DOE/SF/10501-005
(STMPO-488)

PALEONTOLOGIC SALVAGE

SOUTHERN CALIFORNIA EDISON COMPANY

TEN MEGAWATT SOLAR GENERATING PILOT PLANT

DAGGETT, SAN BERNARDINO COUNTY, CALIFORNIA

San Bernardino County Museum Association
2024 Orange Tree Lane
Redlands, California
92373

Robert E. Reynolds
Curator, Earth Sciences
San Bernardino County Museum

January, 1980

TOWNSEND AND BOTTUM, INC.

CONSTRUCTORS - CONSTRUCTION MANAGERS - FOR THE POWER INDUSTRY

P.O. Box 366 • Daggett, California 92327 • Telephone (714) 254-2936

January 25, 1980

T&B/GEN-F066
Information

R.N. Schweinberg
Project Director
Department of Energy
9550 Flair Drive, Ste. 210
El Monte, Calif. 91731

Subject: 10 MWe Solar Pilot Plant
Paleontologic Salvage Report
of Findings

Dear Dick:

Transmitted herewith are two copies of the "Paleontologic Salvage Final Report of Findings" associated with the Preliminary Earthwork during construction at the Daggett site. This report was submitted by the San Bernardino County Museum Association in fulfillment of their Service Agreement to monitor excavation.

If you have any questions or require additional information, please contact me.

Very truly yours,

TOWNSEND AND BOTTUM, INC.

John M. Abram
Construction Manager

JMA/WAB/dp

Distribution:

C.R. Allen
R.J. Schwing
J.N. Reeves
N.J. De Haven
Dr. David White
Tom Taylor
Chuck Bell
208-04.00
208-04.72
208-17.45
208-17.58

Table of Contents

Management Summary

Paleontologic monitoring and salvage operations were performed by the San Bernardino County Museum Association during the construction phase of the Ten Megawatt Solar Generating Pilot Plant at Daggett, San Bernardino County, California. With the cooperation of Townsend and Bottum, constructors, J.R. Pope Construction Company, and Southern California Edison, a large and varied assemblage of significant Pleistocene fossils was recovered.

Prior to construction, a literature search and field survey determined that the construction of the plant site had a high potential for impacting fossils. During construction, four members of the paleontologic monitoring crew prepared fossils or monitored the heavy equipment used in earth moving during site grading, tower, drain, and building pad excavation, excavation of the borrow pit for fill material, and interpretive center site preparation. Fossils were encountered during all phases of excavation except at the interpretive center site.

No problems were encountered during monitoring of excavations. Monitoring did not delay excavation or construction when large, significant, or abundant specimens were

located.

The original best estimate for construction time was 44 days. Six additional days of monitoring were added late in the project, which necessitated a budget revision for the salvage from $19,800.00 to $22,500.00.

Preparation, identification, and curation of specimens continued six weeks after this construction project phase terminated on November 27, 1979. The paleontologic specimens have been housed at the San Bernardino County Museum for further study.

Excavation at the solar generating site yielded 28 fossil taxa which lived adjacent to the Mojave River in Pleistocene times. The most significant find was a human skeleton which was stratigraphically associated with fossil remains of horse, camel, rabbit, and smaller vertebrates. Mammoth remains were found at greater depth. The fossil remains of small vertebrates including rodents, birds, reptiles, and toads are a significant contrast to the contemporaneous fossils from Pleistocene Lake Manix to the east.

Radiometric dates suggest that the Camp Cady local fauna from the Manix Lake sediments may range from 13,000 to 20,000 years Before Present. The fluviatile sediments at Daggett probably correlate with the fluviatile portion of the Manix formation and the fauna is probably from the same

time span. Carbon samples are being radiometrically dated and should indicate the age of the human skeleton and the extinct vertebrate taxa.

Paleontologic Salvage
Southern California Edison Company
Ten Megawatt Solar Generating Pilot Plant
Daggett, San Bernardino County, California

Purpose

The environmental assessment for the location and development plan of the Ten Megawatt Solar Generating Pilot Plant at Daggett was approved by the San Bernardino County Planning Commission on May 4, 1978.

During initial field surveys for the environmental assessment fossils and lithic artifacts were located on the surface of the project site. The assessment therefore recommended preconstruction paleontologic surveying and construction monitoring and salvage as partial mitigation of impacts by construction of the solar generating plant at Daggett to satisfy Federal, State, and County regulations and guidelines concerning non-renewable cultural resources. Following the salvage of fossils, it was recommended that specimens be curated and housed in a museum repository, and that a report of the findings be prepared for Townsend and Bottum, the constructors, to further satisfy government requirements.

Paleontologic remains are accepted as non-renewable resources significant to our culture, and as such are protected

under provisions of the Antiquities Act of 1906 and subsequent related legislation, policies, and enacting responsibilities. The January 1, 1979 "Clean Water Grant Program for the Protection and Preservation of Cultural Resources" (California State Water Resources Control Board, Rev. 6-11), for example, defines cultural resources to include paleontologic values, and elucidates guidelines for preservation and summarizes some of the applicable legislation. Data recovery program techniques are discussed therein (section 7.4).

Preservation and salvage of fossils is mandated, in part, by the following: Executive Order 12088, October 17, 1978 (43:201, 47707); The Archaeological and Historic Act of 1974 (P.L. 93-291; 88 Stat. 174; 16 U.S.C. 469); Executive Order 11593, Protection and Enhancement of the Cultural Environment, May 13, 1971 (36 CFR 8931, 16 U.S.C. 470); National Environmental Protection Act of 1969 (P.L. 910190; 83 Stat. 852; 42 U.S.C. 4321-4327); National Historic Preservation Act of 1966 (80 Stat. 915, 16 U.S.C. 470 et seq, amended 1976 P.O. 94-422 and P.L. 94-458); the Montana Power Company decision (Decisions of the Department of the Interior 721.D, A-30310; 518-522, Dec. 3, 1965); Reservoir Salvage Act of 1960, as amended in 1974 (P.L. 86-523, am. P.L. 93-921); U.S. Congress, August 15, 1949 (63 Stat. 606; 20 U.S.C. 78,

78a); Historic Sites Act of 1935 (49 Stat. 666, 16 U.S.C. 461 et seq); Antiquities Act of June 8, 1906 (34 Stat. 225, 16 U.S.C. 432, 433); the Warren Alquist Act, n.b. sec. 25527; and memoranda of opinions, U.S. Department of the Interior, Office of the Solicitor, to Bureau of Land Management, applicability of Antiquities Act to Fossils, 1956-1974.

Significant paleontologic resources, in this report, are defined as those fossils or assemblages of fossils which are unique, unusual, rare, uncommon, diagnostically important or stratigraphically important, as well as those which add to an existing body of knowledge in specific areas, stratigraphically or regionally. These would include fossil remains of large to very small marine and terrestrial vertebrates, the remains of plants and animals previously not represented in certain portions of the stratigraphy, and assemblages of fossils that might aid stratigraphic correlations, particularly those relating marine to terrestrial events and those offering data for the interpretation of tectonic events.

The generating station site is located at Daggett, approximately eight miles east of Barstow, in the Mojave Desert region of San Bernardino County, California. Specifically, the plant site is located in the west half of Section 13,

Township 9 North, Range 1 East, San Bernardino Base and Meridian, as shown on the Minneola 7½ minute U.S.G.S. topographic quadrangle map (1971). Approximately 150 acres of Section 13 were subject to impacts by construction of the plant site and the borrow pit. The associated interpretive center site is located one and one-quarter miles south-southwest of the plant site in the southeast quarter of the southeast quarter of Section 23, Township 9 North, Range 1 East, S.B.B.& M. It is approximately ten acres in size.

The development of the solar generating plant site prompting the environmental assessment involved brush removal, topographic development, and grading for roads and structure pads for the mirror field. Foundations for the central water tower and for buildings were excavated as well as a structure to control drainage. A borrow pit southwest of the construction site provided fill dirt. The proposed interpretive center site south of the generating site was graded.

All phases of excavation disturbed a thin veneer of Recent alluvium and a thick section of Pleistocene fluviatile sediments. These sediments were deposited in and along the Mojave River and are related to the fossiliferous lacustrine sediments of Pleistocene Lake Manix to the east.

Background

Although this monitoring and salvage project was targeted primarily to mitigate impacts to paleontologic resources, archaeologic and historic artifacts were encountered and were recorded and, as necessary, salvaged during the process of monitoring construction to assure their preservation. Therefore, in addition to paleontologic background, abbreviated archaeologic and historic information is presented to provide a framework for analysis of the recovered artifacts.

Paleontology

Pleistocene sediments along the Mojave River between Victorville and Afton Canyon have produced fossils. Associations of fossil taxa and isolated fossil remains have been referred to the Rancholabrean land mammal age of late Pleistocene times. Between Victorville and Barstow, Pleistocene Mojave River sediments containing horse, camel, and mammoth remains are reported (Bowen 1954; Dibblee 1967, 1968; Noble 1953, 1954a, 1954b; SBCM; Woodburne 1978; Woodburne and Golz 1972).

