5.8 PALEONTOLOGICAL RESOURCES

Paleontological resources (fossils) are the remains or traces of prehistoric animals and plants. 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 these organisms lived, (3) determining the relative ages of the strata in which they occur, and (4) determining the geologic events that resulted in the deposition of the sediments in which they were buried.

This section of the Application for Certification summarizes the potential environmental effects on paleontological resources that could result from construction of the SES Solar Two, LLC (Solar Two or Applicant) Project and its ancillary systems (Project). Section 5.8.1, Affected Environment, describes the existing environment that could be affected by the Project. Section 5.8.2, Environmental Consequences, describes the potential effects on paleontological resources resulting from construction and operation of the Project. The potential cumulative effects to paleontological resources are discussed in Section 5.8.3, Cumulative Effects. Proposed mitigation measures to reduce potential adverse effects to paleontological resources are discussed in Section 5.8.4, Mitigation Measures. Section 5.8.5 lists the federal, state, and local laws, ordinances, regulations, and standards (LORS) and the professional standards that protect paleontological resources. The agencies involved and their contact information are provided in Section 5.8.5.4, Agencies and Agency Contacts. Section 5.8.5, Compliance with LORS, discusses the status of permits required and the permit schedule. Finally, Section 5.8.6, References, lists the references used in preparing this document.

This paleontological resources inventory and effect assessment was prepared by Dr. Lanny H. Fisk, PhD PG, a California-licensed Professional Geologist (PG) and Principal Paleontologist, and by Stephen J. Blakely, Project Manager and Staff Paleontologist, both with PaleoResource Consultants (PRC). This assessment meets all requirements of the California Energy Commission (CEC 2007) and the standard measures for mitigating adverse construction-related environmental effects on significant paleontological resources established by the Society of Vertebrate Paleontology (SVP) (SVP 1995, 1996; see Appendix AA, Paleontological Resources Technical Report).

5.8.1 Affected Environment

5.8.1.1 Geographic Location

The Project is located near the City of El Centro in western Imperial County, California, within Townships (T) 16 South (S), Ranges (R) 10-11 East (E) (Figure 5.8-1, Project Site and Vicinity). The site is located approximately 100 miles east of San Diego, California, 14 miles west of El Centro, California, and adjacent to and immediately south of Plaster City, California. The center of the Project Site is at approximately latitude 32˚46'28"N and longitude 115˚51'42"W. In addition to the Project Site, linear features extending beyond the main site, including a water pipeline and an off-site transmission right-of-way (ROW) are proposed. The water pipeline will extend from the Main Services Complex approximately 7.17 miles east to the Imperial Irrigation District Westside Main Canal. The off-site transmission ROW will extend from the proposed Project substation approximately 10.3 miles southeast to the San Diego Gas & Electric Imperial

Valley Substation. The Project would affect Sections 7, 9-10, 14-18, and 19-22 within T16S, R11E on the Plaster City United States Geological Survey (USGS) 7.5-minute Quadrangle. On the Painted Gorge USGS 7.5-minute Quadrangle, the Project would affect Sections 7, 18, and 19 within T16S, R11E, and Sections 12-15 and 22-27 within T16S, R10E. The proposed off-site water pipeline would affect Sections 10-12 and 14 within T16S, R11E and Section 7 within T16S, R12E on the Plaster City USGS 7.5-minute Quadrangle. The proposed off-site transmission line would affect: Sections 22, 23, 25, and 26 within T16S, R11E and Section 30 within T16S, R12E on the Plaster City USGS 7.5-minute Quadrangle; Sections 29-32 within T16S, R12E on the Yuha Basin USGS 7.5-minute Quadrangle; and Sections 3, 4, and 33 within T16S, R12E on the Mount Signal USGS 7.5-minute Quadrangle. The topographic relief at the Project Site varies, with elevations ranging from approximately 0 to 345 feet (about 0 to 105 meters).

The Salton Trough, which is within the Colorado Desert Geomorphic Province, is bounded on the south by the United States–Mexico border, on the north by the San Gorgonio Pass in the Transverse Ranges, by the San Jacinto, Santa Rosa, Vallecito, Laguna, and other Peninsular Ranges Mountains to the west, and by the Colorado River to the east. The Colorado Desert Physiographic Province is south of the easternmost extent of the Transverse Ranges, and between the Mohave Desert Physiographic Province on the northwest and the Peninsular Ranges Physiographic Province to the west. The Colorado Desert is a low lying desert dominated by the Salton Sea and shorelines of ancient Lake Cahuilla. Several major fault systems are present in the Colorado Desert region, and have a general north-northwest orientation. The Solar Two Project Site is located within the Yuha Desert and partially within the Yuha Buttes in the southern and western areas (Figure 5.8-1, Project Site and Vicinity). The Yuha Desert is a subregion of the Colorado Desert, and is designated an Area of Critical Environmental Concern by the Bureau of Land Management (BLM). Access to the Project area is provided by Interstate 8, the Evan Hewes Highway (also Walker Avenue), and Dunaway Road. The site is partially bounded by Interstate 8 on the south and the Union Pacific and Rio Grande Railroad south of Evan Hewes Highway to the north (Figure 5.8-1).

5.8.1.2 Regional Geologic Setting

The general geology of the Project vicinity has been described in some detail by Blake (1858), MacDougal (1914), Brown (1923), Woodring (1932), Tarbet (1951), Dibblee (1954, 1984), Woodard (1963), Sharp (1967), Randall (1974), Morton (1977), Younker et al. (1982), Quinn and Cronin (1984), Herber (1985), Axen and Fletcher (1998), Cassiliano (2002), Dorsey (2005), Winker and Kidwell (2006), and Dorsey et al. (2007), among others. Surficial geologic mapping in the Project vicinity has been provided at a scale of 1:750,000 by Jennings et al. (1977); at a scale of 1:500,000 by Brown (1923) and Jenkins (1938); at a scale of 1:250,000 by Dibblee (1954) and Strand (1962); and at a scale of 1:125,000 by Morton (1977). No larger scale maps (e.g., 1:62,500 or 1:24,000) are available for this area. The information in these geologic maps and 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 aspects of geology pertinent to this report are the types, distribution, and age of sediments immediately underlying the Project area and their probability of producing fossils during Project construction. The site-specific geology in the vicinity of the Project is discussed separately below.

The Salton Trough is a large fault-bounded basin in Southern California and northern Mexico that was created by regional extension associated with the opening of the Gulf of California, beginning in the Miocene (Axen and Fletcher 1998). It is a tectonically complex region that records various episodes of subsidence, deposition, and erosion. The primary driving force in the evolution of the Salton Trough since the late Miocene has been the combined slip on the San Andreas Fault system, which marks the active boundary between the Pacific and North American tectonic plates, and the oblique-normal West Salton Detachment Fault (Axen and Fletcher 1998; Dorsey 2005; Dorsey et al. 2007). The San Andreas Fault System in the Salton Trough is composed primarily of the dextral strike-slip San Andreas Fault, the younger San Jacinto and Elsinore dextral strike-slip faults, and various other strike-slip and normal faults (Dorsey 2005). Sediments within the Salton Trough are of primarily Neogene age, with as much as 20,000 feet (6,200 meters) of sediment accumulation in some areas (Dibblee 1984).

The geology of the Colorado Desert in the vicinity of the Solar Two Project area was first described by Blake (1858). In his work, he provided a discussion of the general region and defined the boundaries of the Colorado Desert. In this early work, the geology in the Yuha Desert area was mapped as either Quaternary alluvium or Tertiary "*stratified clay, sand, and conglomerate, poorly consolidated, highly gypsiferous in places, usually tilted and broken… In part marine, in part terrestrial"* (Blake 1858). Since this initial investigation, many other publications have added to the knowledge of the region (see above).

Dibblee (1984) provided an updated inventory of the stratigraphy in the Salton Trough and thoroughly described the geology of that region. In this work, Dibblee (1984) divided the geology of the Salton Trough into a series of subdivisions based on general age, lithological type, and depositional environment. Basement rocks are exposed primarily in the Santa Rosa Mountains and Peninsular Ranges and are composed of "late Mesozoic crystalline rocks" which he described as metasediments of probable Jurassic age and plutonic igneous rocks of primarily Cretaceous age (Dibblee 1984). The superjacent rocks in the Salton Trough are primarily Cenozoic marine and nonmarine sedimentary rocks with some volcanic units. These include the "pre-Imperial formations" including the Split Mountain Formation, the Anza Formation, and the Alverson Canyon Andesite; the Imperial Formation; the Palm Springs Formation; the Canebrake Conglomerate; the Truckhaven Rhyolite; the Borrego Formation; the Ocotillo Conglomerate; and the Brawley Formation (Dibblee 1984). Units mapped without formal formation names were not discussed in detail.

5.8.1.3 Resource Inventory Methods

To develop a baseline paleontological resource inventory of the Project and surrounding area and to assess the potential paleontological productivity of each stratigraphic unit present, 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). These methods are consistent with CEC (2007) and SVP (1995) guidelines for assessing the importance of paleontological resources in areas of potential environmental effect.

Geologic maps and reports covering the bedrock and surficial geology of the Project 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 Project area. Museum records searches were conducted at the University of California Museum of Paleontology (UCMP) at Berkeley, at the San Diego Natural History Museum, at the Colorado Desert District Stout Research Center (CDDSRC), and at the Natural History Museum of Los Angeles County (LACM) to determine whether any of the stratigraphic units found within the Project vicinity had previously yielded significant paleontological resources. In addition, aerial photographs of the area were examined to aid in determining the areal distribution of distinctive sediment and soil types. No subsurface exploration was conducted for this assessment.

