of California made by Hay (1927), Lundelius et al. (1983), and Jefferson (1991b), and surveys of Quaternary birds, reptiles, and amphibians made by Miller and DeMay (1953) and Jefferson (1991a) were also reviewed. The literature review was supplemented by archival searches conducted at San Bernardino County Museum, University of California Museum of Paleontology in Berkeley, Los Angeles County Museum of Natural History, and San Diego Museum of Natural History, looking for additional information regarding the occurrence of fossil sites and remains in and near the project site. These methods are consistent with CEC (2007) and SVP (1995) guidelines for assessing the importance of paleontological resources in areas of potential environmental effect. No subsurface exploration was conducted for this assessment.

Geologic maps and reports covering the surface and subsurface geology of the project site and vicinity were reviewed to determine the exposed and subsurface rock units, to assess the potential paleontological productivity of each rock unit, and to delineate their respective areal distribution in the proposed project

area. In addition, available soil surveys and aerial photographs of the area were examined to aid in determining the areal distribution of distinctive sediment and soil types.

A field survey of the proposed project area was conducted on February 18 and 19, 2007, by Lanny H. Fisk, Ph.D., PG and Hugh M. Wagner, Ph.D., with PaleoResource Consultants (PRC). This survey included a visual inspection of exposures of potentially fossiliferous strata to document the presence of sediments suitable for containing fossil remains and the presence of any previously unrecorded fossil sites. During the field survey, stratigraphy was observed in outcrops, the banks of dry washes, and in excavations at the SCE Devers substation.

In common with other environmental disciplines such as biological resources (specifically in regard to threatened and endangered species) and cultural resources, following the California Environmental Quality Act (CEQA) and SVP (1995) paleontologists consider all fossil specimens significant, unless demonstrated otherwise, and therefore protected by environmental statutes. This position is held because fossils are uncommon and only rarely will a fossil locality yield a statistically significant number of specimens representing the same species. In fact, vertebrate fossils are so uncommon that, in most cases, each fossil specimen found provides additional important information about the characteristics or distribution of the species it represents.

A stratigraphic unit (such as a formation, member, or bed) known to contain significant fossils is considered to be *sensitive* to adverse impacts if there is a potential that earth-moving or ground-disturbing activities in that rock unit will either disturb or destroy fossil remains. This definition of sensitivity differs fundamentally from that for archaeological resources:

> *It is extremely important to distinguish between archaeological and paleontological (fossil) resource sites when defining the sensitivity of rock units. The boundaries of archaeological sites define the areal extent of the resource. Paleontologic sites, however, indicate that the containing sedimentary rock unit or formation is fossiliferous. The limits of the entire rock formation, both areal and stratigraphic, therefore define the scope of the paleontologic potential in each case (SVP, 1995).*

This distinction between archaeological and paleontological sites is important. Most archaeological sites have a surface expression that allows for their geographic location. Fossils, on the other hand, are an integral component of the rock unit below the ground surface, and, therefore, are not observable unless exposed by erosion or human activity. Thus, a paleontologist cannot know either the quality or quantity of fossils present before the rock unit is exposed as a result of natural erosion processes or earth-moving activities. The paleontologist can only make conclusions on sensitivity to impact based upon what fossils have been found in the rock unit in the past, along with a judgment on whether or not the depositional environment of the sediments that compose the rock unit was likely to result in the burial and preservation of fossils.

Fossils are seldom uniformly distributed within a rock unit. Most of a rock unit may lack fossils, but at other locations within the same rock unit concentrations of fossils may exist. Even within a fossiliferous portion of a rock unit, fossils may occur in local concentrations. For example, Shipman (1977, 1981) excavated a fossiliferous site using a three-dimensional grid and removed blocks of matrix of a consistent size. The site chosen was known prior to excavation to be richly fossiliferous, yet only 17 percent of the blocks actually contained fossils. These studies demonstrate the physical basis for the difficulty in predicting the location and quantity of fossils in advance of project-related ground disturbance.

Since it is not possible to determine where fossils are located without actually disturbing a rock unit, monitoring of excavation by an experienced paleontologist during construction increases the probability that fossils will be discovered and preserved. Preconstruction mitigation measures such as surface

prospecting and collecting will not prevent adverse impacts on fossils because many sites will be unknown in advance due to the absence of fossils at the surface.

The nonuniform distribution of fossils within a rock unit is essentially universal and many paleontological resource assessment and mitigation reports conducted in support of environmental impact documents and mitigation plan summary reports document similar findings (see for instance Lander, 1989, 1993; Reynolds, 1987, 1990; Spencer, 1990; Fisk et al., 1994; and references cited therein). In fact, most fossil sites recorded in reports of impact mitigation (where construction monitoring has been implemented) had no previous surface expression. Because the presence or location of fossils within a rock unit cannot be known without exposure from erosion or excavation, under SVP (1995) standard guidelines, an entire rock unit is assigned the same level of sensitivity based on previously recorded fossil occurrences.