East of Barstow, Pleistocene fluviatile and lacustrine fossiliferous sediments deposited by the Mojave River and in the Manix Lake basin have been described (Blackwelder and

Ellsworth 1936; Buwalda 1914; Dibblee 1970; Dibblee and Bassett 1966; Jefferson 1965; Keaton et al 1979; McCulloh 1965; Rogers 1967; Woodburne 1978).

The Camp Cady local fauna, a major Rancholabrean land mammal age fauna, is known from the Manix Basin east of the project (Howard 1955; Jefferson 1968; Winters 1954).

Jefferson (1968) indicates that the Camp Cady local fauna from Pleistocene Manix Lake is very similar to the fossil fauna from the tar pits at Rancho La Brea in Los Angeles County, which have been designated as the type locality for the Rancholabrean land mammal age. Jefferson also indicates that the Camp Cady local fauna is similar to Pleistocene faunas which range in age from 40,000 to 6,000 years Before Present (B.P.). Radiocarbon dates from Manix Lake range from 20,050 to 13,800 years B.P. (Bassett and Jefferson 1971; Ferguson and Libby 1962; Hubbs et al 1962; Jefferson 1968).

The possibility of human skeletal remains and artifacts associated with fossils from fluviatile deposits along the Mojave River and in the Manix Basin has been suggested by several authors (Alsoszatai-Petheo 1978; Leakey et al 1968, 1969; Schuiling 1979; Simpson 1958, 1960, 1965, 1966, 1967; Smith 1957, 1963). Dates on human remains in southern California indicate that man was present during the late Rancholabrean land mammal age and that fossil specimens might be found in

sedimentary deposits of such age (Bada et al 1975; Bryan 1978; Carter 1957; Childers 1977; Ku and Kern 1975; Orr 1968; PM; Rogers 1974).

Dix Van Dyke reported the recovery of a fossil mammoth from the area east of Daggett and south of the Mojave River (Smith 1977). Previous paleontologic surveys on and adjacent to the Daggett solar generating site were conducted by the San Bernardino County Museum (1977) and Rozaire (1978) which recorded the presence of fossil vertebrates including camel (SBCM locality numbers 1.76.4, 1.76.11, and 1.76.12), and located lithic artifacts manufactured by humans. The fossils were considered to be from the Rancholabrean land mammal age.

Paleoclimatic and paleobotanic studies which pertain to the area around Daggett and the Manix Basin include those by G.I. Smith (1965), King (1976), Jorgensen (1964), and Wells and Berger (1967). These indicate that 10,000 years ago, the climate was cooler and moister, that piñon pine grew near the 4,000 foot elevation, and Oregon juniper ranged as low as 3,000 feet. The latter might have occurred as close as seven miles south of the generating station site.

Geologic maps of the area encompassing the solar generating station site have been prepared by Dibblee (1970), McCulloh (1965) and Rogers (1967). These authors identify

the sediments at the site as Recent alluvium underlain by late Pleistocene silt and sand. The site is located five miles west of the Calico fault. Studies of the structural events in the Newberry quadrangle (Dibblee and Bassett 1966; Keaton et al 1979) east of the project suggest complex lateral movement along the Calico fault which has locally produced elevational differences. The generating station is located on the higher, west side of the Calico fault. Wind and water erosion on this elevated portion has removed an unrecorded thickness of Pleistocene sediments and has left part of these locally reworked as a veneer of Recent sediments.

Archaeology

The project area contains lithic, animal, and vegetable resources that are known to have been utilized prehistorically and historically. A creosote - scrub community dominated most of the parcel, which also probably supported species of Yucca and Opuntia prior to historic cultivation. A riparian plant community in the Mojave River bottom provided additional plant resources including desert willow, reeds and roots, and cottonwood (Coues 1900; Jaeger 1968; Reynolds 1977).

Coarse gravel bars exposed in the sand and silt along the river contain a variety of lithologies which have been

utilized for tool making and vegetable processing, including chalcedony, quartzite, volcanic porphyries, and basalt. Clasts found in the Pleistocene alluvium of the terrace include basalt, meta-volcanics, granitic rocks, and quartzite. In addition to these locally available materials, abundant sources of lithic materials are available in surrounding regions, such as in the Calico Mountains and the Newberry Mountains (Reynolds 1977; Rogers 1967).

Animal resources currently in the area include jack-rabbit and cottontail rabbit, coyote, rodents, birds, tortoise, snakes, and lizards (Rozaire 1978). The fossil record indicates that large mammals and small game animals existed in the late Pleistocene.

The Mojave River itself was a major resource, providing water for support of the entire biotic community, including man. It also influenced the topography of the site. The terrace upon which about three-quarters of the plant site is located was leveled by the river during Pleistocene times; currently, drainages trend eastward, paralleling the Recent riverbottom. Locally, some drainages on the flat terrace have been obstructed, creating intermittent small ponds (Dibblee 1970; Reynolds 1977; Rogers 1967). This topography offers little shelter, suggesting that aboriginal usages of a temporary or intermittent nature were more likely than permanently

established habitation sites. Because of the abundant resources available, intermittent usage could have extended from late Pleistocene to historic times (Rozaire 1978).

Rozaire (1978) summarizes in detail a possible prehistoric chronology for the area. Briefly, a pre-projectile point culture may have existed 50,000 years ago or more at, for instance, the nearby Calico Mountains and in Manix Basin (Schuiling 1979; Simpson 1958, 1960, 1965, 1966, 1967); a fluted point tradition may date as late as 10,000 years B.C.; the Lake Mohave/San Dieguito tradition lasted from 9,000 to 6,000 years B.C. About 3,000 B.C. another pluvial period occurred and a series of point types appear, including Silver Lake and Pinto (Smith 1963). Vegetable processing tools begin to be more evident at this time. After 1 A.D. the Amargosa culture, characterized by Rose Spring/Eastgate points, appears in the Mojave Desert and is known from the Daggett area (Rogers 1939; Rozaire 1978; Smith 1963). The late Prehistoric period, from about 1,000 A.D., is characterized by the presence of Desert Side-notched and Cottonwood Triangle points and the introduction of brownware pottery (Rogers 1939; Rozaire 1978; Smith 1963).

Historically the area was inhabited by the Vanyume branch of the Serrano (Coues 1900; Galvin 1967; Kroeber 1953; Reynolds 1977; Smith 1963). Their population was very small

and subsisted primarily by hunting and gathering (Kroeber 1953). In 1776, Garcés described visiting a Vanyume village of "25 souls" and a nearby abandoned settlement, both just west of the project site (Coues 1900; Galvin 1967). However, the Mojave River was a major trade route for many Indian groups, including Vanyume, Serrano, Chemehuevi, Mohave, Pueblo, and Paiute (Kroeber 1953; Smith 1963; Walker 1971), and artifacts specific to any of these cultures could be encountered in the project area.

The one site recorded adjacent to the project area prior to 1977 and 1978 field surveys for Southern California Edison was SBCM 97 (SBr 1961), an assemblage of flakes and lithic tools. Several other lithic sites, petroglyphs, and caves were recorded in nearby areas (SBCM) including SBr 3163, a flake scatter southeast of the solar site in Section 24.

In 1977 the San Bernardino County Museum Association conducted a field survey of the site area prior to brush clearing. Three sites were located: a single chalcedony flake near an intermittent pond; a scraper plane, hammerstone, flakes and retouched flakes, and brownware pottery on the bluffs south of the Mojave River; and scraper planes and hammerstones east of the project site, postulated as an extension of SBCM 97 (SBr 1961) (Reynolds 1977). Rozaire's 1978 survey located three artifact sites: a chopper and

hammerstone also interpreted as a part of the SBCM 97 (SBr 1961) complex; a flake scatter on a relatively low terrace in Section 15; and, most significantly, a diagnostic projectile point of the Elko-eared style, associated with a scraper and flakes, also in Section 15. The point is consistent with the Middle Rose Springs typology and is similar to those found at Newberry Cave (about 10 miles southeast of the site), dated from 1,000 to 100 B.C. (Reynolds 1977; Rozaire 1978; Smith 1957). Reference to archaeologic resources near the interpretive center site is made on Southern California Edison blueprints.

History

The first Spaniard to encounter the project area was Fr. Francesco Garcés in 1776, following the Mojave River Trail which then ran along the south bank of the river in the project area. The first United States citizen to utilize this route was Jedediah Smith in 1826. After Smith, trappers and traders continued to pass through the area until the late nineteenth century, when a preferred route was established along the north side of the Mojave River. Because historic campsites from this era are known to have existed at Forks in the Road and between Daggett and Barstow, east and west of

Section 13, it is likely that the project area usage was transitory in the early nineteenth century (Caton 1938; Coues 1900; Galvin 1967; Van Dyke 1927; Walker 1971).