A field survey, which included visual inspection of exposures of potentially fossiliferous strata in the Project area, was conducted to document the presence of sediments suitable for containing fossil remains and the presence of any previously unrecorded fossil sites. The field survey for this assessment was conducted over several site visits from December 2007 through February 2008. During 17-21 December 2007, the survey was conducted by Stephen J. Blakely, Project Manager and Staff Paleontologist and Phillip R. Peck, Field Paleontologist, both with PRC. From 14-18 January 2008, the survey was conducted by: Stephen J. Blakely; David F. Maloney, Field Supervisor with PRC; Dr. Lanny H. Fisk PhD PG, Principal Paleontologist with PRC; and Dr. Joe D. Stewart PhD, with URS. During 23-26 February 2008, the final portion of the site was surveyed by Stephen J. Blakely and Annette E. Cornelius, Staff Paleontologist with PRC. During the field survey, stratigraphy was observed in arroyos, hill slopes, badlands, and road cuts. Exposed sediments up to approximately 100 feet (about 30.5 meters) were observed in locations in the vicinity of the Project.

5.8.1.4 Paleontological Resource Assessment Criteria

The SVP (1995), in common with other environmental disciplines such as archaeology and biology (specifically in regard to listed species), considers any fossil specimen significant unless demonstrated otherwise, and 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 will provide 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 effects if there is a high probability 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 allow for their geographic location. Fossils, on the other hand, are an integral component of the rock unit below the ground surface;

therefore, they 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 effect based on 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 the 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 before excavation to be richly fossiliferous, yet only 17% 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 unfortunately not possible to determine where fossils are located without actually disturbing a rock unit, monitoring of excavations 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 effects on fossils because many sites will be unknown in advance due to an absence of fossils at the surface.

The non-uniform distribution of fossils within a rock unit is typical. Many paleontological resource assessment and mitigation reports conducted in support of environmental effect 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 effect 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 resulting from erosion or excavation, under SVP (1995) standard guidelines, an entire rock unit is assigned the same level of sensitivity based on 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 sensitivity of a stratigraphic unit reflects: (1) its potential paleontological productivity, 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 in a Project Site 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.

Under the California Environmental Quality Act (CEQA) Guidelines Section 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. 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, or
- a skeletal element different from, or a specimen more complete than, those now available for that species.

All identifiable land mammal fossils are considered scientifically important because of their potential use in providing relative 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 (Miller et al. 1971) and as sedentary organisms, are 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/or 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 tasks described below 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 previously recorded and newly documented fossil sites it contains at and/or near the Project Site.
- The scientific importance of fossil remains recorded from a stratigraphic unit exposed at and/or near 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.

Categories of Sensitivity

In its standard guidelines for assessment and mitigation of adverse effects 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 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 have high sensitivity. 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. Monitoring is usually not recommended nor needed during excavation 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 (e.g., road cuts) and natural exposures (e.g., stream banks), and possible subsurface testing (e.g., augering or trenching), an experienced, professional paleontologist can often determine whether the stratigraphic unit should be categorized as having high or low sensitivity.

The BLM Paleontological Resources Handbook H-8270-1 (BLM 1998) uses a slightly different classification system for ranking areas according to their potential to contain significant fossils. These rankings are used in land-use planning, as well as to identify areas that may warrant special management and/or special designation such as Areas of Critical Environmental Concern. BLM-administered public land is classified based on its potential to contain fossils using the criteria below.

- **Condition 1:** Areas that are known to contain vertebrate fossils or noteworthy occurrences of invertebrate or plant fossils.
- **Condition 2:** Areas with exposures of geological units or settings that have high potential to contain vertebrate fossils or noteworthy occurrences of invertebrate or plant fossils.
- **Condition 3:** Areas that are very unlikely to produce vertebrate fossils or noteworthy occurrences of invertebrate or plant fossils based on their surficial geology, igneous or metamorphic rocks, extremely young alluvium, colluvium, or aeolian deposits or the presence of deep soils (BLM 1998).

A 1971 BLM (Marshall 1976) internal memorandum suggested the following criteria for determining the significance of individual paleontological resources. “A paleontological resource may be significant if…

- It represents a rare species or one that has not been recorded previously in the literature.
- It illustrates previously unknown sexual dimorphism, phenotypic variation, or an ontogenetic series of a given taxon.
- It is from a locality that marks either a geographical or temporal range extension for a given species.

- It is exceptional in that it represents an exhibit-quality specimen.
- It represents material that assists in refining the age assignment of an otherwise poorly dated litho-stratigraphic unit.
- It represents a concentration of vertebrate specimens in a bed or series of beds. The sample may include either associated skeletal material referable to an individual or an aggregate of specimens referable to more than one individual. In either case, the material yields potentially significant taphonomic information that can be utilized in paleontologic analyses.
- It provides important information on the evolutionary trends among organisms, relating inhabitants of the earth to extinct organisms.
- It provides important information regarding development of biological communities or interaction between botanical and zoological biota.
- It demonstrates unusual or spectacular circumstances in the history of life.
- 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.
- All vertebrate fossils are of scientific value."

The previously described BLM criteria have been widely used by both lead agencies and professional mitigation paleontologists as objective measures of significance. In this paleontological resource effect assessment, the criteria of both the SVP (1995) and the BLM (1998) are applied.

5.8.1.5 Resource Inventory Results

Stratigraphic Inventory

Regional geologic mapping in the vicinity of the Project has been provided by Jennings et al. (1977; 1:750,000); Brown (1923; 1:500,000); Jenkins (1938; 1:500,000); Dibblee (1954; 1:250,000); and Strand (1962; 1:250,000). Larger scale mapping of the Project Site has been provided by Morton (1977; 1:125,000). Unfortunately, there are no larger scale geological maps of the Project area available.

Project Geology

Based on the available geologic literature, recent geologic maps, and field observations, four stratigraphic units will be potentially impacted during Project construction activities. 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 (2006) have specifically discussed "the problems of proliferating local stratigraphic names and ambiguous or conflicting usages of more

widely used names." In the discussion below, the stratigraphic nomenclature of the Project area will follow that of Morton (1977), the most detailed and also most recent geologic map available. Morton (1977) identified four stratigraphic units within the Project area: Quaternary alluvium, Quaternary older alluvium, Quaternary lake beds, and Plio-Pleistocene Palm Springs Formation. Each of these stratigraphic units is described below.

In his geologic mapping, Morton (1977) mapped the area in the vicinity of the Project Site and the ROWs of the proposed water pipeline and the transmission line as Quaternary alluvium, Quaternary lake beds, or Quaternary older alluvium overlying the Palm Springs Formation. In a large portion of the eastern Project area, mapping indicates lacustrine deposits (Quaternary lake beds) of Lake Cahuilla at the surface. The Cahuilla lake beds form a relatively thin sedimentary deposit (thickening to the northeast) over the older Palm Springs Formation (see Figure 5.8-2, Wind Deflated Area in the Northeastern Project Area). Thus, although the Cahuilla lake beds are mapped as being present at the surface over much of the eastern Project area, the older Palm Springs Formation may still be encountered in the shallow subsurface. West of the Lake Cahuilla high-stand shoreline, Quaternary alluvium is mapped at the surface. Again, as in the area defined as Lake Cahuilla deposits, this alluvium often forms only a thin veneer over the underlying Palm Springs Formation. Sediments referable to the Plio-Pleistocene Palm Springs Formation outcrop in the Lake Cahuilla Beds and the Quaternary alluvium as resistant sandstones jutting above the flat lying alluvial and lacustrine sediments (see Figure 5.8-3, Palm Springs Sandstone Outcropping in the Lake Cahuilla Deposits). In the area of the Yuha Buttes, Pleistocene terrace deposits (mapped as Quaternary older alluvium) generally overlie sediments of the Palm Springs Formation, with some thin deposits of Quaternary alluvium in drainage channels (see Figure 5.8-4, Landscape View of Exposed Palm Springs and Pleistocene Terrace Deposits).

Excavations at the Project Site will clearly disturb sediments of Quaternary alluvium, Quaternary older alluvium, Quaternary lake beds, and Plio-Pleistocene Palm Springs Formation. Excavations along the ROW of the proposed water pipeline and transmission line will disturb Quaternary alluvium, Quaternary lake beds, and potentially Plio-Pleistocene Palm Springs Formation.

Quaternary Alluvium

Quaternary alluvium is composed primarily of fluvial sands and gravels reworked from older formations and transported from the topographically high adjacent areas. Because sediments in this area were in part deposited by the Colorado River, the ages and lithologies of individual clasts vary greatly. In the Project vicinity, the Quaternary alluvium contains an uppermost layer of desert pavement, which is a resistant layer created through wind and water processes which remove lighter, smaller sized particles, and leave behind larger and heavier particles (see Figure 5.8-5, Desert Pavement Exposed in the Project Area). These larger clasts accumulate at the ground surface and shield underlying smaller particles from wind action. In the immediate vicinity of the Project Site, the alluvium is composed of clast sizes ranging up to approximately 24 inches (about 61 centimeters) in diameter. Age determination of these deposits is difficult due to the fact that there may have been continuous erosion at this site since perhaps Pleistocene time, desert erosion processes and the formation of desert pavement and desert varnish typically are relatively slow, and recent deposits are not easily separated from upper Pleistocene strata.

Sediments within the Project vicinity mapped as Quaternary alluvium are similar to those found in the elevated areas of the Yuha Buttes which are mapped as Quaternary older alluvium, perhaps indicating a pre-Holocene age.