Using SVP (1995) criteria, the paleontological importance or sensitivity (high, low, or undetermined) of each rock unit exposed in a project site or surrounding area is the measure most amenable to assessing the significance of paleontological resources because the areal distribution of each rock unit can be delineated on a topographic or geologic map. The paleontological importance of a stratigraphic unit reflects: (1) its potential paleontological productivity (and thus sensitivity), and (2) the scientific significance of the fossils it has produced. This method of paleontological resources assessment is the most appropriate because discrete levels of paleontological importance can be delineated on a topographic or geologic map.

The potential paleontological productivity of a stratigraphic unit exposed in a project area is based on the abundance/densities of fossil specimens and/or previously recorded fossil sites in exposures of the unit in and near a project site. The underlying assumption of this assessment method is that exposures of a stratigraphic unit are most likely to yield fossil remains both in quantity and density similar to those previously recorded from that stratigraphic unit in and near the project site.

An individual fossil specimen is considered scientifically important if it is:

- Identifiable
- Complete
- Well preserved
- Age diagnostic
- Useful in paleoenvironmental reconstruction
- A type or topotypic specimen
- A member of a rare species
- A species that is part of a diverse assemblage
- A skeletal element different from, or a specimen more complete than, those now available for that species

Identifiable land mammal fossils are considered scientifically important because of their potential use in providing accurate age determinations and paleoenvironmental reconstructions for the sediments in which they occur. Moreover, vertebrate remains are comparatively rare in the fossil record. Although fossil plants are usually considered of lesser importance because they are less helpful in age determination, they are actually more sensitive indicators of their environment; thus, as sedentary organisms, more valuable than mobile animals for paleoenvironmental reconstructions. For marine sediments, invertebrate and marine algal fossils, including microfossils, are scientifically important for the same reasons that land mammal and land plant fossils are valuable in terrestrial deposits. The value or importance of different fossil groups varies depending on the age and depositional environment of the stratigraphic unit that contains the fossils.

The following tasks were completed to establish the paleontological importance and sensitivity of each stratigraphic unit exposed in or near the project site:

- The potential paleontological productivity of each rock unit was assessed based on the density of fossil remains and/or previously recorded and newly documented fossil sites it contains in and/or near the project site.

- The scientific importance of fossil remains recorded from a stratigraphic unit exposed in the project site was assessed.

- The paleontological importance of a rock unit was assessed, based on its documented and/or potential fossil content in the area surrounding the project site.

7.16.1.4 Paleontological Sensitivity

In its standard guidelines for assessment and mitigation of adverse impacts to paleontological resources, the SVP (1995) established three categories of sensitivity for paleontological resources: high, low, and undetermined.

High Sensitivity

Stratigraphic units in which fossils have been previously found have a high potential to produce additional fossils and are therefore considered to be highly sensitive. In areas of high sensitivity, full-time monitoring is recommended during any project-related ground disturbance.

Low Sensitivity

Stratigraphic units that are not sedimentary in origin or that have not been known to produce fossils in the past are considered to have low sensitivity. Full-time monitoring is usually not recommended nor needed during project excavations in a stratigraphic unit with low sensitivity.

Undetermined Sensitivity

Stratigraphic units that have not had any previous paleontological resource surveys or any fossil finds are considered to have undetermined sensitivity. After reconnaissance surveys, observation of artificial exposures (such as road cuts) and natural exposures (such as stream banks), and possible subsurface testing (such as augering or trenching), an experienced, professional paleontologist can often determine whether the stratigraphic unit should be categorized as having high or low sensitivity.

In keeping with the significance criteria of the SVP (1995), all vertebrate fossils are categorized as having significant scientific value and all stratigraphic units in which vertebrate fossils have previously been found to have high sensitivity.

7.16.1.5 Resource Inventory Results

Stratigraphic Inventory

Small-scale regional geologic mapping of the proposed project site and vicinity has been provided by Blake (1858; approximately 1:2,000,000 scale), Jennings et al. (1977; 1:750,000 scale), Jenkins (1938; 1:500,000 scale), Brown (1923, 1:250,000 scale), Dibblee (1954, 1:250,000 scale), and Rogers (1965; 1:250,000 scale). Larger-scale mapping of the proposed project area has been provided by Dibblee (1982, 1:62,500 scale) and Dibblee and Minch (2004, 1:24,000 scale). Unfortunately, in their geologic maps of the Late Cenozoic deposits of the project area, geologists have not always used formally named stratigraphic units; nor have they consistently used the same map units. In addition, differences in interpretation are present in several of these maps and outcrops are still subject to interpretation. In spite of several recent attempts to revise the stratigraphy of late Cenozoic outcrops in the Salton Trough area

(e.g., Winker, 1987; Remeika and Jefferson, 1995; Cassiliano, 2002; Dorsey, 2006), the stratigraphic nomenclature of this area is still in a state of flux. Winker and Kidwell (1996) have specifically discussed "the problems of proliferating local stratigraphic names and ambiguous or conflicting usages of more widely used names." Powell (1995) has addressed the "myriad of stratigraphic schemes" that have been proposed for the Imperial Formation alone (Kew, 1914; Hanna, 1926; Woodring, 1932; Dibblee, 1954; Stump, 1972; Woodard, 1974; Winker, 1987). The discussion below attempts to stay out of the ongoing controversy by greatly simplifying the stratigraphic nomenclature of the proposed project area.