More recently, the peripheries of the solar site have been utilized for agricultural cultivation and livestock raising, evidence of which exists as leveled areas, a pig corral and associated ephemera, and occasional sheep grazing (Reynolds 1977; Rozaire 1978).

In 1895 the Southern California Improvement Company constructed a wooden-flumed aqueduct to carry water from the Mojave River to Daggett. It was later improved by Chinese laborers hired by Dix Van Dyke and John Funk to irrigate what was to become the Coolwater Ranch, acquired by Southern California Edison in the middle 1950s (Mueller 1980).

Some of the rubbish found in the area may have been discarded as early as the 1920s (Rozaire 1978). Rubbish in Section 19 (SBr 3170), southeast of the solar site, was probably deposited prior to 1932 and contains porcelain manufactured prior to 1905.

Methodology

Prior to the preconstruction field survey, a literature and data search was conducted to determine the existance and nature of known paleontologic resources within and near the project area. This research included reviewing published and unpublished documents and sources at the San Bernardino County Museum, including curators' libraries and files, the museum library, field notes, and paleontologic collections and catalogs. Paleontologic collections and files were also examined at the University of California at Riverside. Pertinent regional data was obtained from the curatorial staff at the Page Museum at Rancho La Brea and at the Los Angeles County Museum of Natural History.

When the Daggett solar generating site construction commenced on September 17, 1979, an intensive field survey took place immediately prior to and immediately after brush removal operations. This survey included the drain, borrow pit, access roads, the perimeter of the site where impacts might occur, the interpretive center site, and nearby adjacent locations where fossils had been previously recorded. These included sites SBCM 1.76.4, 1.76.11, and 1.76.12.

These known sites and construction surfaces to be excavated

were inspected on foot, with traverses by crew members approximately five feet apart. Where necessary, test excavations were conducted to examine the subsurface extent of paleontologic and archaeologic sites.

During construction, each piece of heavy equipment involved in earth moving (dozers, graders, grade-alls, and scrapers) were monitored by at least one crew member. Crew members inspected new sedimentary exposures as they were developed and made test excavations in likely areas.

The fossil remains of micro-vertebrates were encountered on the surface of the project site and at subsurface exposures, particularly in the central tower pit. In the tower pit, test samples were collected and screened until prolific concentrations of bone were located. From such concentrations approximately 7,000 pounds of sandy matrix were processed through "20 mesh" screen. The vertebrate remains were later separated and identified.

Fossil remains of large mammals were encountered on the surface and at subsurface localities below the mirror field, in the central tower pit, in the drain, and in the borrow pit. Some specimens at or near the surface were sturdy enough to be excavated and wrapped without the use of a hardening liquid or a protective plaster jacket. Other large specimens, specimens fragmented and sometimes distributed over a distance,

and specimens which were articulated (such as the human skeleton) or in concentration (such as rodent and rabbit skeletons and concentrations of bones of small vertebrates) needed to be stabilized by a liquid hardener. In this case, Glyptal #1276 concentrate mixed at a ratio of one to ten with acetone was used to penetrate the block of matrix and the fossil bone it contained. After the extent of the fossil bone or concentrations of bone was determined and stabilized with hardener, the surrounding area was excavated to develop a free-standing block of matrix containing the specimen on a pedestal base. Exposed fossil bone fragments were covered with a cap of tissue and newspaper to protect the specimen. The protected block of matrix was then covered with strips of burlap dipped in plaster. A longer burlap strip was pulled tightly around the narrow neck of the pedestal to prevent the matrix from falling out when the protective jacket containing the specimen was turned over. Data concerning the provenience of the specimen was incised in the plaster jacket surrounding the specimen as well as being recorded in the field notes. The jacketed specimen was turned over, and excess matrix was removed to make the specimen more portable.

Specimens were prepared in a vehicle at the site, at the temporary laboratory maintained at the field camp, or

at the museum laboratory.

When located, charcoal, carbonized wood, and carbonaceous sediments were collected for radiocarbon dates. Soil samples and bone without hardener were collected adjacent to some of the larger concentrations of bone.

Fossil specimens were identified by comparative anatomical techniques, utilizing fossil and recent osteological collections at the San Bernardino County Museum (SBCM), the University of California at Riverside (UCR), and the George Page Museum (PM).

The field supervisor of the paleontologic monitoring of the Daggett solar generating site construction was the author, Robert E. Reynolds, Curator of Earth Sciences, San Bernardino County Museum. He was assisted by Quintin Lake, Roger Brandt, and Mark Norell, experienced museum fossil collectors and preparators, and Richard Reynolds, Janet Dock, and Debbie Beckley, experienced paleontologic collectors and preparators associated with the George Page Museum and the Los Angeles County Museum of Natural History.

Valuable assistance during construction was provided by John Abrams and Roger Piehl of Townsend and Bottum, constructors, and by Harold Meadows of Pope Construction Company as they directed equipment and supervised safety operations.

Resources and Significance

Paleontology

Stratigraphy can be seen in fresh exposures at construction sites. At the Daggett solar site, stratigraphic relationships were visible in cuts related to the drain, the tower pit, office buildings, and in the borrow pit. Logs of preliminary borings by Woodward - Clyde Consultants (1979) assisted in subsurface interpretations.

The Daggett solar site is located on a section of fluviatile silts and sandy silts overlying fluviatile gravels and gravely sands. Both sedimentary units were deposited by the Mojave River in late Pleistocene times. The Calico fault crosses the Mojave River five miles east of the project site. Movement along this fault in late Pleistocene or Recent times produced relative uplift on its west side. Erosion by wind and water on the elevated portions removed an undetermined thickness of Pleistocene sediments. This deflation left coarse clastic materials and fossilized bones of horse and rabbit in a veneer of Recent alluvium.

Gravel deposits are thickest where the carrying capacity of the Mojave River current was greatest. At the solar site the large, heavy bones of mammoths are found in the gravels, while the bones of horse, camel, and small animals are found in the silt.

A thick section of well-rounded gravels occurs at the north end of the site. It was deposited by the Pleistocene Mojave River, which flowed in the center of the valley near its present course. The thick section of sub-rounded fanglomeratic gravels at the south end of the site is derived from the Newberry Mountains.

South of the river gravels and north of the fanglomerate at the mid-ground of the solar site, gravels and coarse clastic sediments were deposited infrequently. Water reached this mid-ground by river overflow, rain, and by sheet flow from the south. The relatively low rate of flow and reduced carrying capacity of the water deposited fine-grained clasts such as silt and sand. The entire fluviatile section of silt and gravel extends eastward and gradually thins as it interfingers with the lacustrine sediments of the Manix formation. This fluviatile unit is termed Unit D by Jefferson (1968).

The sedimentary thicknesses and relationships at the solar site are shown in the simplified cross-section, appended.

A fourteen-foot thick section of silt and sandy silt overlying four feet of fanglomeratic gravels is seen in the north wall of the borrow pit. Exposures on the south wall show only three feet of silt overlying the fanglomerates.

In Pleistocene times the mid-ground area was an

undulating surface with intermittent ponds, and may have been similar to that north of the riverbed in the area today. The system of sand dunes, however, was less extensively developed.

Paleontologic monitoring and salvage during construction at the Daggett solar generating station site yielded the following fossil taxa:

Kingdom: Animalia	
Phylum Insecta	
Order Coleoptera	
Family Dermestidae	Carpet beetle
Phylum Vertebrata	
Class Amphibia	
Order Anura	
Family Bufonidae	
cf. *Bufo* sp.	Toad
Class Reptilia	
Order Chelonia	
Family Testudinidae	
Gopherus sp.	Tortoise
Order Squamata	
Suborder Lacertilia	
Family Anguinidae	
Gerrhonotus sp.? or	Alligator lizard
Family Teidae	
Cnemidophorus sp.?	Whip-tailed lizard
Family Iguanidae	
Uta sp.?	Side-blotched lizard
Crotophytus sp.	Collared? lizard

Phrynosoma sp. cf. *P. platyrhinos*	Desert horned lizard
Sauromalus sp. cf. *S. obesus*	Chuckawalla
Suborder Serpentes Family Colubridae	Snake
Family Crotalidae *Crotalus* sp.	Rattlesnake
Class Aves	
Order Passeriformes	
Family Tyrannidae	Tyrant flycatcher
Family Icteridae	Oriole
Family Fringillidae	Sparrow
Order Strigiformes	Owl
Class Mammalia	
Order Lagomorpha Family Leporidae *Syvilagus* sp.	Cottontail rabbit
Lepus sp. cf. *L. californicus*	Jackrabbit
Order Rodentia Family Sciuridae *Ammospermophilus* sp. cf. *A. leucurus*	Antelope ground squirrel
Spermophilus sp. cf. *S. tereticaudus*	Round-tailed ground squirrel
Family Geomyidae *Thomomys* sp. cf. *T. umbrinus*	Pocket gopher
Family Heteromyidae Subfamily Perognathinae *Perognathus* sp. (sm)	small Pocket mouse
Perognathus sp. (lg)	large Pocket mouse

Subfamily Dipodomyinae	
Dipodomys sp. cf. *D. merriami*	Merriam's kangaroo rat
Dipodomys sp. cf. *D. deserti*	Desert kangaroo rat
Family Cricetidae	
Neotoma sp.	Wood rat
Order Perissodactyla	
Family Equidae	
Equus sp. cf. *E. occidentalis*	large horse
Order Artiodactyla	
Family Camelidae	
Camelops sp. (*C. hesternus*-sized)	large camel
Order Proboscidea	
Family Elephantidae	
Mammuthus sp.	Mammoth
Order Primates	
Family Homonidae	
Homo sapiens	Human

The fossil fauna from the Daggett solar site is especially significant because it produced a human skeleton associated stratigraphically with a Rancholabrean land mammal age Pleistocene fauna, because the prolific taxonomic list provides a new comparison and contrast with the nearby Camp Cady local fauna in the Manix formation, and because the fauna is radiometrically datable.