Quaternary Older Alluvium

The Quaternary older alluvium, as observed within and in the vicinity of the Solar Two Project Site, is lithologically similar to that of the Quaternary alluvium, though in places has a much greater stratigraphic thickness. Sediments of Quaternary older alluvium exposed in badlands within the Yuha Buttes area are as much as 20 feet (about 6 meters) thick and overlie sediments of the Palm Springs Formation (see Figure 5.8-4, Landscape View of Exposed Palm Springs and Pleistocene Terrace Deposits). In the Yuha Buttes area, these deposits of older alluvium are present as terrace deposits of probable Pleistocene age.

Quaternary Lake Beds (Lake Cahuilla Lake Beds)

The Quaternary lake deposits in the Project area are the result of deposition within ancient Lake Cahuilla. The Lake Cahuilla Beds were first named by Blake (1907). Sediments deposited in Lake Cahuilla are generally fined grained sands, silts, and clays away from the lake margins, with coarser sands dominant near the margin and along the high-stand shoreline. The high-stand shoreline in the Project vicinity is generally represented by a 1 meter to 2.5 meter high beach berm composed of coarse sands and gravels. Ancient Lake Cahuilla is the name for the body of water that periodically filled the Salton Trough resulting from water diversion of the Colorado River. The lake has persisted since at least Late Pleistocene time, and was present as recently as approximately 500 years before present (Gobalet 1992). Radiocarbon analysis of Lake Cahuilla sediments have yielded varying ages, with Whistler et al. (1995) indicating high-stand ages up to 5,890 $\pm$ 60 years before present. However, both Stanley (1962) and Thomas (1963) independently suggested that the oldest sediments deposited in Lake Cahuilla may be Late Pleistocene. Fossils from a Lake Cahuilla shoreline yielded a Late Pleistocene radiocarbon date of 37,100 $\pm$ 2,000 years before present (Hubbs et al. 1963).

Plio-Pleistocene Palm Springs Formation

The Palm Springs Formation, named by Woodring (1932), is a sedimentary succession representing the deposition of Colorado River sediments in a fluvial-deltaic system during Pliocene and Pleistocene time. Fossils within the Palm Springs Formation range in age from early Blancan to early Irvingtonian North American Land Mammal Age (Norell 1989). The unit is primarily indicative of a freshwater depositional environment. However, fossil evidence indicates that some deposition occurred in brackish water (Tarbet 1951; Tarbet and Holman 1944; Woodard 1963; Quinn and Cronin 1984). Sediments of the Palm Springs Formation as observed in the field are consistent with the descriptions given for the “Arroyo Diablo Formation of the Palm Springs Group” by Cassiliano (2002). These can be generally described as either reddish-brown claystones or siltstones; brown, buff, or yellowish siltstones to sandy siltstones; or buff to orange silty sandstones and feldspathic arenites; with some exceptions (see Figure 5.8-6, Cross-Bedded Sandstones and Claystones of the Palm Springs Formation). The claystones are generally nondescript and massively bedded, with some minor interlaminated siltstone or sandy siltstone lenses. The siltstones vary in color, and may or may not be laminated or contain sedimentary structures such as cross-beds or load structures. Siltstones in the Project vicinity often contain ferruginous oxidized organic material (Cassiliano 2002; personal observations).

Sandstones generally occur as lenses or as massive beds, sometimes cross-bedded and occasionally contain rip-up clasts from underlying strata. Concretions are also common in these sandstone beds, and ferruginous concretions are less common but occur (Cassiliano 2002; personal observations). In some outcrops, these lithological strata graded into the next; in others, local unconformities are present between beds. The sediments, as a whole, are indicative of a fluvial to deltaic depositional environment.

Paleontological Resource Inventory

An inventory of known paleontological resources previously discovered in the vicinity of the Project is presented below and the paleontological importance of these resources is assessed. The literature review and UCMP, San Diego Natural History Museum, CDDSRC, and LACM archival records search conducted for this inventory documented no previously recorded fossil sites within the actual Project Site. However, sediments of Quaternary alluvium, Quaternary older alluvium, Quaternary Lake Beds, and Plio-Pleistocene Palm Springs Formation have yielded fossilized remains of extinct species of continental vertebrates and other types of organisms at previously recorded fossil sites in the region (Jefferson 1991; McLeod 2007; UCMP records; CDDSRC records; LACM records).

Quaternary Alluvium

No fossil localities have previously been reported from Quaternary alluvium at the Project Site. However, significant vertebrate fossils have been reported from Holocene and Pleistocene sediments in several areas of Imperial County (Jefferson 1991; UCMP records). During the field survey for this assessment, fossils were seen at the surface in the exposed poorly consolidated Quaternary alluvium. Desert pavement consistently contains fossil wood and fossil invertebrates (see Figure 5.8-7, Fossil Wood Found in the Desert Pavement of the Quaternary Alluvium, Figure 5.8-8, Fossil Invertebrate Fragments Found in the Desert Pavement of the Quaternary Alluvium, and Appendix AA, Paleontological Resources Technical Report). In most cases, this abundant fossil material has been reworked from older formations. However, considering the possible age of this pavement, in situ fossils potentially could be found. In addition, a paleosol containing ichnofossils was identified at several locations below the desert pavement (see Figure 5.8-9, Paleosol of the Quaternary Alluvium). The age of this paleosol is difficult to determine from initial examination, as is the overlying desert pavement. Further investigation may produce identifiable and datable material. However, the depositional environment of these sediments appears to be conducive to burial and preservation specifically of large vertebrate and plant remains.

Fossils occurring in Quaternary alluvium are valuable to the scientific community as they provide information about climatic conditions in the not too distant past. The occurrence of large and small mammals are well documented from these and older subsurface deposits and with further observation of earth-moving activities and prospecting for fossils, more specimens could be unearthed.

Sediments referable to the Quaternary alluvium produced several previously unrecorded fossil localities less than 1 mile from the Project during the field survey. The presence of fossil sites in Quaternary alluvium within one mile of the Project Site suggests that there is a high potential for fossil remains to be uncovered by excavations at the Project Site. Because this unit has produced potentially significant fossils, under SVP (1995) criteria the Quaternary alluvium is judged to have high sensitivity. Additional identifiable fossil remains recovered from the Quaternary alluvium during Project construction could be scientifically important and significant.

Quaternary Older Alluvium

No fossil localities have previously been reported from Quaternary older alluvium at the Project Site. However, significant vertebrate fossils have been reported from Holocene and Pleistocene sediments in several areas of Imperial County (Jefferson 1991; UCMP records). Numerous previously unreported fossil localities were identified from the Quaternary older alluvium during the field survey for this Project. These included ichnofossils, some vertebrate material, wood found below the desert pavement horizon, and a fossil shell from a basal conglomerate overlying the unconformity with the underlying Palm Springs Formation (see Figures 5.8-10 through 5.8-12). The fossils found within the desert pavement of the Quaternary older alluvium are consistent with those in the Quaternary alluvium and consist primarily of similar fossil wood and invertebrates. Fossil wood found within the Quaternary alluvium below the desert pavement horizon typically exhibited a different degree of mineral replacement from that seen in the pavement and in other formations, indicating perhaps a different source (see Figure 5.8-11, Fossil Wood in the Quaternary Older Alluvium). The vertebrate material seen was mammalian, though the age and taxon could not be determined without additional work (see Figure 5.8-12, Fossil Bone Fragment in the Quaternary Older Alluvium). In all, the depositional environment of these sediments appears conducive to burial and preservation specifically of large vertebrate and plant remains.

Fossils occurring in Quaternary deposits are valuable to the scientific community as they provide information about climatic conditions in the not too distant past. The occurrence of large and small mammals are well documented from these and older subsurface deposits and with observation of earth-moving activities and prospecting for fossils, more specimens could be unearthed.

Sediments referable to the Quaternary older alluvium (Pleistocene terrace deposits) produced several previously unrecorded fossil localities less than 1 mile from the Project during the field survey. The presence of fossil sites in Quaternary older alluvium within one mile of the Project Site suggests that there is a high potential for fossil remains to be uncovered by excavations at the Project Site. Because this unit has produced potentially significant fossils, under SVP (1995) criteria the Quaternary older alluvium is judged to have high sensitivity. Additional identifiable fossil remains recovered from the Quaternary older alluvium during Project construction could be scientifically important and significant.

Quaternary Lake Beds (Lake Cahuilla Lake Beds)

The Lake Cahuilla Beds have yielded fossil remains at numerous sites in the Imperial Valley. Blake (1907) stated that the sediments of ancient Lake Cahuilla contained “myriads of fossil fresh-water shells.” Stearns (1879) used language such as “vast multitude” and “untold millions” in reference to Lake Cahuilla fossil invertebrates. Jennings (1967) stated that the Lake Cahuilla

deposits "contain abundant nonmarine fossils." In addition to invertebrates (primarily snails, clams, and ostracods), these fossil remains include wood (Stanley 1962; Van de Kamp 1973; Whistler et al. 1995), seeds (Waters 1983), pollen (Whistler et al. 1995), diatoms (Whistler et al. 1995), foraminifera (Van de Kamp 1973), sponges (Whistler et al. 1995), fish (LACM records; Hubbs and Miller 1948; Gobalet 1992, 1994; Wilke 1980; Schoenherr 1993; Whistler et al. 1995), birds (LACM records; Whistler et al. 1995), reptiles (LACM records); and the bones and teeth of a diversity of land mammals (LACM records; Whistler et al. 1995). Whistler et al. (1995) reported teeth and bones of rodents, rabbits, reptiles (tortoises, lizards, and snakes), horses, and desert bighorn sheep from sediments of the Lake Cahuilla Beds. During a field survey of prospective fossiliferous sediments within and near the Project Site, abundant fossil mollusks were found in Lake Cahuilla Beds both at the surface and in the banks stream channels at many localities (see Figure 5.8-13, Fossil Bivalve in Lake Cahuilla Sediments, and Figure 5.8-14, Fossil Mollusks in Lake Cahuilla Sediments). All these localities are less than 1 mile from the Project Site or linear features.