In his geologic mapping, Rogers (1965) mapped the area in the vicinity of the proposed project site and the ROW of the proposed natural gas pipeline as "Recent Alluvium" (including eolian dune sands) surrounding small, low-relief hills mapped as "Pleistocene Nonmarine Sedimentary Deposits." In the latter map unit, Rogers included both the "Ocotillo Conglomerate", an informal stratigraphic unit consisting of unconsolidated boulder conglomerates found along the margins of the Coachella Valley; and the "Cabezon Fanglomerate", a lithologically similar, informally named unit based on outcrops in the San Gorgonio/Banning Pass area and on Whitewater Hill southwest of the project site. Rogers (1965) also mapped outcrops of Pliocene Imperial Formation both on Garnet Hill southeast of the project area and on Painted Hill west-northwest of the project area.

In the most recent and most detailed geologic mapping in the area, Dibblee (1982) and Dibblee and Minch (2004) mapped the project site and vicinity as Holocene "alluvial sand and gravel" overlying Pleistocene "alluvial fan gravel and sand." The latter is exposed at the surface in the southeast corner of the proposed project site and also on Devers Hill immediately east of the project site. These outcrops were referred to the "Ocotillo Conglomerate" or "Cabezon Fanglomerate" by Rogers (1965). Dibblee and Minch (2004) attempted to separate what they interpreted as "younger" Pleistocene alluvial fan conglomerates, such as those exposed on the project site and Devers Hill, from similar but "in part older" Pleistocene alluvial fan conglomerates exposed on Garnet and Whitewater Hills. Dibblee and Minch (2004) referred the "older" conglomerates on Garnet and Whitewater Hills to the "Cabazon Fanglomerate" but did not apply a name to the "younger" conglomerates. Dibblee and Minch (2004) described the "younger" unnamed Pleistocene conglomerates as "granitic and gneiss detritus" and the "Cabazon Fanglomerate" on Whitewater Hill as "gneiss and granitic detritus." In other words, these two outcrops are lithologically indistinguishable. However, in this author's professional opinion, they should be treated as a single stratigraphic unit, as they are in this section. The "Cabazon Fanglomerate" mapped by Dibblee and Minch (2004) on Garnet Hill along with outcrops of the Pliocene Imperial Formation are distinctly different from those outcropping on the project site and on Devers and Whitewater Hills. The outcrops interpreted by Dibblee and Minch (2004) as "Cabezon Fanglomerate" on Garnet Hill are heterolithologic breccias composed of predominantly metamorphic clasts including gneiss, schist, and marble, with a large basalt component. In this author's opinion, this megabreccia is part of the Imperial Formation.

Excavations both at the project site and along the ROW of the proposed natural gas pipeline will clearly disturb both Holocene and Pleistocene alluvial fan deposits. What is unclear is whether deeper excavations at the project site or trenching for the natural gas pipeline could also disturb the Pliocene Imperial Formation. One of the reasons for this uncertainty is that the project lies within the San Andreas Fault Zone. The Banning or South Branch of the San Andreas Fault is located less than 1/4 mile south of the project site and is crossed by the proposed ROW of the natural gas pipeline. In the Coachella Valley, compressive stresses along the various faults in the San Andreas Fault System have resulted in "pop-up" structures (small domes and anticlines) which have brought older rocks to the surface. The older rocks exposed on Garnet Hill southeast of the project site and on Devers Hill immediately east of the project site are examples. Since it is possible that similar "pop-up" structures could be encountered at shallow depths underlying either the project site or the proposed ROW of the natural gas pipeline, the Imperial Formation will also be included in the discussion below, even though the probability of this stratigraphic unit being encountered may be low.

Pliocene Imperial Formation. In the vicinity of the Coachella Valley, the Imperial Formation consists of weakly cemented, marine siltstone, sandstone, conglomerate, and breccia containing a heterogeneous mixture of rock types, including angular to subrounded metamorphic and igneous clasts. This stratigraphic unit has been described by Woodring (1932), Proctor (1968), and Dibblee (1981, 1982) and outcrops have been mapped both on Garnet Hill southeast of the project area and on Painted Hill west-northwest of the project area by Rogers (1965), Dibblee (1982), and Dibblee and Minch (2004). In the northwestern Coachella Valley, the Imperial Formation has been dated about 6.5 to 6.3 million years ago (Ma) based on micropaleontologic and geochronologic data (McDougall et al., 1999). Although the Imperial Formation is not mapped as being present at the surface in the project area and is not known to be present in the subsurface underlying the project area, the fact that Imperial Formation rocks are exposed at the surface one mile southeast and three miles northwest of the project area suggests that this stratigraphic unit could be encountered in deep excavations during project construction.