Radiocarbon dates on tufa and anodonta shell from the Manix formation are as old as 20,000 years B.P. and as young as 13,800 years B.P. (Bassett and Jefferson 1971; Fergusson and Libby 1962; Hubbs et al 1962, 1965; Jefferson 1968).

Radiocarbon dates from the Daggett solar site will probably fall within the range of 10,000 to 20,000 years B.P. Some fossil faunas containing a small number of species, possibly representing a Rancholabrean land mammal age, have been dated as being 6,000 years B.P. (Jefferson 1968).

The age of the solar site fauna may be older than 10,000 years B.P. This would be a significant date for a previously unreported Pleistocene fauna, particularly because of its human remains. If the dates are more recent than 10,000 years B.P. they will indicate a significantly more recent date for the presence of Equus sp. and Camelops sp. in the Mojave Desert. The dates may also help define periods of activity on the Calico fault, which is one of the more prominent structural features in this portion of the Mojave Desert.

The skeleton of a human (Homo sapiens) was located in the central tower pit of the generating station site. Fossil remains of early man in North America are sparce. In the Mojave Desert this may be due in part to a low aboriginal population, relatively limited exploration by paleoanthropologists, and possibly by early, as yet undefined, prehistoric cultural procedures relating to dispensation of human remains. It is known that ethnographic groups in the Mojave Desert and in the San Bernardino Mountains favored cremation of remains (Kroeber 1953), a practice which might have roots in prehistory.

The skull of this Homo was located in the central tower pit of the Daggett solar generating station site, 190.76 feet South 25° 34' 40" West of the central survey hub of the pit. The skeleton was oriented N 70° W with the skull toward the west and the pelvis toward the east. The skull was located at an elevation of 1940.27 feet, and thus was 4.83 feet below the elevation of the central survey hub and at least five and one-half feet below the local surface. The specimen is encased in a medium-grained silty sand containing pebbles averaging one inch in diameter. This sand grades conformably downward into carbonaceous silt containing fragments of charcoal up to one-half inch in diameter. The dark carbonaceous silt lies in distinct horizontal contact with a sandy silt which grades downward into oxide-coated gravel. The carbonaceous silt contains shrinkage cracks filled by the lighter colored overlying sand. The carbonaceous silt containing charcoal continues eight feet to the west past the skeleton until it is truncated by a lens of dark dense clay. The skeleton was deposited against a bank of silt which is penetrated by animal burrows. The skeleton (which is diagrammed in the appendix) is lying on its vertebral column, oriented north 70° west, with its skull facing north and femur pointing south. It is associated with pebbles, charcoal, and a jackrabbit (Lepus sp.) forelimb.

The charcoal and pebbles are found at various elevations within the one foot layer around the skeleton and might have been deposited by subsequent storm activities. The Lepus sp. forelimb lies under the human cranium and may have been deposited concurrently. The human and rabbit skeletal elements are partially disarticulated; teeth, vertebrae, metacarpals, and limb fragments have been somewhat scattered. Fractures in the human skeletal elements may have been caused by the weight of the scrapers (which first exposed the tibia of the specimen). It is unlikely that the scrapers caused the partial disarticulation of the skeleton.

The partial disarticulation and twisting of the human skeleton and its association with pebbles and the partially articulated rabbit limb suggests that the specimen was washed into place against the silt bank. It then lay exposed and there was partial disarticulation and scattering of teeth, limbs, and vertebrae. It was subsequently covered with additional sand.

The skeleton does not appear to have been introduced to this depth as a purposeful burial. Had it been, it would probably show better articulation, and the skull might not have been twisted in an opposite direction from the femur. Moreover, the overlying silt is very compact and is not easily moved with a modern steel pick. For practical reasons it

would have been an unlikely effort for aboriginal man to have made an excavation of more than five feet for burial purposes. Were this a burial, it was so shallow that exposure and disarticulation of the skeleton followed. It was subsequently covered by more than five feet of sediment prior to final movement of the Calico fault.

The human skeleton is stratigraphically at the same depth as horse (Equus sp.) and camel (Camelops sp.) material found elsewhere in the borrow pit and in the office pit, and is stratigraphically below horse (Equus sp.) material from the office pit and from the surface. This suggests that the specimen of Homo sapiens was deposited in the Rancholabrean land mammal age of the late Pleistocene.

Only five of the 28 fossil taxa from the Daggett solar site are recorded from the Camp Cady local fauna of the Manix formation, although both sites may represent contemporaneous paleoecologic communities.

In the Manix formation, animals lived in three environments: the "lacustrine", the "grassland", and the "brush and scrub woodland" communities (Jefferson 1968). At the Daggett solar site, three paleo-ecologic communities are represented by the species recovered during fossil salvage. They are the predominant "grass and scrub" community, the

"riparian" community at the northern border of the site, and the "rocky hillside" community at least four miles away.

The "grasses and scrub" community at the Daggett solar site are represented by the desert tortoise (Gopherus sp.), the whip-tailed lizard (?) (Cnemidophorus sp.?), side-blotched lizard (Uta sp.), the collared lizard (Crotophytus sp.), the horned lizard (Phrynosoma sp. cf. P. platyrhinos), the jack-rabbit (Lepus sp.), antelope ground squirrel (Ammospermophilus sp. cf. A. leucurus, round-tailed ground squirrel (Spermophilus sp. cf. S. tereticaudus), pocket gopher (Thomomys sp.), pocket mice (Perognathus sp.), kangaroo rat (Dipodomys sp.) and the large horse (Equus sp. cf. E. occidentalis) and large camel (Camelops sp.).

The "riparian" community probably included a belt of cottonwood and willow trees and dense brush along the Mojave River. The toad (Bufo sp.) and the alligator lizard (Gerrhonotus sp.) are from this community, but probably have been introduced to their area of deposition in owl pellets or as carnivore feces.

The "rocky hillside" community is represented at Daggett by the chuckawalla (Sauromalus sp.). Chuckawalla probably did not live within four miles of the solar plant site; the introduction of its remains probably occurred from pellets and feces of raptors and carnivores.

Species such as man (Homo sapiens), camel (Camelops sp.) (Welton 1979), mammoth (Mammuthus sp.), gopher (Thomomys sp.), woodrat (Neotoma sp.), cottontail rabbit (Syvilagus sp.) and rattlesnake and other snakes may have ranged through two or more of the communities. The birds (sparrows, orioles, flycatchers, and owls) also range through riparian, scrub, grassland and hillside communities.

Concentrations of the bones of small vertebrates probably represent the contents of owl pellets and carnivore feces. Large concentrations in the tower pit suggest that they may have been selectively winnowed from the surrounding area by local conditions of water sheet flow or wind, and transported to the site of deposition.

Less extensive concentrations of small vertebrate skeletal elements were found associated with the bones of large mammals and may be the contents of owl pellets or carnivore feces lodging against implaced bones during transport by wind or water. Some concentrations of pellets and feces may be the result of wood rat activity.

Some concentrations of skeletal elements which may represent owl prey through pellet deposition contain mammals as large as the jackrabbit (Lepus sp.) and as small as the pocket mouse (Perognathus sp.). Prey is also represented by nocturnal animals such as the kangaroo rat (Dipodomys sp.)

and diurnal species such as the lizards, passiformes birds, and ground squirrels. The prey was drawn primarily from the grassland and scrub community near trees providing roosting sites for raptors. However, the presence of the toad (Bufo sp.) and alligator lizard (Gerrhontus sp.) represent the riparian community and the chuckawalla (Sauromalis sp.) represents the rocky hillside community. The fossil remains suggest a multi-specific source for the pellets and perhaps represent burrowing owls as well as larger owl species such as the great horned owl. Remains of larger species such as jackrabbit (Lepus sp.) may have been deposited in feces of coyote in addition to owl pellets. Owl pellets and coyote feces are of similar weight and bouyancy and would be subject to concentration by similar mechanisms.

The presence of dermestid beetles is evidenced by the characteristic damage by their larvae to large bone fragments. These beetles and their larvae are present at decomposing carcasses of large animals today (Miller and Reynolds 1978).