In summary, sediments referable to the Quaternary lake beds (Lake Cahuilla Beds) have yielded scientifically significant fossils in the past and several previously unrecorded fossil localities were found less than 1 mile from the Project. The presence of fossil sites in Lake Cahuilla Beds within one mile of the Project Site suggests that there is a high potential for fossil remains to be uncovered by excavations at the Project Site. Because this unit in the past has produced significant fossils, under SVP (1995) criteria the Lake Cahuilla Beds are judged to have high sensitivity. Additional identifiable fossil remains recovered from the Lake Cahuilla Beds during Project construction could be scientifically important and significant.

Plio-Pleistocene Palm Springs Formation

Sediments of the Palm Springs Formation have yielded thousands of fossil remains at numerous sites in the Imperial Valley. Cassiliano (2002) reported over 15,000 fossils from over 2,000 localities representing terrestrial, lacustrine, and marine vertebrates. Remeika and Fleming (1995) reported Neogene fossil wood, as well as Cretaceous pollen reworked from the Colorado Plateau in the "Diablo Formation of the Palm Springs Group." Fossil remains of very large teratornithid birds have also been recovered from the Palm Springs Formation (Jefferson 1995). Norell (1989) described "*the most diverse Neogene lizard assemblage yet collected*" from study of the Palm Springs Formation in the southern Anza-Borrego Desert State Park. Other fossils reported from the Palm Springs Formation include: vertebrate megafossils (UCMP records; LACM records; Woodard 1963; White 1968, 1984); marine megafossils (Tarbet 1951; Woodard 1963); wood (Dibblee 1954, 1984; Woodard 1963); and microfossils (primarily foraminifers and ostracodes) (Tarbet and Holman 1944; Quinn and Cronin 1984). During the field survey for this assessment many previously unrecorded fossil localities were identified, including fossil plant, invertebrate, and vertebrate localities (see Figures 5.8-15 through 5.8-17, and Appendix AA, Paleontological Resources Technical Report).

Since fossil vertebrates, invertebrates, and plants have been previously reported from the Plio-Pleistocene Palm Springs Formation within Imperial County, vertebrate fossils have been reported in similar deposits not far from the Project Site, vertebrate fossils were found within one mile of the Project Site and transmission line ROW, and since depositional conditions observed in exposures in the vicinity of the Project appear to be favorable for the preservation of fossils, the Palm Springs Formation is judged to have high sensitivity based on SVP (1995) criteria. There is a high probability of adverse effects on paleontological resources resulting from Project excavations in the Palm Springs Formation.

Summary

In summary, fossils are known to directly underlie the Project, numerous fossil localities have been reported in both the published scientific literature and museum records, and numerous previously unrecorded fossil localities were identified during the field survey of the stratigraphic units that underlie the Project Site. The presence of fossils in the Quaternary alluvium, Quaternary older alluvium (Pleistocene terrace deposits), Quaternary lake beds (Lake Cahuilla Beds), and Plio-Pleistocene Palm Springs Formation suggests that there is a high potential for additional similar fossil remains to be uncovered by excavations in these stratigraphic units during Project construction. Under SVP (1995) criteria, all four stratigraphic units that would be impacted by this Project have a high sensitivity for producing additional paleontological resources.

Identifiable fossil remains salvaged from Quaternary alluvium, Quaternary older alluvium, Quaternary lake beds, or the Plio-Pleistocene Palm Springs Formation during Project construction could be scientifically important and significant. Identifiable fossil remains discovered during Project construction could represent new taxa or new fossil records for the area, for the State of California, for the Quaternary/Tertiary, or for a stratigraphic unit. 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 salvaged. Finally, fossil remains salvaged during Project construction could provide a more comprehensive documentation of the diversity of animal and plant life that once existed in Imperial County and could result in a more accurate reconstruction of the geologic and paleobiologic history of the Colorado Desert and the Salton Trough.

5.8.2 Environmental Consequences

Potential effects on paleontological resources resulting from construction of the proposed Solar Two Project can be divided into construction-related effects and operation-related effects. The potential environmental effects from construction and operation of the Project on paleontological resources are presented in the following subsections.

Potential Effects from Project Construction

Construction-related effects to paleontological resources primarily involve terrain modifications (excavations and drainage improvement measures). Paleontological 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

affected by (i.e., would be sensitive to) ground disturbance and earth moving associated with construction of the Project. Direct effects could result from: vegetation clearing; grading of roads and the Main Services Complex and other structure sites; trenching for pipelines, electrical transmission lines, and drainage improvements; augering for foundations for electrical towers or poles and SunCatchers; and any other earth-moving activity that disturbed or buried previously undisturbed fossiliferous sediments, making those sediments and their paleontologic resources unavailable for future scientific investigation.

Clearing, grading, and deeper excavations at the Project Site could result in significant adverse effects to paleontological resources. Also, the construction of supporting facilities, such as temporary construction offices, laydown areas, and parking areas, have potential to cause adverse effects to significant paleontological resources, if they also will involve new ground disturbance. Thus, any Project-related ground disturbance could have adverse effects on significant paleontological resources. However, with a properly designed and implemented mitigation program, these effects could be reduced to less than significant.

Potential Effects from Project Operation

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

5.8.3 Cumulative Effects

If paleontological finds were to be encountered during Project construction, the potential for cumulative effects would exist. Mitigation measures would be implemented to salvage such resources and reduce cumulative effects to a level that is less than significant. The mitigation measures proposed in Section 5.8.4, Mitigation Measures, would effectively preserve the value to science of any significant fossils uncovered during Project-related excavations.

5.8.4 Mitigation Measures

This section describes proposed mitigation measures that would be implemented to reduce potential adverse effects to significant paleontological resources resulting from Project construction. Mitigation measures are necessary because of potential adverse effects of Project construction on significant paleontological resources within the Quaternary alluvium, the Quaternary older alluvium, the Quaternary lake beds, and the Plio-Pleistocene Palm Springs Formation. The proposed paleontological resource effect mitigation program would reduce to an insignificant level the direct, indirect, and cumulative adverse environmental effects on paleontological resources that could result from Project construction. The mitigation measures proposed below are consistent with SVP standard guidelines for mitigating adverse construction-related effects on paleontological resources (SVP 1995, 1996), and fulfill the requirements of the BLM (1998).

Before construction, a qualified paleontologist should be retained to both design a monitoring and mitigation program and implement the program during all Project-related ground disturbance. The paleontological resource monitoring and mitigation program should include:

- preconstruction coordination,
- construction monitoring,
- emergency discovery procedures,
- sampling and data recovery, if needed,
- preparation, identification, and analysis of the significance of fossil specimens salvaged, if any,
- museum storage of any specimens and data recovered, and
- reporting.

Before the start of construction, the paleontologist should conduct a field survey of exposures of sensitive stratigraphic units that will be disturbed and any fossils discovered should be salvaged. Earth-moving construction activities should be monitored wherever these activities will disturb previously undisturbed sediment. Monitoring will not need to be conducted in areas where sediments have been previously disturbed or in areas where exposed sediments will be buried, but not otherwise disturbed.

Before the start of construction, construction personnel involved with earth-moving activities should be informed: that fossils may be discovered during excavating; that these fossils are protected by laws; on the appearance of common fossils; and, on proper notification procedures. This worker training should be prepared and presented by a qualified paleontologist.

Implementation of these mitigation measures will reduce the potentially significant adverse environmental effect of Project-related ground disturbance and earth-moving on paleontological resources to an insignificant level by allowing for the salvage of fossil remains and associated specimen data and corresponding geologic and geographic site data that otherwise might 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 effects on paleontological resources through the discovery of fossil remains that would not have been exposed without Project construction and, therefore, would not have been available for study. The salvage of fossil remains as part of Project construction could help answer important questions regarding the geographic distribution, stratigraphic position, and age of fossiliferous sediments in the Project area.

5.8.5 Compliance with LORS

Paleontological resources are classified as non-renewable scientific resources and are protected by several federal and state statutes (California Office of Historic Preservation 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 effects 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 5.8-1, Summary of LORS – Paleontological Resources**,** and discussed briefly below, together with county and city requirements and SVP professional standards.

Table 5.8-1
Summary of LORS – Paleontological Resources

LORS	Requirements	Conformance Section	Administering Agency	Agency Contact
Federal Jurisdiction				
Antiquities Act of 1906	Protects paleontological resources on federal lands	Section 5.8.5.1	BLM	Carrie L. Simmons Archaeologist El Centro Field Office BLM 1661 South 4th Street El Centro, CA 92243 Phone: 760-337-4437 Fax: 760-337-4490 carrie_simmons@ca.blm.gov
NEPA, 1969	Protects paleontological resources on federal lands	Section 5.8.5.1	EPA	N/A
State Jurisdiction				
CEQA	Protects paleontological resources on state lands	Section 5.8.5.2	CEC	N/A
Public Resources Code Sections 5097.5/5097.9	Protects paleontological resources on state lands	Section 5.8.5.2	CEC	N/A
Local Jurisdiction				
Imperial County General Plan	Protects natural resources on county lands	Section 5.8.5.3	Imperial County	N/A

Source: PaleoResource Consultants, 2008.
Notes:
BLM = Bureau of Land Management
CEC = California Energy Commission
CEQA = California Environmental Quality Act
EPA = Environmental Protection Agency
N/A = not available
NEPA = National Environmental Policy Act of 1969

5.8.5.1 Federal

Federal legislative protection for paleontological resources stems from the Antiquities Act of 1906 (Public Law [P.L.] 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 Antiquities Act of 1906 forbids disturbance of any object of antiquity on federal land without a permit issued by the responsible managing agency. This act also establishes criminal sanctions for unauthorized appropriation or destruction of antiquities. The Federal Highways Act of 1958 clarified that the Antiquities Act applied to paleontological resources and authorized the use of funds appropriated under the Federal Aid Highways Act of 1956 to be used for paleontological salvage in compliance with the Antiquities Act and any applicable state laws.