Pleistocene Alluvial Fan Deposits. Included in this stratigraphic unit are coarse alluvial fan conglomerates consisting of subrounded, boulders and cobbles of primarily granite and gneiss in a sandy matrix. Within the poorly bedded conglomerate sequence are rare silty sand channels. This unit has been referred to by the informal names "Ocotillo Conglomerate" and "Cabazon Fanglomerate" by various authors (Vaughan, 1922; Allen, 1957; Proctor, 1968; Rogers, 1965; Dibblee, 1982; and Dibblee and Minch, 2004). Rogers (1965), Dibblee (1982), and Dibblee and Minch (2004) mapped this stratigraphic unit as present at the surface in the southeast corner of the proposed project site, on Devers Hill immediately east of the project site, and on Whitewater Hill southwest of the project site. In the most recently published work, Dorsey (2006) referred to these deposits simply as Ocotillo Conglomerate and described them as "a widespread coarse alluvial unit in the northwestern [Salton] Trough…." Remeika and Jefferson (1993) reported the age of the "Ocotillo Conglomerate" as ranging from Middle to Late Pleistocene (1.25 to 0.37 Ma) based on mammalian fossils and magnetostratigraphy. This period is correlative with Irvingtonian and earliest Rancholabrean North American Land Mammal Ages (NALMA) (Savage, 1951; Woodburne, 1987).

Holocene Alluvium. Within this stratigraphic unit are included alluvial sand and gravel deposited along stream channels and as overbank deposits on the surface of the Mission Creek alluvial fan during Recent time. Also included in this unit are relatively thin eolian deposits (dune sands) sparsely distributed throughout the proposed project area. By definition, these Holocene sediments are younger than about 10,000 radiocarbon years. Rogers (1965), Dibblee (1982), and Dibblee and Minch (2004) have all mapped Holocene alluvial fan deposits covering most of the CPVS project area, although locally they may form only a relatively thin blanket over Pleistocene conglomerates. Since they have been largely, if not entirely, derived from the reworking of uplifted Pleistocene conglomerates, the Holocene alluvium on the Mission Creek alluvial fan is lithologically similar to the underlying Pleistocene alluvial fan deposits, but can be distinguished from them by stratigraphic position, degree of lithification (and therefore resistance to erosion and topographic expression), amount of deformation (both faulting and folding), and age based on age-diagnostic vertebrate fossils and magnetostratigraphy.

Paleontological Resource Inventory

An inventory of the paleontological resources of each stratigraphic unit present at or near the proposed project area is presented below and the scientific and educational importance of these resources is briefly assessed. The literature review and museum archival record searches conducted for this inventory documented no previously recorded fossil sites within either the footprint of the proposed project site or along the proposed ROW of the natural gas pipeline. Nor were any paleontological resources discovered in the immediate project area during the field survey done for this paleontological resource impact assessment. However, numerous fossil localities have been reported from sediments referable to the Pleistocene alluvial fan deposits and Imperial Formation in the general vicinity of the proposed project

site. In addition, fossil remains were found at a previously unrecorded fossil site during the field survey of the proposed project site and vicinity conducted for this assessment.

Pliocene Imperial Formation. In the vicinity of the Coachella Valley, the Imperial Formation contains fossil gastropods (snails and limpets; Schremp, 1981), echinoids (sea stars, sea urchins, and sand dollars; Powell, 1995), and pelecypods (clams), including oysters (Dibblee and Minch, 2004). In addition, during a field survey of prospective fossiliferous sediments in the project area abundant ichnofossils (burrows and root casts) were discovered in Imperial Formation sediments exposed on Garnet Hill one mile southeast of the proposed project area. In other areas of the Salton Trough, fossils of sponges, bryozoans, brachiopods, foraminifers, corals, molluscs (clams and snails), echinoids (sea stars, sea urchins, and sand dollars), crustaceans (barnacles, crabs, and shrimp), and teeth and bones of sharks, rays, bony fishes, sea turtles, and marine mammals (walruses, whales, and dolphins) have been reported from the Imperial Formation (Deméré, 1993, 2006, and Deméré and Rugh, 2006). Invertebrate fossils in the Imperial Formation are particularly significant to understanding North American geologic and paleobiologic history because they include species nearly identical or very similar to species now living in the Caribbean Sea and thus document that the eastern Pacific Ocean and the Caribbean Sea were connected in a single tropical marine province until Middle to Late Pliocene time (Stump and Stump, 1972). Rugh (2005) has stated "that the importance of the Imperial Group [Formation] invertebrate fossils will increase as our understanding of the desert region and its fossils grows." Deméré (2006) has remarked regarding the Imperial Formation "that there is still a great deal of paleontological work to be done in these marine rocks and … many more fossils are to be found."