Archaeology

Lithic artifacts and fire pits were located during construction. These occured on or slightly below the pre-construction surface. The fire pits, circular depressions

two to three feet in diameter filled with charcoal and sediment, intruded the sand and silt to a depth of twelve inches. Rocks, primarily basalt, were concentrated in some of the fire pits.

Artifacts included metates, biface scrapers and scraper planes, chopping tools, utilized flakes, hammerstones, and cores and flakes. None of the artifacts were culturally specific, but the relative abundance of metates and scrapers is suggestive of hunting and gathering cultures within the last 5,000 years. The fire pits, associated with the only large concentration of artifacts, were near the small playa southwest of the office building area. This site may have been used repeatedly for camping and for processing vegetable materials growing around the playa. The playa probably developed after late activity on the Calico fault.

Data from the above complex site is recorded under the site number SBr 3427 (SBCM 4072).

A light scatter of artifactual material was collected on the surface of the mirror field and near the drain. Artifacts are recorded under the site number SBr 1961 (SBCM 97), an extensive site that parallels the bluffs on the south side of the current Mojave River. These artifacts may have been utilized and abandoned by small transient groups and individuals utilizing the Mojave River Trail along the south

side of the river.

A metate and a chopping tool were located west of the visitor center site; they are recorded under site number SBr 3428 (SBCM 4073). Sporadic foraging for vegetable material on these alluvial slopes probably accounts for this site.

Lithic material used for artifacts includes basalt and vesicular basalt, tuff and welded tuff, obsidian, meta-volcanics from the Sidewinder series, variegated chalcedony including agate, "moss" agate, jasper, and silicified lacustrine sediments, and quartzite and aplite. Except for the obsidian, these materials are found as clasts in the gravels deposited by the Mojave River in Pleistocene and Recent times. Their primary source is as far away as Victorville and as close as the Calico and Newberry Mountains. Most were probably transported only short distances to the sites where they were utilized. The specimen of obsidian is non-porphyritic which suggests that its source was Inyo or Mono County to the north rather than Imperial County to the south. Its presence probably relates to the use of the Mojave River Trail as a trade route.

History

Historic materials located on and adjacent to the Daggett

solar site can be divided into three categories. These are hog ranching debris, refuse dumps of non-organic debris, and relicts and structures from local agriculture.

Agricultural remains consist primarily of fields cleared and leveled by equipment. These are partitioned by berms, divided by roads and connected by irrigation channels and gates. Several pieces of metal were found which were probably parts from tractors and harvesting equipment.

A hog ranch site is located east of the drain and between the mirror field and the Mojave River. Structures were present but deteriorating at the time of the 1977 Museum Association survey and were subsequently removed during project construction in November 1979. They consisted of cement slabs and vertical posts of railroad ties, and hog fence surrounding stalls with feeding bins. Debris surrounded the pens for a radius of one thousand feet, and consisted primarily of cut bone from beef, hogs, sheep, and turkeys. Serving utensils, cups, saucers, and plates were associated with glass and metal containers such as hot sauce bottles and anti-acid jars. Can opening devices of the military "P-38" type which were dispensed with rations are present, and utensils in part were marked with military and medical insignia. The style and content of the non-organic refuse suggests that garbage was collected from the mess of local military facilities

and delivered to the ranch for hog fodder.

Recent skeletons of cows and horses were located on the surface of the site. Range cattle which grazed in the area may account for some of the carcasses; both cattle and horses may also have been dumped after death to avoid the time and expense of conventional disposal.

Sheep have grazed the area within the last three years and their carcasses are located near the river. A cement-lined structure referred to as a "sheep-dip tank" (Rozaire 1978) appears to date from the period of alfalfa farming and hog ranching and is structurally associated with a water system common to both.

Refuse dumps on and adjacent to the solar generating station site primarily contain non-organic debris such as metal and glass. These were probably domestic items that accumulated over a period of several years and then were dumped away from their source. Some dumps contained purple and blue glass which is suggestive of the antiquity of the objects but does not define the time of dumping. A 1947 license plate was present and suggests dumping in the 1950s. Dumping may have occurred intermittently over a period of years.

Summary

Paleontologic monitoring and salvage during the excavation of the Daggett solar site produced a significant suite of 28 fossil taxa, including the skeleton of a human, representing the Rancholabrean land mammal age of late Pleistocene times. Abundant specimens of small rodents, birds, and reptiles significantly amplify the description of the communities of the Manix basin. Members of a "grassland and scrub", "riparian", and "rocky hillside" habitat are present. Forthcoming radiometric dates and further study of the small vertebrates may produce absolute dates of the fauna.

Archaeologic remains are consistent with pre-field research expectations, as are historic remains. Both have intrinsic value relative to the general accumulation of data concerning prehistoric and historic usage of the area.

Recommendations

Future construction plans call for the augering of holes to develop footings for the mirrors and other structures. Other paleontologic salvage projects involving augering have shown that significant fossils can be recovered and identified (Reynolds 1979). Augering will reach sediments previously unexplored during construction and will undoubtedly contact fossils and datable organic materials. Additional fossil species will significantly aid in the interpretation of the paleoecologic habitat.

Additional radiometrically datable materials removed during augering would help provide an absolute age range for the fossil fauna and may help date movement on the Calico fault.

Debris from the augered holes needs to be inspected by a trained paleontologic observer in order to salvage significant, non-renewable paleontologic specimens and associated datable organic materials.

References

Alsoszatai-Petheo, J., 1978. Early man in the Manix basin. Cerro Coso Community College, Ridgecrest.

Bada, J.L., R.A. Schroeder, and G.F. Carter, 1974. New evidence of the antiquity of man in North America deduced from aspartic acid racemization. Science 184: 791-3.

Bassett, A.M. and G.T. Jefferson, 1971. Radiocarbon dates of Manix Lake, central Mojave Desert, California. Geological Society of America, Cordilleran section, abstract.

Blackwelder, E. and E.W. Ellsworth, 1936. Pleistocene lakes of the Afton basin, California. American Journal of Science, 5th Series, Vol. 31, pp 453-463.

Bowen, D.E., Jr., 1954. Geology and mineral deposits of the Barstow quadrangle, San Bernardino County, California. California Division of Mines and Geology Bulletin 165, San Francisco.

Bryan, A.L., 1978. Early man in America. Department of Anthropology, University of Alberta, Occasional Paper #1, Edmonton, Alberta, CA.

Buwalda, J.P., 1914. Pleistocene beds at Manix in the eastern Mojave Desert region. University of California, Department of Geology, Bulletin Vol. 7 No. 25, pp 443-464.

Carter, G.F., 1957. Pleistocene man at San Diego. John Hopkins Press, Baltimore.

Caton, Dorothy L., 1938. "Garces, the Traveler", in California History Nugget, V. 5, California State Department of Education, Sacramento, pp 148-153.

Childers, W.M., 1977. Ridge-back tools of the Colorado Desert. American Antiquity Vol. 42 No. 2, pp 242-248.

Coues, E., 1900. On the trail of a Spanish pioneer: the diary and itinerary of Francisco Garces 1775-1776. Francis Harper, New York, Vol. I pp 239-242.

Dibblee, T.W. Jr., 1967. Areal geology of the western Mojave Desert. U.S. Geological Survey Professional Paper 552, Washington D.C., pp 1-53.

_____, 1968. Displacements on the San Andreas fault system in the San Gabriel, San Bernardino, and San Jacinto Mountains, southern California. Proceedings of conference on geologic problems of the San Andreas fault system, W.R. Dickinson and A. Gruntz, eds. Stanford University Publications in Geological Science 11: 260-276, figs.

_____, 1970. Geologic map of the Daggett quadrangle, San Bernardino County, California. U.S. Geological Survey Miscellaneous Geologic Investigations Map I-592, Washington, D.C.

_____ and A.M. Bassett, 1966. Geologic map of the Newberry quadrangle, San Bernardino County, California. U.S. Geological Survey, Map I-461, Washington, D.C.

Fergusson, G.J. and W. F. Libby, 1962. UCLA radiocarbon dates I. Radiocarbon Vol. 4 p. 113.

Galvin, J. (trans), 1967. A record of travels in Arizona and California 1775-1776. John Howell Books, San Francisco, pp 36-37.

Howard, R.H., 1955. Fossil birds from Manix Lake, California. U.S. Geological Survey Professional Paper 264-J, Washington D.C.

Hubbs, C.L., G.S. Bein, and H.E. Suess, 1962. La Jolla radiocarbon measurements II. Radiocarbon Vol. 4 pp 204-238.

_____, and R.R. Miller, 1965. La Jolla radiocarbon measurements IV. Radiocarbon Vol. 7, pp 66-117.

Jaeger, E.C., 1968. Desert Wild Flowers, rev. ed. Stanford University Press, Menlo Park.