In addition to the Antiquities Act, other federal statutes protect fossils. The Historic Sites Act of 1935 (P.L. 74-292; 49 Stat. 666, 16 U.S.C. 461 *et seq.*) declares it national policy to preserve objects of historical significance for public use and gives the Secretary of the Interior broad powers to execute this policy, including criminal sanctions. The National Environmental Policy Act of 1969 (P.L. 91-190, 31 Stat. 852, 42 U.S.C. 4321-4327) requires that important natural aspects of our national heritage be considered in assessing the environmental consequences of any proposed Project. The Federal Land Policy Management Act of 1976 (P.L. 94-579; 90 Stat. 2743, U.S.C. 1701-1782) requires that public lands be managed in a manner that protects the quality of their scientific values. Paleontological resources are also afforded federal protection under 40 CFR 1508.27 as a subset of scientific resources.

Federal protection for significant paleontological resources would apply to this Project if any construction or other related Project effects occur on federally owned or managed lands.

A local agreement between the United States Department of the Interior, BLM, California Desert Conservation District and the California Park Service, Colorado Desert District, Anza-Borrego Desert State Park was made to better protect the unique assemblages of fossils known to occur in the Colorado Desert Region. "The purpose of this Interagency Cooperative Agreement … is to enhance the conservation and management of paleontological resources on public lands administered by the Bureau of Land Management…, California Desert Conservation District…, and the California Park Service…, Anza-Borrego Desert State Park…within Imperial, Riverside, and San Diego counties, California" (Remeika 1995).

5.8.5.2 State

The CEC environmental review process under the Warren-Alquist Act is considered functionally equivalent to that of CEQA (Public Resources Code 15000 *et seq.*) with respect to paleontological resources. Guidelines for the Implementation of CEQA, as amended 7 September 2004 (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: *"Will the proposed project directly or indirectly destroy a unique paleontological resource or site?"*

Although neither CEQA nor the Guidelines define what is "a unique paleontological resource or site," CEQA Section 21083.2 defines "unique archaeological resources" as "…any archaeological artifact, object, or site about which it can be clearly demonstrated that, without merely adding to the current body of knowledge, there is a high probability that it meets any of the criteria described below.

- Contains information needed to answer important scientific research questions and that there is a demonstrable public interest in that information.
- It has a special and particular quality such as being the oldest of its type or the best available example of its type.
- Is directly associated with a scientifically recognized import prehistoric or historic event."

With only slight modification, this definition is equally applicable to recognizing "a unique paleontological resource or site." Additional guidance is provided in CEQA Guidelines section 15064.5(a)(3)(D), which indicates "generally, a resource shall be considered historically significant if it has yielded, or may be likely to yield, information important in prehistory or history."

Paleontological resources are considered to be significant if they:

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

CEQA Guidelines Section XVII, part a, of the Environmental Checklist asks a second question equally applicable to paleontological resources: "Does the project have the potential to . . . eliminate important examples of the major periods of California history or pre-history?" Fossils are important examples of the major periods of California prehistory. To be in compliance with CEQA, environmental impact assessments, statements, and reports must answer both these questions in the Environmental Checklist. If the answer to either question is yes or possibly, a mitigation and monitoring plan must be designed and implemented to protect significant paleontological resources.

The CEQA lead agency having jurisdiction over a project is responsible to insure that paleontological resources are protected in compliance with CEQA and other applicable statutes. California Public Resources Code section 21081.6, entitled Mitigation Monitoring Compliance and Reporting, requires that the lead agency demonstrate Project compliance with mitigation measures developed during the environmental impact review process.

Other state requirements for paleontological resources management are in Public Resources Code Chapter 1.7, Section 5097.5 (Stats. 1965, c. 1136), entitled Archaeological, Paleontological, and Historical Sites. This statute defines any unauthorized disturbance or removal of a fossil site or fossil remains on public land as a misdemeanor and specifies that state agencies may undertake surveys, excavations, or other operations as necessary on state lands to preserve or record paleontological resources. This statute would apply to the Solar Two Project if the Project were to be built on city-owned or state-managed lands.

5.8.5.3 Local

California Planning and Zoning Law requires each county and city jurisdiction to adopt a comprehensive, long-term general plan for its development. The general plan is a policy document designed to give long-range guidance to those making decisions affecting the future character of the planning area. It represents the official statement of the community's physical development as well as its environmental goals. The general plan also acts to clarify and articulate the relationship and intentions of local government to the rights and expectations of the general public, property owners, and prospective investors. Through its general plan, the local jurisdiction informs these groups of its goals, policies, and development standards; thereby, communicating what must be done to meet the objectives of the general plan. State planning law requires each jurisdiction to identify environmental resources and to prepare and implement policies which relate to the utilization and management of these resources.

Imperial County does not have mitigation requirements that specifically address potential adverse effects to paleontological resources. However, the Land Use Element of the Imperial County General Plan, which serves as the primary policy statement by the County Board of Supervisors for implementing development policies and land uses, contains in its Goals and Objectives statements that provide direction for private development and guidelines for land use decision making. These Goals and Objectives repeatedly mention preserving natural resources and the natural environment and avoiding adverse environmental effects. Objective 8.8 specifically states that the siting of future facilities for the transmission of electricity should be compatible with the environment. Goal 9 deals with the protection of environmental resources and states that the County will identify and preserve significant natural, cultural, and community character resources. Objective 9.1 requires the preservation of important natural resources, including prehistoric sites.

5.8.5.4 Agencies and Agency Contacts

The El Centro Field Office of the BLM is the local office which administers BLM public land in and around the Project Site. The designated Archaeologist at the El Centro Field Office, BLM, Carrie L. Simmons, was contacted before performing the field assessment for this Project. No state or local agencies have specific jurisdiction over paleontological resources and therefore, no state or local agencies were contacted.

5.8.5.5 Permits Required and Permitting Schedule

To conduct paleontological resource studies and to collect or salvage paleontological resources on BLM-administered public land, specific permits are required. To perform paleontological resource studies, a BLM Fieldwork Authorization to conduct specific cultural resource work under the authority of a Cultural Resources Use Permit issued by the BLM pursuant to Sec. 302(b) of P.L. 94-579, October 21, 1976, 43 U.S.C. 1732 and Sec. 4 of P.L. 96-95, October 31, 1979, 16 U.S.C. 470cc will be required. To collect or salvage paleontological resources, a U.S. Department of the Interior Bureau of Land Management Scientific Paleontological Collecting Permit issued by the BLM pursuant to Sec. 302(b) of P.L. 94-579, October 21, 1976, 43 U.S.C. 1732 will be required. Obtaining these permits may take up to 6 months. No state or local agency requires a paleontological collecting permit to allow for the salvage of fossil remains

discovered as a result of construction-related earth moving on non-federal public or private land in a Project Site.

5.8.5.6 Professional Standards

The SVP, a national scientific organization of professional vertebrate 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 salvage, sampling procedures, and specimen preparation, identification, analysis, and curation. 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. 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. Many federal and California state regulatory agencies have either formally or informally adopted the SVP's "standard guidelines" for the mitigation of construction-related adverse effects on paleontological resources as a measure of professional practice.

Briefly, SVP guidelines recommend that each project have literature and museum archival reviews, a field survey, and, if there is a high potential for disturbing significant fossils during Project construction, a mitigation plan that includes monitoring by a qualified paleontologist to salvage fossils encountered, identification of salvaged fossils, determination of their significance, and placement of curated fossil specimens into a permanent public museum collection (such as the designated California State repository for fossils, the UCMP at Berkeley).

5.8.6 References

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Adequacy Issue:	Adequate		Inadequate		DATA ADEQUACY WORKSHEET	Revision No.	0	Date	
Technical Area:	**Paleontological Resources**			Project:	Solar Two Project		Technical Staff:		
Project Manager:				Docket:			Technical Senior:		