In summary, sediments referable to the Imperial Formation have yielded numerous scientifically significant fossils in the past, including from a fossil locality only one mile from the ROW of the proposed natural gas pipeline for this project. Because this unit has produced significant fossils, the Imperial Formation is judged to have high sensitivity under SVP (1995) criteria. Additional identifiable fossil remains recovered from the Imperial Formation during project construction could be scientifically important and significant.

Pleistocene Alluvial Fan Deposits. Remeika and Jefferson (1993, 1995) have reviewed the large vertebrate fossil fauna from the "Ocotillo Conglomerate" and laterally equivalent strata in the Imperial Valley. Jefferson (2005) has summarized the abundant fossil birds from the "Ocotillo Conglomerate." These fossil remains are scientifically significant because they have been helpful in reconstructing the Pleistocene geologic and paleobiologic history of the Salton Sea area. Since fossil vertebrates have been previously reported from this stratigraphic unit, this formation is judged to also have high sensitivity using SVP (1995) criteria. However, most of the fossils previously reported from Pleistocene alluvial fan deposits in the Salton Trough have been discovered in facies other than the coarse boulder to cobble conglomerates seen in the proposed project area. Since depositional conditions in Coachella Valley outcrops appear to be only marginally favorable for the preservation of fossils, there is actually a low probability of adverse impacts on paleontological resources resulting from ground disturbance in Pleistocene conglomerates during project construction. Additional identifiable fossil remains recovered from this stratigraphic unit during project construction could be scientifically important and significant.

Holocene Alluvium. During the geological and paleontological literature review and museum archival records searches for this paleontological resource impact assessment, no previously recorded fossil sites were found in Holocene alluvium in the project area. During a field survey of prospective fossiliferous sediments, no indications were found that the Holocene alluvium might be fossiliferous. Therefore, because the Holocene alluvium has not been known to produce fossils in the past, this stratigraphic unit is considered to have low sensitivity.

Summary

Fossils are not known to be present in sediments directly underlying the proposed project site or the ROW of the proposed natural gas line. The presence of fossil sites in deposits of the Imperial Formation and Pleistocene alluvial fan deposits elsewhere suggests that there is a potential for additional similar fossil remains to be uncovered by excavations in these formations during CPVS construction. Under SVP (1995) criteria, both these stratigraphic units have a high sensitivity for producing additional paleontological resources. Identifiable fossil remains recovered from either stratigraphic unit during project construction could be scientifically important and significant. Because the Holocene alluvium in the Coachella Valley has not been known to produce fossils in the past, this stratigraphic unit is considered to have low sensitivity.

Identifiable fossil remains recovered during project construction could represent new taxa or new fossil records for the area, for the State of California, or for the formation. They could also represent geographic or temporal range extensions. Moreover, discovered fossil remains could make it possible to more accurately determine the age, paleoclimate, and depositional environment of the sediments from which they are recovered. Finally, fossil remains discovered during project construction could provide a more comprehensive documentation of the diversity of animal and plant life that once existed in Riverside County and could result in a more accurate reconstruction of the geologic and paleobiologic history of the Coachella Valley and Salton Trough area.

7.16.2 Environmental Consequences

7.16.2.1 Significance Criteria

A paleontological resource can be significant if:

- It provides important information on the evolutionary trends among organisms, relating living organisms to extinct organisms.
- It provides important information regarding development of biological communities or interaction between botanical and zoological biota.
- It demonstrates unusual circumstances in biotic history.
- It is in short supply and in danger of being depleted or destroyed by the elements, vandalism, or commercial exploitation, and is not found in other geographic localities.

Under CEQA guidelines (Public Resources Code [PRC] 15064.5 (a) (2)), public agencies must treat all historical and cultural resources as significant unless the preponderance of evidence demonstrates that they are not historically or culturally significant. Paleontological resources are included in CEQA with cultural resources. In keeping with significance criteria of the SVP (1995), all vertebrate fossils are categorized as having significant scientific value.

Potential impacts on paleontological resources resulting from the proposed project can be divided into construction-related impacts and operation-related impacts, discussed below.

7.16.2.2 Project Construction

Construction-related impacts to paleontological resources primarily involve terrain modification (excavations and drainage diversion measures). Paleontologic resources, including an undetermined number of fossil remains and unrecorded fossil sites; associated specimen data and corresponding geologic and geographic site data; and the fossil-bearing strata, could be adversely impacted by ground

disturbance and earth moving associated with construction of the project. Direct impacts would result from vegetation clearing, grading of the generating facility site and associated roads, trenching for pipelines, augering for foundations, and any other earth-moving activity that disturbs or buries previously undisturbed fossiliferous sediments, making those sediments and their paleontologic resources unavailable for future scientific investigation. Construction of supporting facilities, such as temporary construction offices, laydown areas, and parking areas are unlikely to result in adverse impacts on significant paleontological resources, as they will involve only surface ground disturbance.

The proposed project will impact both Pleistocene and Holocene-age alluvial deposits. In addition, there is a slight possibility that sediments of the Pliocene Imperial Formation may be impacted by deep excavations. Site clearing, grading, leveling and deeper excavation at the proposed project site and trenching for the proposed natural gas pipeline could result in significant adverse impacts to paleontological resources in either the Pleistocene alluvial fan deposits or Imperial Formation marine deposits. Impacts on significant fossils in Holocene-age alluvial deposits are highly unlikely.