Jefferson, G.T., 1965. Geology and paleontology of a portion of the Manix basin deposits, San Bernardino County, California. American Association of Petroleum Geologists Bulletin Vol. 49 No. 10, 1762.

_____, 1968. The Camp Cady local fauna from Pleistocene Lake Manix, Mojave Desert, California. M.S. thesis, University of California, Riverside Department of Geological Sciences, unpubl.

Jorgensen, C.D., 1964. Pleistocene wood rat middens and climatic change in the Mojave Desert, a record of juniper woodlands. Science 143: 1171-1173.

Keaton, J.R., G.T. Jefferson, and P. Hamilton, 1979. Field guide to selected geomorphic, stratigraphic, and structural features, Wisconsin Lake Manix and the Manix fault zone. Dames and Moore, Los Angeles County Museum of Natural History, and Southern California Edison, pp 1-17 and maps.

King, T.J. Jr., 1976. Archaeological implications of the paleobotanical record from Lucerne Valley area of the Mojave Desert. San Bernardino County Museum Association Quarterly, Vol. XXIII No. 4.

Kroeber, A.L., 1953. Handbook of the Indians of California. California Book Co. Ltd., Berkeley, pp 614-615.

Ku, T. and J.P. Kern, 1974. Uranium series age of the upper Pleistocene Nestor terrace, San Diego, California. Geological Society of America Bulletin 185: 1713-1716.

Leakey, L.S.B., R.D. Simpson, and T. Clements, 1968. Archaeological excavations in the Calico Mountains; preliminary report. Science 160: 1022-23.

_____, 1969. Man in America: the Calico Mountains excavations. 1970 Britannica yearbook of science and the future, Chicago.

McCulloh, T.H., 1965. Geologic map of the Nebo and Yermo quadrangles, San Bernardino County, California. U.S. Geological Survey, Washington D.C., Open File Report, 1:24,000.

Miller, S., and R.L. Reynolds, 1978. Pleistocene dermestid beetle damage in Equus conversidens bones from caves in California and Mexico. Southern California Academy of Sciences, abstract.

Mueller, C., 1980. Daggett's waterway is seeped in history. The Sun, Redlands edition. San Bernardino, Sec. B-2, January 13.

Noble, L.F., 1953. Geology of the Pearland quadrangle, California. U.S.G.S. quadrangle map series, Washington, D.C.

_____, 1954a. Geology of the Valyermo quadrangle, California. U.S.G.S. quadrangle map series, Washington, D.C.

_____, 1954b. The San Andreas fault zone from Soledad Pass to Cajon Pass, California. California Division of Mines and Geology, San Francisco, Bull. 170, Chapter IV, pp 37-48, figs.

Orr, P.C., 1968. Prehistory of Santa Rosa Island. Santa Barbara

Page Museum, continuing. Rancho La Brea paleontologic collections and catalogs, Los Angeles.

Reynolds, R.E., 1977. Daggett Solar Power Generating Station, paleontologic, archaeologic, and historic assessment. San Bernardino County Museum Association, Redlands, for Environmental Impact Agency, San Bernardino County.

_____, 1979. Paleontologic salvage, Southern California Edison Lugo-Mira Loma 500 kV transmission line, Cajon Pass, Crowder Canyon, and Summit Valley, San Bernardino County, California. San Bernardino County Museum Association, Redlands.

Rogers, M.J., 1939. Early lithic industries of the lower basin of the Colorado River and adjacent desert areas. San Diego Museum Papers #3.

Rogers, S.C., 1974. An ancient human skeleton found at Del Mar, California. San Diego Museum Papers #7.

Rogers, T.H., 1976. Geologic map of California, San Bernardino sheet, 1:250,000. California Division of Mines and Geology, San Francisco.

Rozaire, Charles, 1978. The Coolwater coal project: an archaeologic assessment. Report submitted by Cultural Systems Research Inc., Menlo Park, to Southern California Edison, Rosemead.

San Bernardino County Museum, continuing. Paleontologic site files and collections, Department of Earth Sciences, Redlands.

Schuiling, W.C., ed., 1979. Pleistocene man at Calico. San Bernardino County Museum Association Quarterly Vol. XXVI No. 4.

Simpson, R.D., 1958. The Manix Lake archaeological survey. The Masterkey, Vol. 32 No.1, pp 4-10.

_____, 1960. Archaeological survey of eastern Calico Mountains. The Masterkey, Vol. 34 No. 1, pp 25-35.

_____, 1965, 1966, 1967. A search for Pleistocene archaeological evidence in the Calico Mountains of eastern California. National Geographic Society Research Reports, publ. 1971, 1973, 1974.

Smith, G.A., 1957. Newberry Cave, California. San Bernardino County Museum Association Quarterly Vol. 4 No. 3, Bloomington.

_____, 1963. Archaeologic survey of the Mojave River area and adjacent regions. San Bernardino County Museum Association, Bloomington.

_____, 1977, personal communication. Director, San Bernardino County Museum, Redlands.

Smith, G.I., 1967. Field Guide to examples of late Quaternary geology, Searles Valley, California, in Pleistocene geology and palynology, Searles Valley, California. Guidebook for Friends of the Pleistocene, Pacific Coast section, September 23-24.

University of California, Riverside, continuing. Paleontologic collections and files, Department of Geological Sciences, Riverside.

Van Dyke, Dix, 1927. A modern interpretation of the Garces route. Historical Society of Southern California, pp 353-359 and map.

Walker, C.J., 1971. Opening the Mojave River Trail. San Bernardino County Museum Quarterly XVIII:4, Bloomington.

Wells, P.V. and R. Berger, 1967. Late Pleistocene history of coniferous woodland in the Mohave Desert. Science 155: 1640-1647.

Welton, B., 1979. News bulletin, Society of Vertebrate Paleontology No. 117, October.

Winters, H.H., 1954. The Pleistocene fauna of the Manix beds in the Mojave Desert, California. unpubl. masters thesis, California Institute of Technology.

Woodburne, M.O., 1978 (n.d.) Fossil vertebrates in the CDCA. unpubl. report prepared for the Department of the Interior, Bureau of Land Management, Riverside.

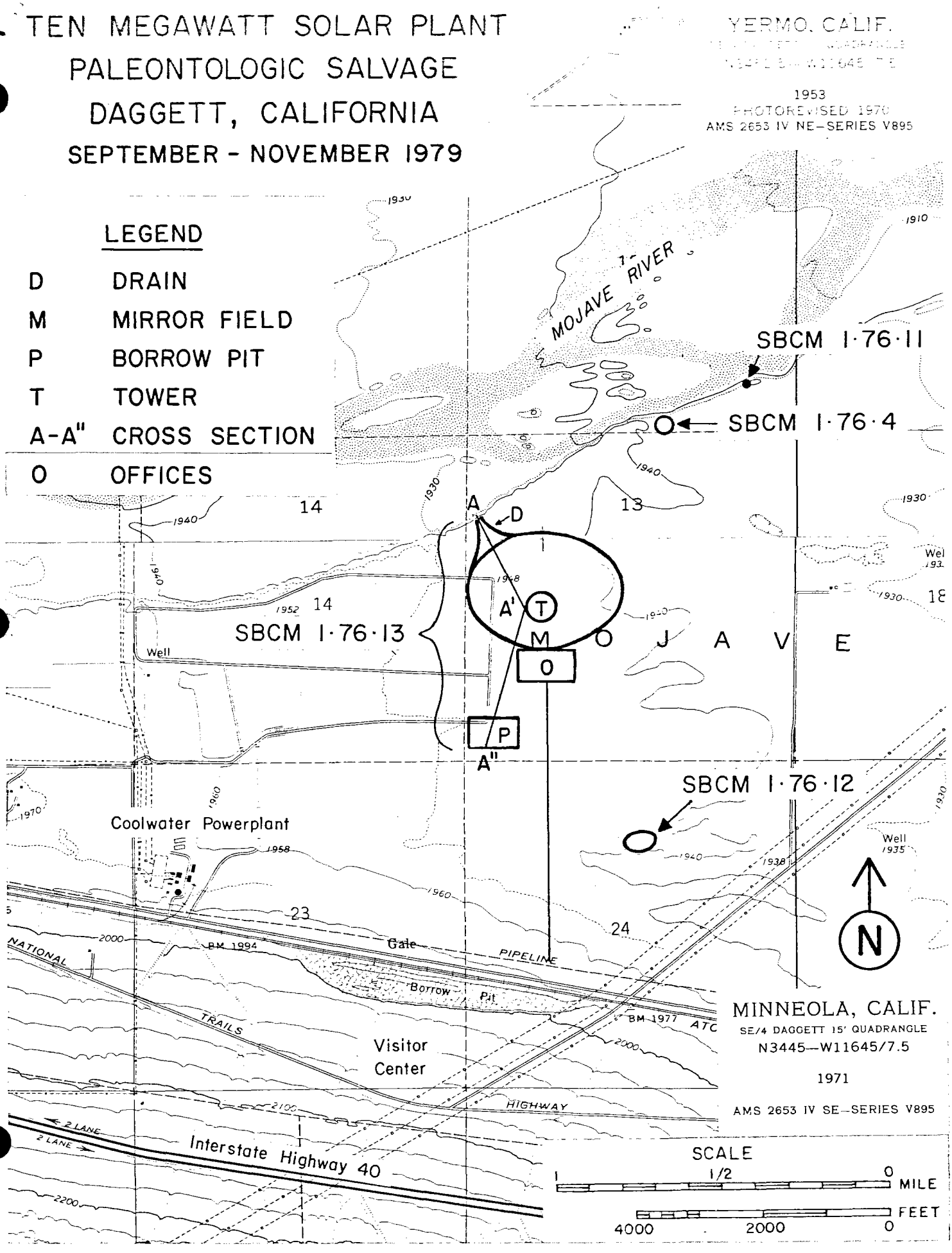
_____ and D. Golz, 1972. Stratigraphy of the Punchbowl formation, Cajon Valley, southern California. University of California Publications in Geological Sciences, Vol. 92, University of California Press, Berkeley.