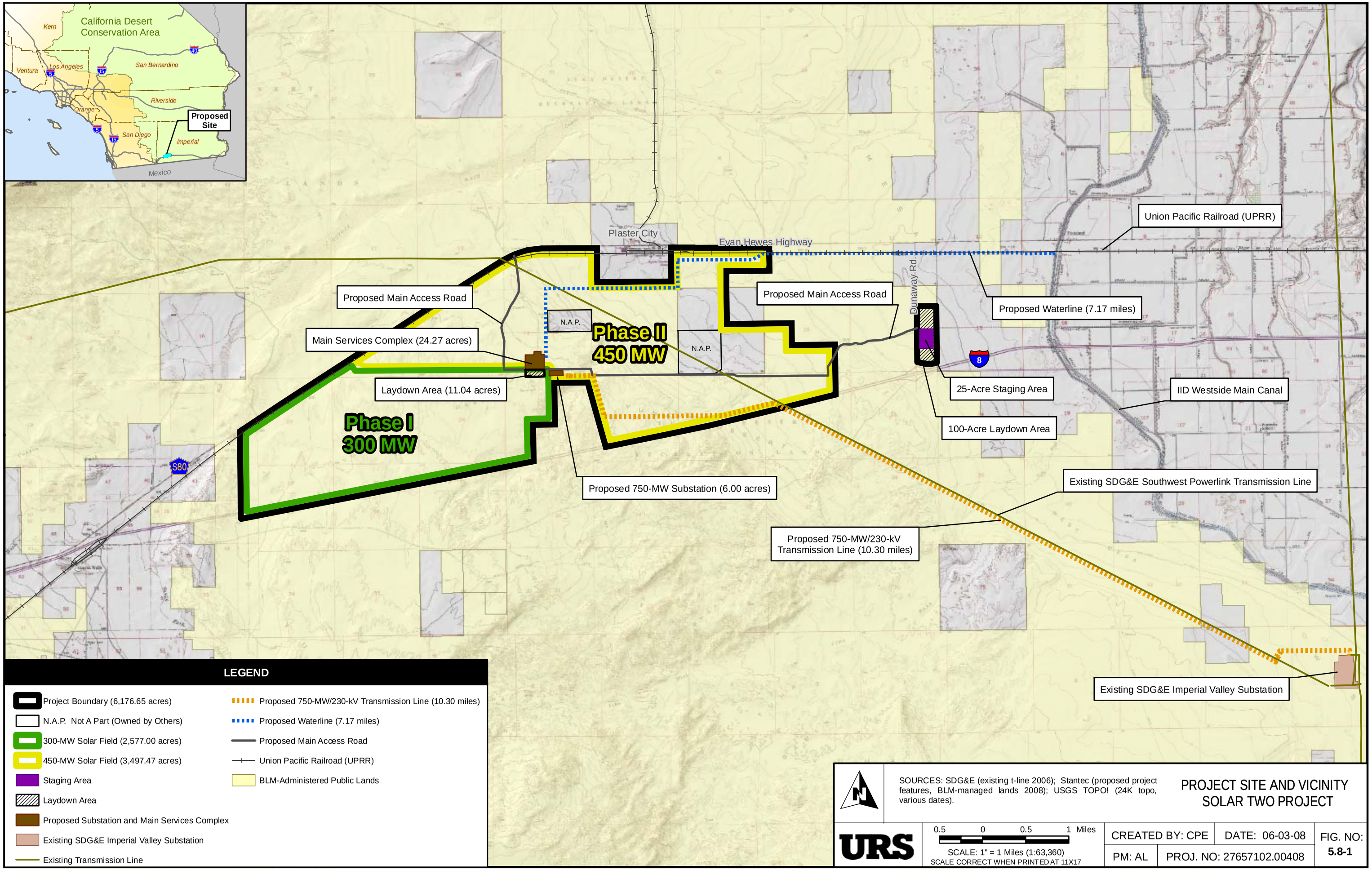
SITING REGULATIONS	INFORMATION	AFC SECTION NUMBER	ADEQUATE YES OR NO	INFORMATION REQUIRED TO MAKE AFC CONFORM WITH REGULATIONS
Appendix T (g) (1)	...provide a discussion of the existing site conditions, the expected direct, indirect and cumulative impacts due to the construction, operation and maintenance of the project, the measures proposed to mitigate adverse environmental impacts of the project, the effectiveness of the proposed measures, and any monitoring plans proposed to verify the effectiveness of the mitigation.	Section 5.8.1.1 Section 5.8.2 Section 5.8.3 Section 5.8.4		
Appendix T (g) (16) (A)	Identification of the physiographic province and a brief summary of the geologic setting, formations, and stratigraphy of the project area. The size of the paleontological study area may vary depending on the depositional history of the region.	Section 5.8.1.1 Section 5.8.1.2 Section 5.8.1.5		
Appendix T (g) (16) (B)	A discussion of the sensitivity of the project area described in subsection (g)(16)(A) and the presence and significance of any known paleontologic localities or other paleontologic resources within or adjacent to the project. Include a discussion of sensitivity for each geologic unit identified on the most recent geologic map at a scale of 1:24,000. Provide rationale as to why the sensitivity was assigned.	Section 5.8.1.5		
Appendix T (g) (16) (C)	A summary of all local museums, literature searches and field surveys used to provide information about paleontologic resources in the project area described in subsection (g)(16)(A). Identify the dates of the surveys, methods used in completing the surveys, and the names and qualifications of the individuals conducting the surveys.	Section 5.8.1.3		

Adequacy Issue:	Adequate		Inadequate		DATA ADEQUACY WORKSHEET	Revision No.	0	Date	
Technical Area:	**Paleontological Resources**			Project:	Solar Two Project		Technical Staff:		
Project Manager:				Docket:			Technical Senior:		

SITING REGULATIONS	INFORMATION	AFC SECTION NUMBER	ADEQUATE YES OR NO	INFORMATION REQUIRED TO MAKE AFC CONFORM WITH REGULATIONS
Appendix T (g) (16) (D)	Information on the specific location of known paleontologic resources, survey reports, locality records, and maps at a scale of 1:24,000, showing occurrences of fossil finds, if known, within a one-mile radius of the project and related facilities shall be included in a separate appendix to the Application and submitted to the Commission under a request for confidentiality, pursuant to Title 20, California Code of Regulations, 2501 *et seq*.	Appendix AA, Paleontological Resources Technical Report (Confidential)		
Appendix T (g) (16) (E)	A discussion of any educational programs proposed to enhance awareness of potential impacts to paleontological resources by employees, measures proposed for mitigation of impacts to known paleontologic resources, and a set of contingency measures for mitigation of potential impacts to currently unknown paleontologic resources.	Section 5.8.4		
Appendix T (i) (1) (A)	Tables which identify laws, regulations, ordinances, standards, adopted local, regional, state, and federal land use plans, leases, and permits applicable to the proposed project, and a discussion of the applicability of, and conformance with each. The table or matrix shall explicitly reference pages in the application wherein conformance, with each law or standard during both construction and operation of the facility is discussed; and	Section 5.8.5 Table 5.8-1		

Adequacy Issue:	Adequate		Inadequate		DATA ADEQUACY WORKSHEET	Revision No.	0	Date	
Technical Area:	**Paleontological Resources**			Project:	Solar Two Project		Technical Staff:		
Project Manager:				Docket:			Technical Senior:		

SITING REGULATIONS	INFORMATION	AFC SECTION NUMBER	ADEQUATE YES OR NO	INFORMATION REQUIRED TO MAKE AFC CONFORM WITH REGULATIONS
Appendix T (i) (1) (B)	Tables which identify each agency with jurisdiction to issue applicable permits, leases, and approvals or to enforce identified laws, regulations, standards, and adopted local, regional, state and federal land use plans, and agencies which would have permit approval or enforcement authority, but for the exclusive authority of the commission to certify sites and related facilities.	Section 5.8.5 Table 5.8-1		
Appendix T (i) (2)	The name, title, phone number, address (required), and email address (if known), of an official who was contacted within each agency, and also provide the name of the official who will serve as a contact person for Commission staff.	Section 5.8.5.4		
Appendix T (i) (3)	A schedule indicating when permits outside the authority of the commission will be obtained and the steps the applicant has taken or plans to take to obtain such permits.	Section 5.8.5.5		



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WIND DEFLATED AREA IN THE
NORTHEASTERN PROJECT AREA
SOLAR TWO PROJECT

URS

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PALM SPRINGS SANDSTONE OUTCROPPING IN THE
LAKE CAHUILLA DEPOSITS
SOLAR TWO PROJECT

URS

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LANDSCAPE VIEW OF EXPOSED PALM SPRINGS AND PLEISTOCENE TERRACE DEPOSITS
SOLAR TWO PROJECT

URS	CREATED BY: PRC	DATE: 05-20-08	FIG. NO:
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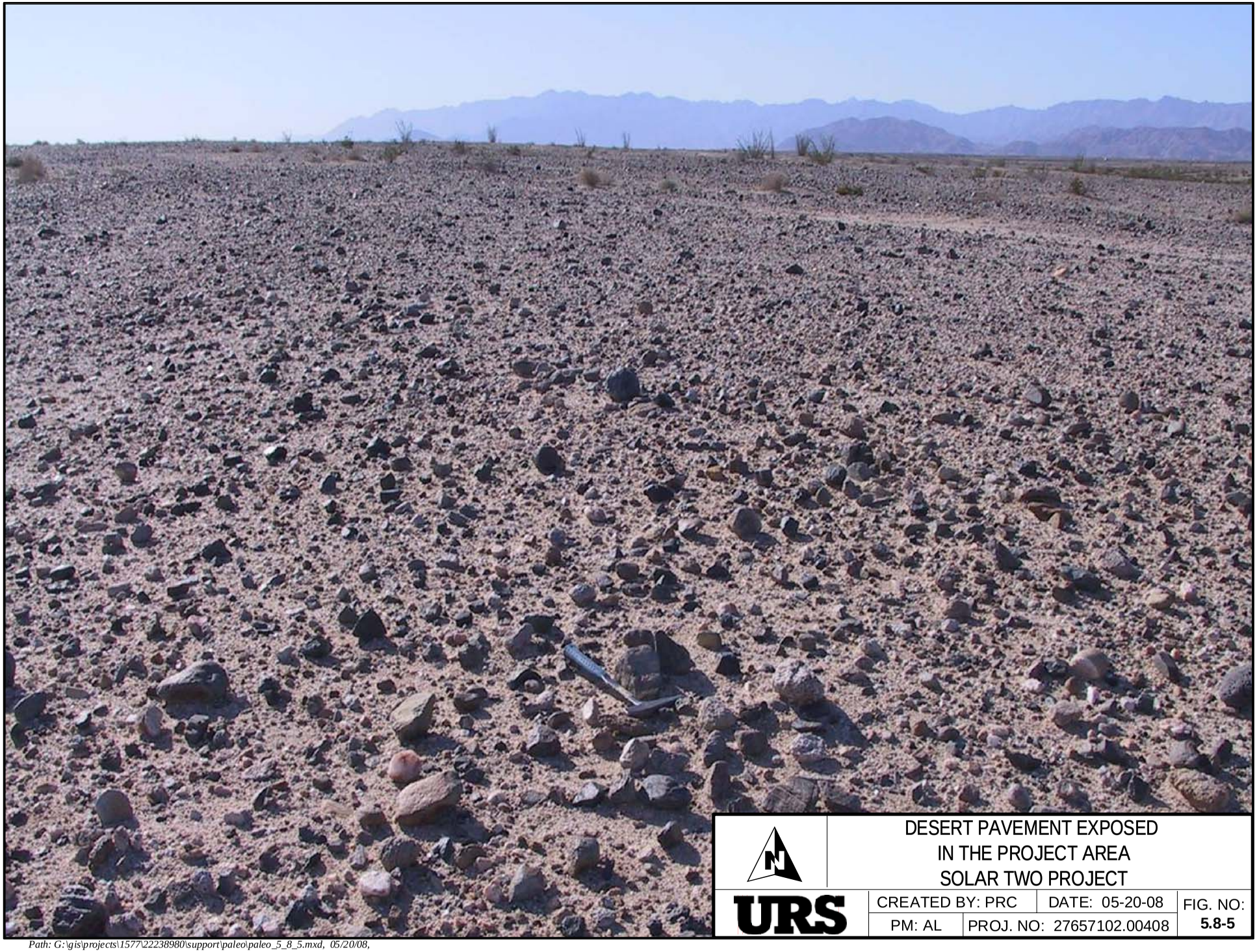