7.16.2.3 Project Operation

No impacts on paleontological resources are expected to occur from the continuing operation of the project or any of its related facilities.

7.16.3 Cumulative Impacts

Based on proximity to the project site, the following future projects in the area are considered under cumulative impacts:

- Indian Avenue/I-10 Interchange Project: This proposed project involves reconstruction of the I-10 Freeway/Indian Avenue interchange and is located south of the proposed project. This reconstruction is expected to occur in 2008.

- Dillon Wind Farm: Installation of 45 wind turbines located in three separate areas, including (1) an area west of Devers substation, (2) an area 2,000 feet east of the project site, and (3) an area 4,500 feet to the southeast of the project site. The Environmental Impact Report for this project was recently certified by Riverside County.

- Wind Energy Conservation System (WECS) 20 Permit Project: This project would consist of 8 new GE 1.5 MW wind turbine generators in the existing WECS 20 Wind Park. This site is located approximately 0.5 mile west of State Route 62 and 2 miles north of I-10; about 2 miles northwest of the proposed project site.

- Green Path Project: The main feature of the Green Path project is a new 100-mile, 500kV line planned to extend from the Devers-Palo Verde transmission corridor north to a new Upland substation in the northeastern sector of Los Angeles Department of Water and Power (LADWP) service territory. The project would increase the reliability and voltage support of existing system by upgrading to 230kV standards of existing corridors. Planned construction is 2007 to 2009; planned in-service date is 2010.

- Oasis Annexation: Mixed-use development (including residential) on 155 acres located approximately 3.2 miles northeast of the project site.

- Alpine Group Development: Mixed-use development (including schools and high-density residential) on 160 acres located 1 mile northwest of the project site. The City Desert of Hot Springs is expecting to annex and approve this project.

- Palmwood Specific Plan and Outparcels Development: Mixed-use development (including 1,853 residential units) on 1,926-acres located 6.5 miles north of the site.

If paleontological resources were encountered during construction of these projects, impacts to paleontological resources could be significant if measures are not implemented to adequately address these resources. However, the contribution to these cumulative impacts from the proposed project would be less than significant, since mitigation measures would be implemented as part of the proposed project to recover the resources. The mitigation measures proposed in Section 7.16.4 below would effectively recover the value to science of significant fossils discovered and ensure that the project's contribution to cumulative impacts to paleontological resources was less than significant.

7.16.4 Mitigation Measures

Potential impacts on paleontological resources as a result of project construction could represent significant adverse impacts and consequently will need to be mitigated. This section describes mitigation measures that would be implemented to reduce potential adverse impacts to significant paleontological resources resulting from project construction. These proposed paleontological resource impact mitigation measures would reduce direct, indirect, and cumulative adverse environmental impacts on paleontological resources to a less-than-significant level. The mitigation measures proposed below are in compliance with CEC environmental guidelines (CEC, 2007) and with SVP standard guidelines for mitigating adverse construction-related impacts on paleontological resources (SVP, 1995, 1996).

PALEO-1, **Paleontological Monitoring.** Prior to construction, a qualified paleontologist will be retained to both design and implement a monitoring and mitigation program. During construction, earth-moving construction activities will be monitored where these activities will potentially disturb previously undisturbed sediment. Monitoring will not be conducted where the ground has been previously disturbed or where exposed sediment will be buried, but not otherwise disturbed. Construction monitoring is recommended to ensure that unanticipated discoveries will be addressed in a timely manner and construction will not be delayed.

PALEO-2, Paleontological Monitoring and Mitigation Program. The paleontological resource monitoring and mitigation program will include preconstruction coordination; construction monitoring; emergency discovery procedures; sampling and data recovery, if needed; preparation, identification, analysis, and museum curation of any fossil specimens and data recovered; and reporting. This monitoring and mitigation plan will be consistent with SVP (1995) standard guidelines for the mitigation of construction-related adverse impacts on paleontological resources, as well as the requirements of the designated museum repository for any fossils collected (SVP, 1996).

PALEO-3, Construction Personnel Education. Prior to start of construction, all personnel who will be involved with earth-moving activities will be informed that fossils could be encountered. They will also be informed on the appearance of common fossils and on proper notification procedures. This worker training will be prepared and presented by a qualified paleontologist.

Scientific recovery, preparation, identification, determination of significance, and curation into a public museum is considered by most land management agencies and by the SVP (1995) to adequately mitigate impacts to paleontological resources in most circumstances. Therefore, the implementation of these mitigation measures would reduce the potentially significant adverse environmental impact of project-related ground disturbance and earth moving on paleontological resources to an less-than-significant level by allowing for the recovery of fossil remains and associated specimen data and corresponding geologic and geographic site data that otherwise would be lost to earth moving and to unauthorized fossil collecting. With a well designed and implemented paleontological resource monitoring and mitigation plan, project construction could actually result in beneficial impacts on paleontological resources through

the possible discovery of fossil remains that would not have been exposed without project construction and, therefore, would not have been available for scientific study. The identification and analysis of fossil remains discovered as part of project construction could help answer important questions regarding the geographic distribution, stratigraphic position, tectonic history, and age of fossiliferous sediments in the project area.