DESERT PAVEMENT EXPOSED
IN THE PROJECT AREA
SOLAR TWO PROJECT

URS

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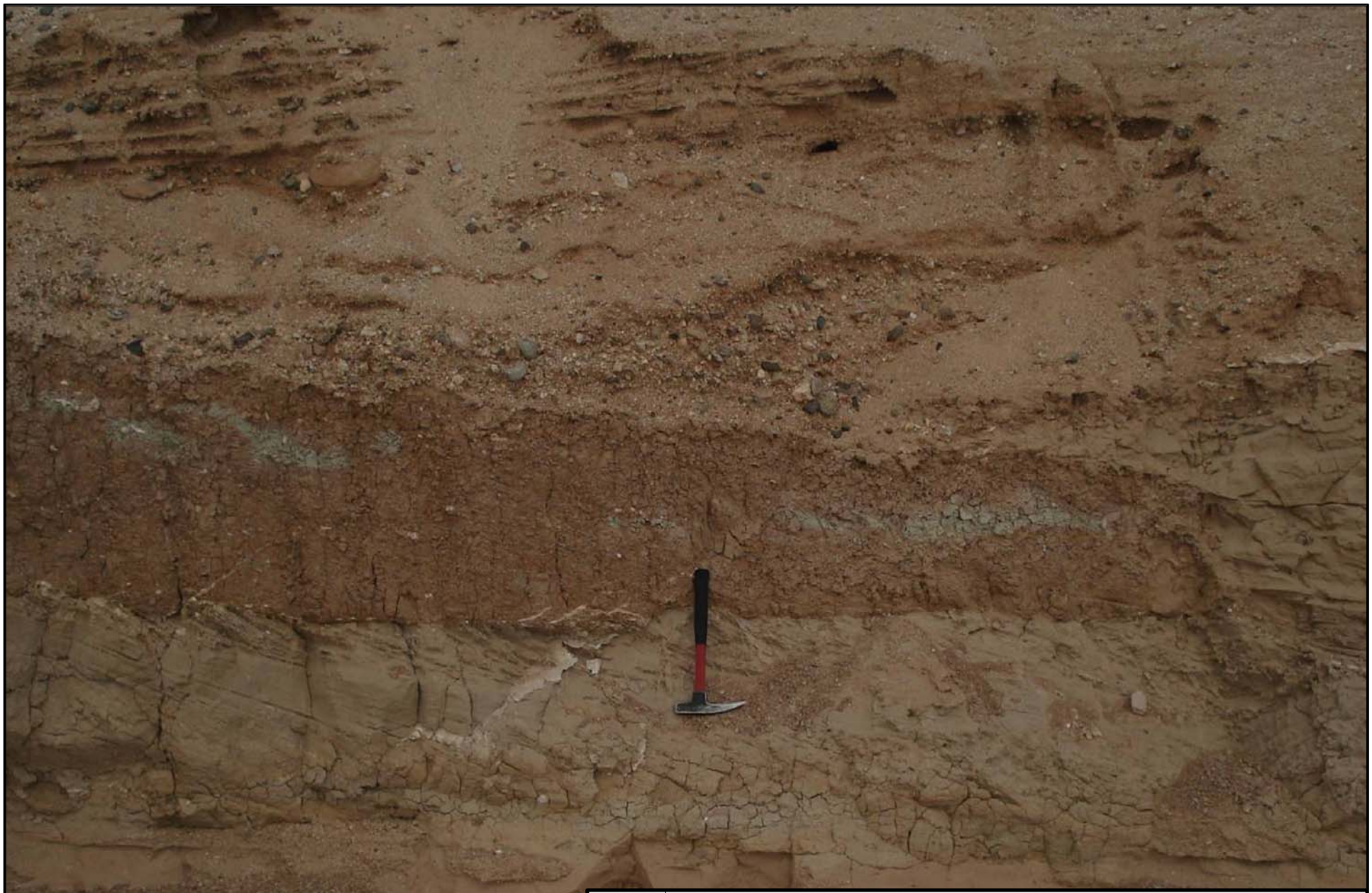

CROSS-BEDDED SANDSTONES AND CLAYSTONES OF THE
PALM SPRINGS FORMATION
SOLAR TWO PROJECT

URS

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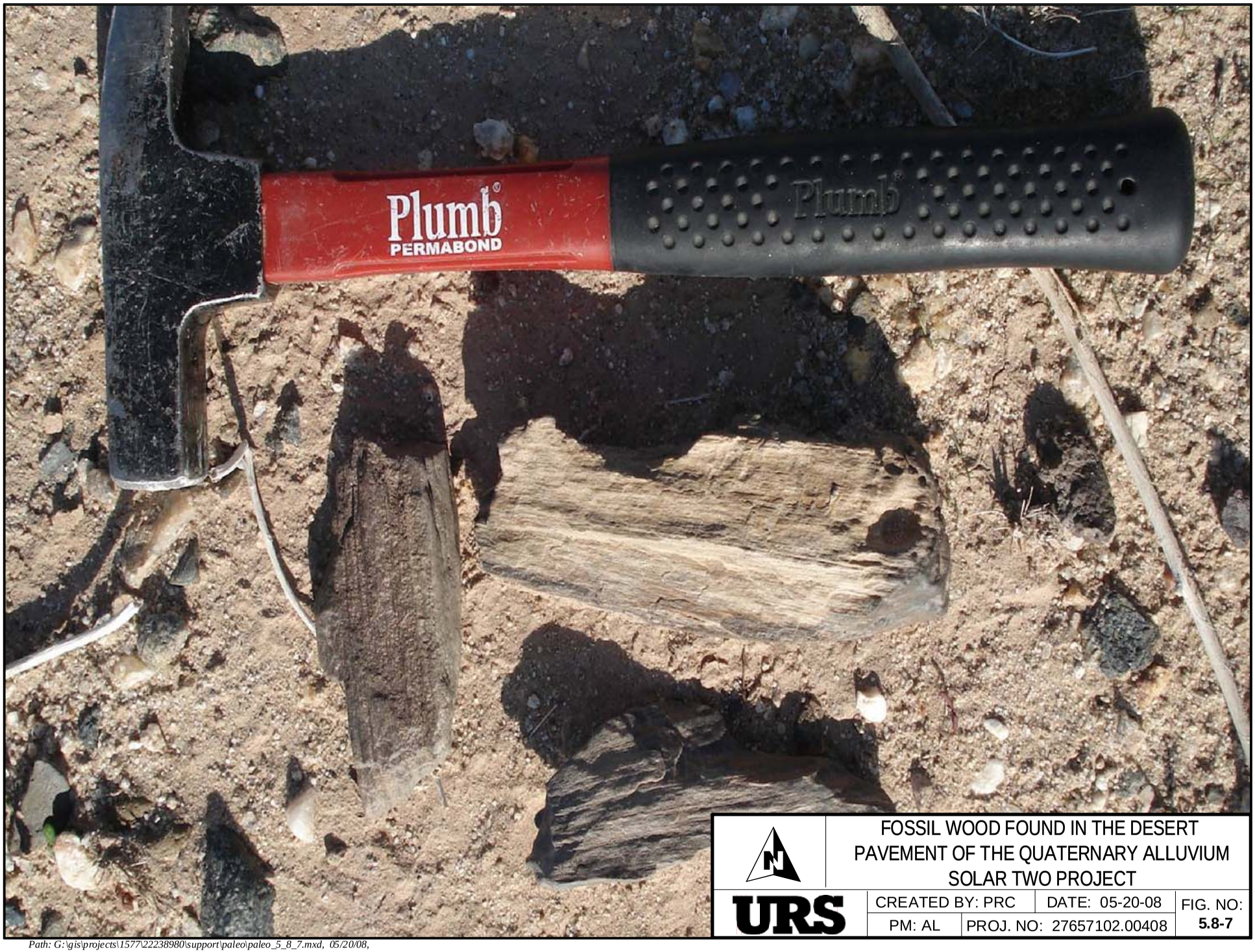