7.16.5 Laws, Ordinances, Regulations, and Standards

Paleontological resources are classified as nonrenewable scientific resources and are protected by several federal and state statutes (CSHPO, 1983; Marshall, 1976; West, 1991; Fisk and Spencer, 1994; Gastaldo, 1999), 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 by the SVP (1995, 1996). Design, construction, and operation of the proposed project, including ancillary facilities, will be conducted in accordance with LORS applicable to paleontological resources. Federal and state LORS applicable to paleontological resources are summarized in Table 7.16-1 and discussed briefly below, together with SVP professional standards.

7.16.5.1 Federal

Federal protection for significant paleontological resources would apply to the project if any construction or other related project impacts occurred on federally owned or managed lands. 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.

7.16.5.2 State

The CEC environmental review process required under the Warren-Alquist Act is considered functionally equivalent to that of the CEQA (CEQA; PRC Sections 15000 et seq.) with respect to paleontological resources. Guidelines for the Implementation of CEQA (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 include as one of the questions to be answered in the Environmental Checklist (Section 15023, Appendix G, Section XIV, Part a) the following: "Would the project directly or indirectly destroy a unique paleontological resource or site…?"

Other state requirements for paleontological resources management are in PRC Chapter 1.7, Section 5097.5, Archaeological, Paleontological, and Historical Sites. This statute specifies that state agencies may undertake surveys, excavations, or other operations as necessary on state lands to preserve or record paleontological resources and defines any unauthorized disturbance or removal of a fossil site or remains on public land as a misdemeanor. It would apply to the proposed project only if any construction or other related project impacts occurred on state owned or managed lands or if the state or a state agency were to obtain ownership of project lands during the term of the project license.

7.16.5.3 County

Riverside County has mitigation requirements that specifically address potential adverse impacts to paleontological resources. The Cultural and Paleontological Resources section of Chapter 5: Multipurpose Open Space Element of the Riverside County General Plan states in part:

> *Riverside County has also been inventoried for geologic formations known to potentially contain paleontological resources. Paleontological resources are the fossilized biotic remains of ancient environments. They are valued for the information they yield about the*

> *history of the earth and its past ecological settings. Lands with low, undetermined or high potential for finding paleontological resources are mapped on Figure OS-8, the Paleontological Sensitivity Resources map. This map is used in the environmental assessment of development proposals and the determination of required impact mitigation.*

Although the Paleontological Sensitivity Resources map provided in the General Plan is very small scale, it nonetheless is helpful in determining that the geological formations exposed at the surface in the area that will be impacted by this proposed project have low or undetermined paleontological sensitivity. Geological formations potentially found in the subsurface in the proposed project area have been determined to have high paleontological sensitivity.

The County General Plan provides the following policies that are intended to ensure the preservation of paleontological resources:

> **OS 19.8.** Whenever existing information indicates that a site proposed for development may contain . . . paleontological . . . resources, a report shall be filed stating the extent and potential significance of the resources that may exist within the proposed development and appropriate measures through which the impacts of development may be mitigated.
>
> **OS 19.9.** This policy requires that when existing information indicates that a site proposed for development may contain paleontological resources, a paleontologist shall monitor site grading activities, with the authority to halt grading to collect uncovered paleontological resources, curate any resources collected with an appropriate repository, and file a report with the Planning Department documenting any paleontological resources that are found during the course of site grading.
>
> **OS 19.10.** Transmit significant development applications subject to CEQA to the San Bernardino County Museum for review, comment, and/or preparation of recommended conditions of approval with regard to paleontological resources.

7.16.5.4 Professional Standards

The SVP, an international scientific organization of professional paleontologists, has established standard guidelines (SVP, 1995, 1996) that outline acceptable professional practices in the conduct of paleontological resource assessments and surveys, monitoring and mitigation, data and fossil recovery, sampling procedures, and specimen preparation, identification, analysis, and curation. The SVP's standard guidelines were approved by a consensus of professional paleontologists and are the standard against which all paleontological monitoring and mitigation programs are judged. Most practicing professional paleontologists in the nation adhere closely to the SVP's assessment, mitigation, and monitoring requirements as specifically spelled out in its standard guidelines. Most federal and California state regulatory agencies accept the SVP standard guidelines as a measure of professional practice.

7.16.6 Involved Agencies and Agency Contacts

No state or local agencies have specific jurisdiction over paleontological resources on either state or privately owned land.

7.16.7 Permits Required and Permit Schedule

No state or county agency requires a paleontological collecting permit to allow for the recovery of fossil remains discovered as a result of construction-related earth moving on state or private land. A federal Antiquities Act Permit would be required from the Bureau of Land Management (BLM) for the collection of fossils from any BLM-owned or managed lands.