FOSSIL WOOD FOUND IN THE DESERT PAVEMENT OF THE QUATERNARY ALLUVIUM
SOLAR TWO PROJECT

URS	CREATED BY: PRC	DATE: 05-20-08	FIG. NO:
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FOSSIL INVERTEBRATE FRAGMENTS FOUND IN THE DESERT PAVEMENT OF THE QUATERNARY ALLUVIUM
SOLAR TWO PROJECT

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PALEOSOL OF THE QUATERNARY ALLUVIUM
SOLAR TWO PROJECT

URS

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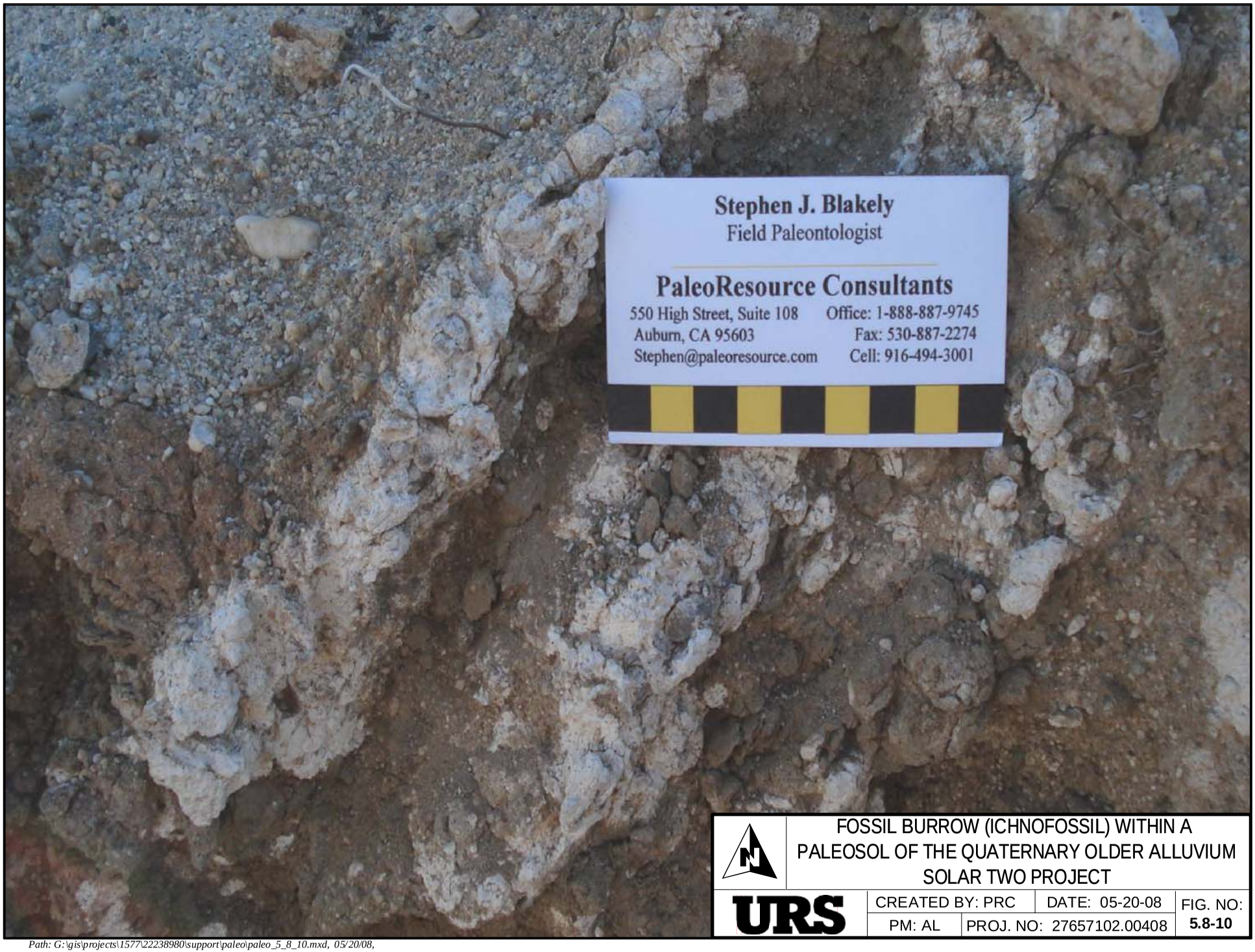

FOSSIL BURROW (ICHNOFOSSIL) WITHIN A PALEOSOL OF THE QUATERNARY OLDER ALLUVIUM
SOLAR TWO PROJECT

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FOSSIL WOOD IN THE
QUATERNARY OLDER ALLUVIUM
SOLAR TWO PROJECT

URS

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FOSSIL BONE FRAGMENT IN THE
QUATERNARY OLDER ALLUVIUM
SOLAR TWO PROJECT

URS	CREATED BY: PRC	DATE: 05-20-08	FIG. NO:
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FOSSIL BIVALVE IN LAKE
CAHUILLA SEDIMENTS
SOLAR TWO PROJECT

URS

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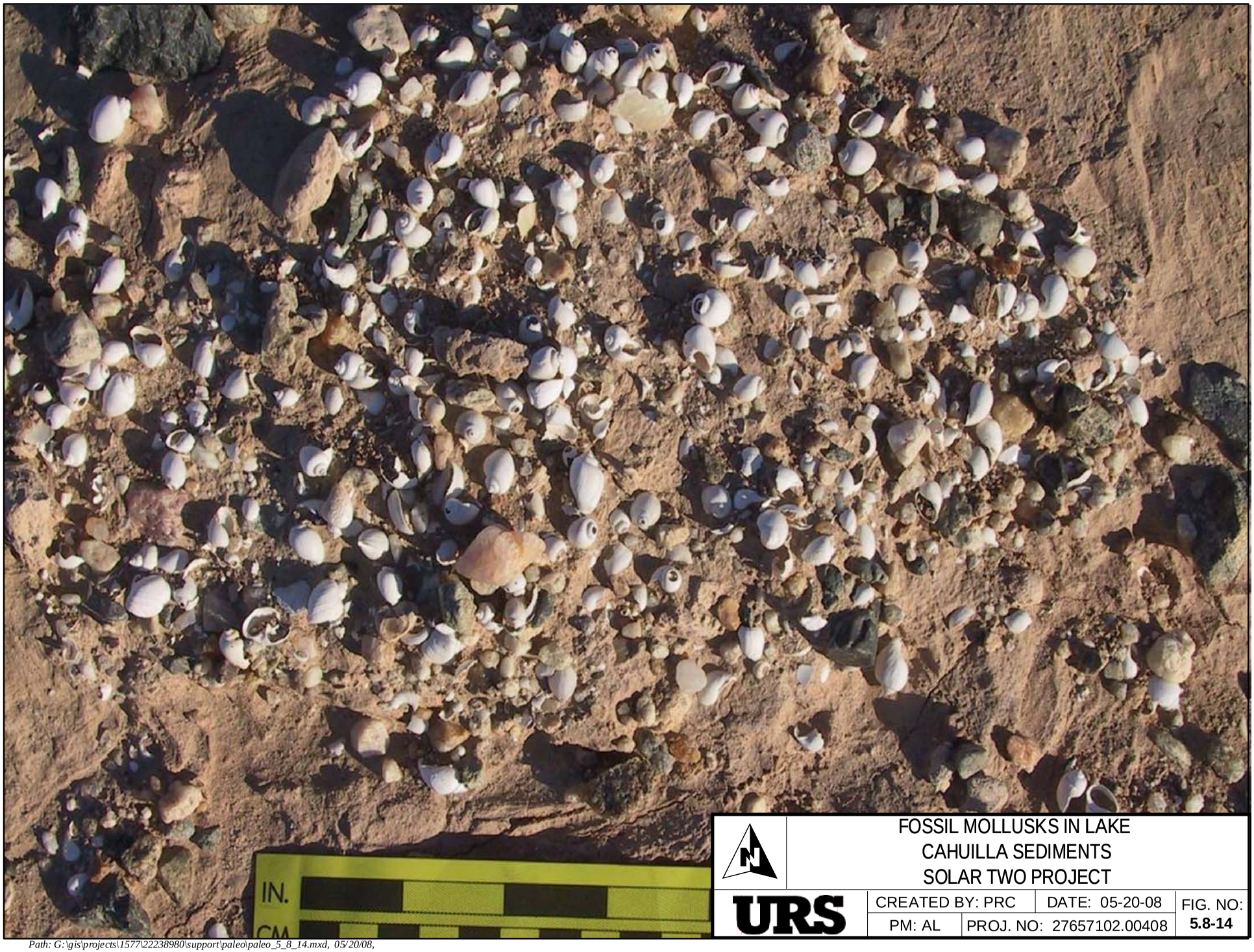

FOSSIL MOLLUSKS IN LAKE CAHUILLA SEDIMENTS
SOLAR TWO PROJECT

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FOSSIL PLANT MATTER FROM WITHIN A SANDSTONE CONCRETION OF THE PALM SPRINGS FORMATION
SOLAR TWO PROJECT

URS

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ABUNDANT FOSSIL OYSTERS IN
THE PALM SPRINGS FORMATION
SOLAR TWO PROJECT

URS	CREATED BY: PRC	DATE: 05-20-08	FIG. NO:
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FOSSIL BONE FRAGMENT IN
THE PALM SPRINGS FORMATION
SOLAR TWO PROJECT

URS

CREATED BY: PRC	DATE: 05-20-08	FIG. NO:
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