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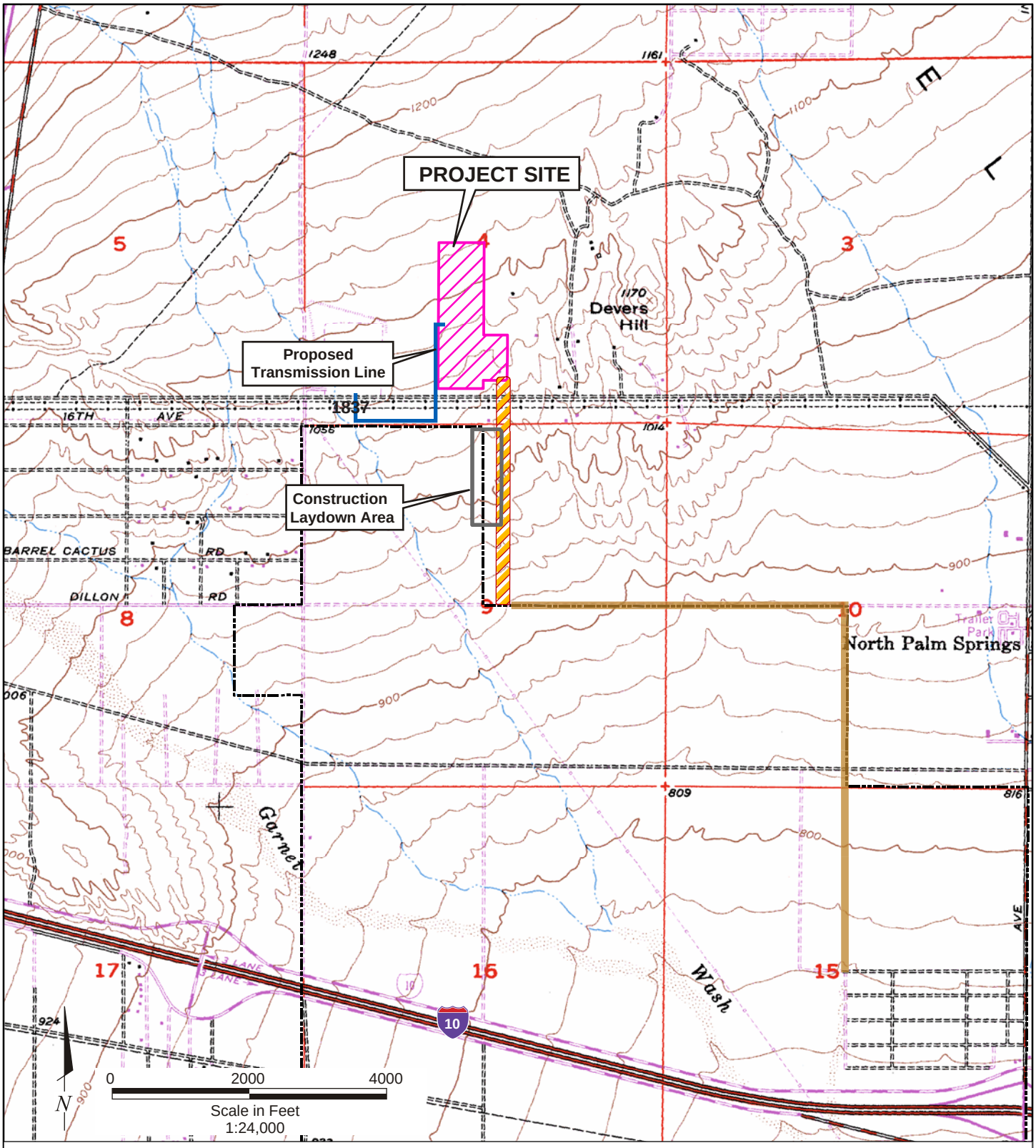
Table 7.16-1
Laws, Ordinances, Regulations, and Standards

Project LORS	Applicability	AFC Reference
Antiquities Act of 1906	Protects paleontological resources on federal lands	Section 7.16.5.1
CEQA	Fossil remains may be encountered by earth-moving	Section 7.16.5.2
PRC Sections 5097.5/5097.9	Would apply only if project impacts occurred on lands either owned or managed by the State of California	Section 7.16.5.2



LEGEND

- Proposed Project Site
- Potential Construction Laydown Area
- Gas Transmission Corridor (75-feet wide)
- Transmission Line
- Gas Transmission Corridor Potable Water Line/ Access Road Corridor (200-feet wide)

Source: site boundary, proposed pipelines, laydown areas, potential transmission line area and radii, digitized by URS, 2006-2007; 7.5-minute quadrangle, USGS 1978.

SITE LOCATION MAP

CPV Sentinel Energy Project
CPV Sentinel, LLC
Riverside County, California

June 2007
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FIGURE 7.16-1

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