Woodward-Clyde Consultants, 1979. Boring log, Daggett Solar Pilot Plant, San Bernardino County, California, via Townsend and Bottum, El Monte.

Appendix A

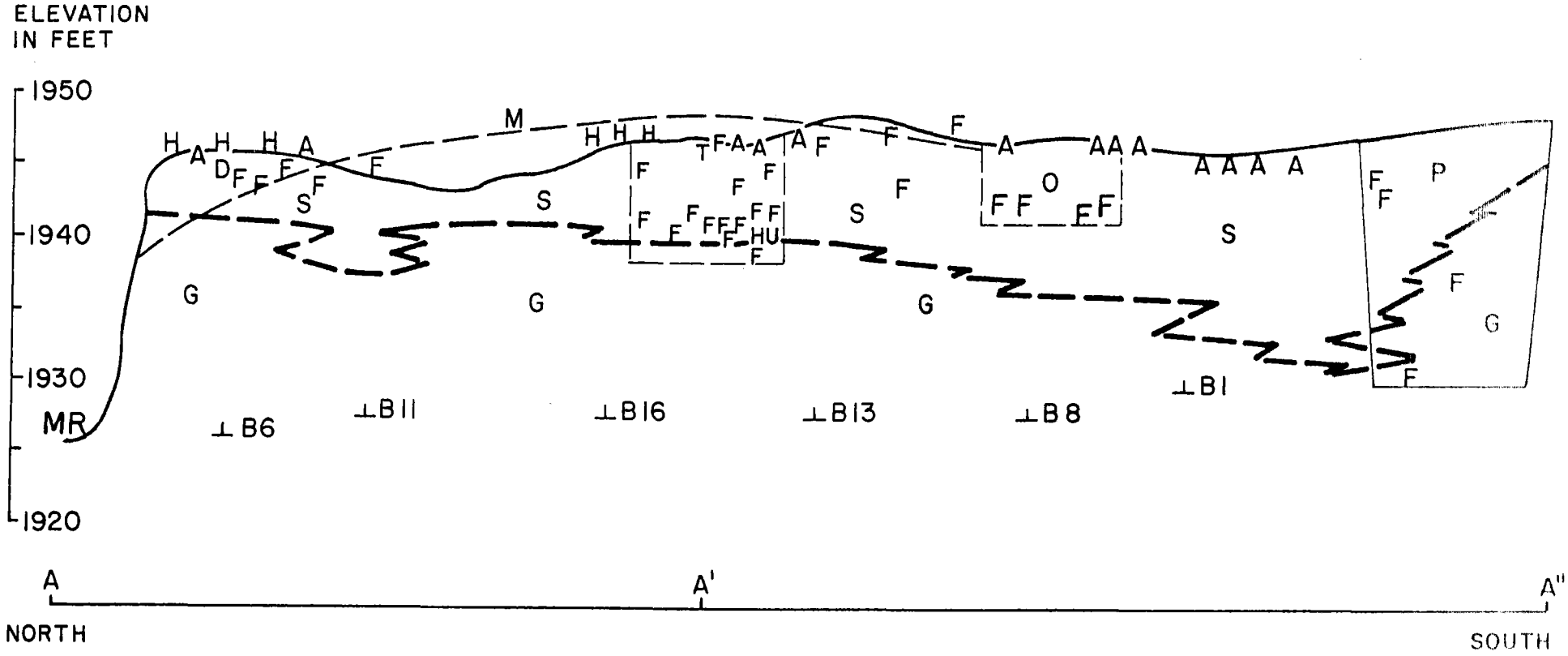
Locality Map

TEN MEGAWATT SOLAR PLANT
PALEONTOLOGIC SALVAGE
DAGGETT, CALIFORNIA
SEPTEMBER - NOVEMBER 1979



Appendix B

Simplified Cross-Section



DAGGETT SOLAR GENERATING SITE
Simplified Cross Section

Legend:

A - Artifacts
D - Drain
F - Fossils
G - Gravels, sandy gravels
H - Historic relicts
HU - Human skeleton
M - Mirror field
MR - Mojave River
O - Office
P - Borrow pit
S - Silt, sandy silt
T - Tower
⊥ B1 - Boring 1
~ - Contact

Scale:

Horizontal 4,333'

Vertical 10'
(exaggerated)

Appendix C

Human Skeleton

HUMAN SKELETON
Daggett Solar Generating Site

View from underside of partially prepared skeleton as it appears in plaster jacket, December 7, 1979.

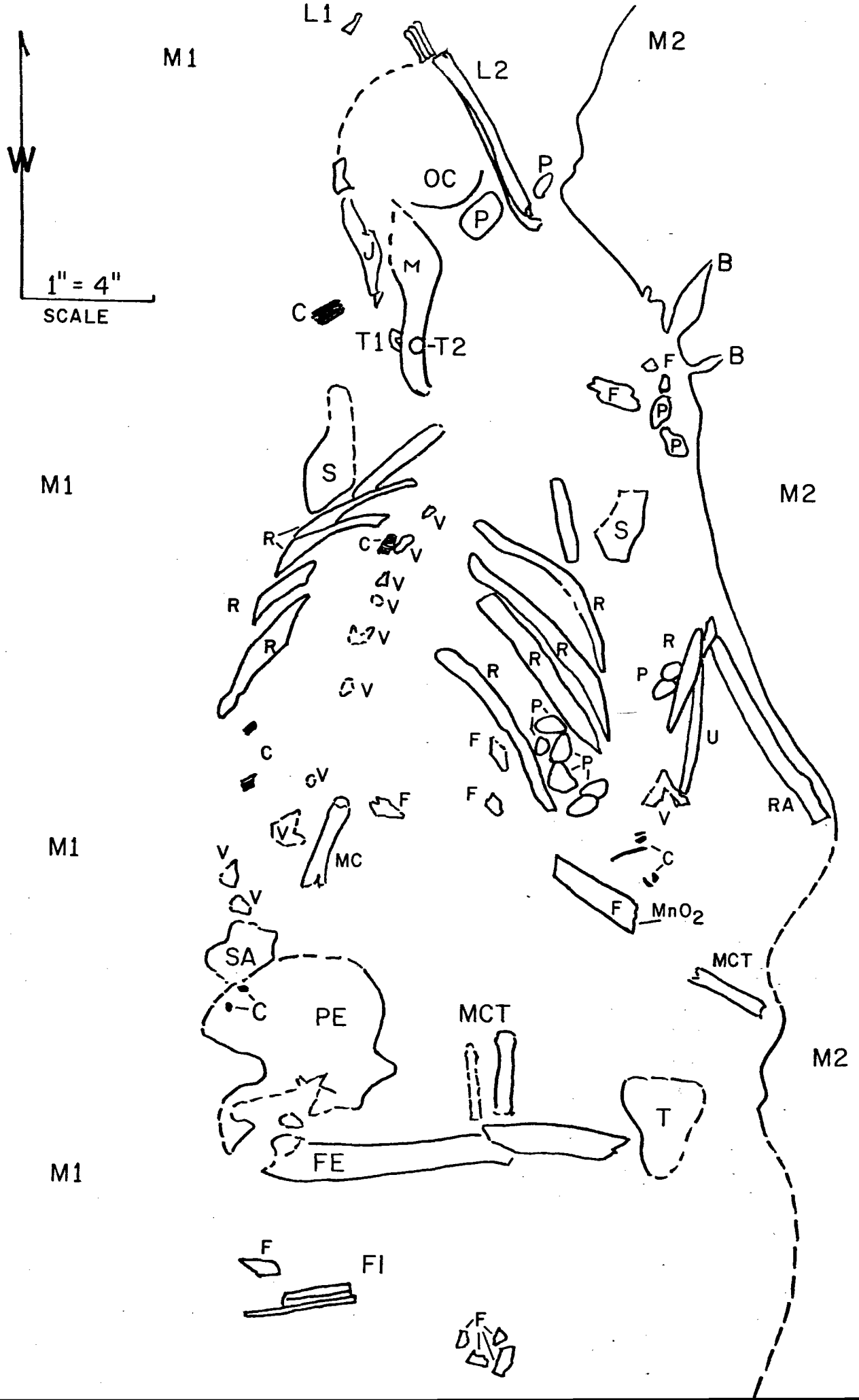
Legend:

Skeletal Elements

F - Fragment of bone
FE - Femur
FI - Fibula
J - Jugal
L1 - Lepus sp. first phalange
L2 - Lepus sp. radius, ulna, metacarpals
M - Manidble
MC - Metacarpal
MCT - Metacarpal or metatarsal
OC - Occipital region
PE - Pelvis
R - Rib
RA - Radius
S - Scapula
SA - Sacrum
T - Proximal tibia?
T1 - Tooth in mandible
T2 - Tooth out of mandible
U - Ulna
V - Vertebra

Matrix Components

B - Burrows
C - Charcoal
M1 - Medium-grained silty sand
M2 - Silt and fine-grained sandy silt
MnO_2 - Pyrolusite on limb fragment
P - Pebble


W
1" = 4"
SCALE
M1
L1
L2
M2
OC
P
J
M
C
T1
C-T2
B
F
P
S
R
V
MC
SA
PE
MCT
T
FE
FI
U
RA
MnO_2

Department of Energy
San Francisco Operations Office
1333 Broadway
Oakland, California 94612

Reply to:
DOE Project Office
Post Office Box 366
Daggett, CA 92327
(619) 254-2672

Mr. William D. Matheny
Chief, Control Branch
Document Control & Evaluation Division
DOE Technical Information Center
Post Office Box 62
Oak Ridge, TN 37830

MAR 3 0 1984

Submission of 10-MWe Pilot Plant ("Solar One") Document under Cooperative Agreement DE-FC03-77SF10501, for TIC/NTIS Archiving and Announcement

Dear Mr. Matheny:

Enclosed are two reproducible copies of a report prepared under a service agreement to the Project Office by the San Bernardino County Museum Association, with accompanying DOE Form RA-426:

Primary Number: DOE/SF/10501-005

Secondary No.: STMPO-488

Title: "Paleontologic Salvage; Southern California Edison Company Ten Megawatt Solar Generating Pilot Plant; Daggett, San Bernardino County, California."

One additional copy of this report has been forwarded to the DOE/SAN Office of Patent Counsel for clearance.

Sincerely yours,

S. D. Elliott, Jr., Director,
DOE Project Office, Barstow

Encl.: (1) Report w/DOE Form RA-426

cc: Mike Lopez, DOE/SAN FGS
Don Holz, DOE/SAN ISEA
Roger Gaither, DOE/SAN OPC
Mary Soderstrum, B&McD

DOE Form RA-426
(10/80)

U.S. DEPARTMENT OF ENERGY

OMB NO. 038-R0190

DOE AND MAJOR CONTRACTOR RECOMMENDATIONS FOR ANNOUNCEMENT AND DISTRIBUTION OF DOCUMENTS

See Instructions on Reverse Side

1. DOE Report No.	2. Contract No.	3. Subject Category No.
DOE/SF/10501-005 (STMPO-488)	DE-FC03-77SF10501	UC-62

4. Title
"Paleontologic Salvage; SCE 10-MWe Solar Generating Pilot Plant; Daggett, CA"

5. Type of Document ("x" one)
- [X] a. Scientific and technical report
- [ ] b. Conference paper: Title of conference _____
  _____ Date of conference _____
  Exact location of conference _____ Sponsoring organization _____
- [ ] c. Other (specify planning, educational, impact, market, social, economic, thesis, translations, journal article manuscript, etc.)

6. Copies Transmitted ("x" one or more)
- [ ] a. Copies being transmitted for standard distribution by DOE–TIC.
- [ ] b. Copies being transmitted for special distribution per attached complete address list.
- [X] c. Two completely legible, reproducible copies being transmitted to DOE–TIC. (Classified documents, see instructions)
- [ ] d. Twenty-seven copies being transmitted to DOE–TIC for TIC processing and NTIS sales.

7. Recommended Distribution ("x" one)
- [ ] a. Normal handling (after patent clearance): no restraints on distribution except as may be required by the security classification.

Make available only [ ] b. To U.S. Government agencies and their contractors. [ ] c. within DOE and to DOE contractors. [ ] d. within DOE. [ ] e. to those listed in item 13 below.

- [X] f. Other (Specify) Archive/issue on request

8. Recommended Announcement ("x" one)
- [X] a. Normal procedure may be followed. [ ] b. Recommend the following announcement limitations:

9. Reason for Restrictions Recommended in 7 or 8 above.
- [ ] a. Preliminary information. [ ] b. Prepared primarily for internal use. [ ] c. Other (Explain)

10. Patent, Copyright and Proprietary Information

Does this information product disclose any new equipment, process or material? [X] No [ ] Yes If so, identify page nos. _____

Has an invention disclosure been submitted to DOE covering any aspect of this information product? [X] No [ ] Yes

If so, identify the DOE (or other) disclosure number and to whom the disclosure was submitted.

Are there any patent-related objections to the release of this information product? [X] No [ ] Yes If so, state these objections.

Does this information product contain copyrighted material? [X] No [ ] Yes

If so, identify the page number _____ and attach the license or other authority for the government to reproduce.

Does this information product contain proprietary information? [X] No [ ] Yes If so, identify the page numbers _____.

("x" one [ ] a. DOE patent clearance has been granted by responsible DOE patent group.
[X] b. Document has been sent to responsible DOE patent group for clearance.

11. National Security Information (For classified document only; "x" one)

Document [ ] a. does [ ] b. does not contain national security information

12. Copy Reproduction and Distribution

Total number of copies reproduced 10 Number of copies distributed outside originating organization 5

13. Additional Information or Remarks (Continue on separate sheet, if necessary)

14. Submitted by (Name and Position) (Please print or type)

S. D. Elliott, Jr., Director, DOE Project Office, Barstow

Organization

Post Office Box 366, Daggett, CA 92327 (619) 254-2672

Signature _____ Date 30 March, 1984

DOE F 1325.8
(7-79)

U.S. DEPARTMENT OF ENERGY

memorandum

DATE MAR 3 0 1984

REPLY TO ATTN OF: Doug Elliott, DOE Project Office, Barstow

SUBJECT: Submission of 10-MWe Pilot Plant ("Solar One") Document under Cooperative Agreement DE-FC03-77SF10501 for Patent Clearance

TO: Roger Gaither, DOE/SAN OPC

Enclosed is one report prepared under a service agreement to the DOE Project Office by the San Bernardino County Museum Association, with SAN Form 70:

DOE/SF/10501-005 (STMPO-488), "Paleontologic Salvage; Southern California Edison Company Ten Megawatt Solar Generating Pilot Plant; Daggett, San Bernardino County, California"

Two additional copies of this report are being forwarded directly to the DOE Technical Information Center for archiving, photocopying and distribution on request by TIC and NTIS. Please review this report to insure no patentable material is included, and advise TIC as appropriate. The feedback copy of the SAN Form 70 should be sent to me at the Project Office.

When review is completed, please transmit your copy to Mike Lopez, DOE/SAN FGS.

Encl.: One Report w/SAN Form 70

S. D. Elliott, Jr., Director,
DOE Project Office, Barstow

cc: Mike Lopez, DOE/SAN FGS
Don Holz, DOE/SAN ISEA
William D. Matheny, TIC
Mary Soderstrum, B&McD

DEPARTMENT OF ENERGY
SAN FRANCISCO OPERATIONS OFFICE

CONTRACTOR REQUEST FOR PATENT CLEARANCE
FOR RELEASE OF UNCLASSIFIED DOCUMENT

Prime Contract No.	DE-FC03-77SF10501
Subcontract No.	(N/A)
Report No.	DOE/SF/10501-005 (STMPO-488)
Date of Report	January, 1980
Name & Phone No. of DOE Technical Representative	S. D. Elliott, Jr. (619) 254-2672

TO: Roger S. Gaither, Asst. Chief for Prosecution
Office of Patent Counsel/Livermore Office
P.O. Box 808, L-376
Livermore, California 94550

FROM: DOE Project Office, Barstow
Post Office Box 366
Daggett, CA 92327

1. Document Title:
"Paleontologic Salvage; Southern California Edison Company Ten Megawatt Solar Generating Pilot Plant; Daggett, San Bernardino County, California"

2. Type of Document: XX Technical Report, ☐ Conference Paper, ☐ Journal Article, ☐ Abstract or Summary,
☐ Copy of Oral Presentation, ☐ Other (please specify): _____

3. In order to meet a publication schedule or submission deadline, patent clearance by (Routine) would be desired.

SENDER IS TO CHECK BOX #4 OR #5 BELOW.

☐ 4. I have reviewed (or have had reviewed by technically knowledgeable personnel) this document for possible inventive subject matter (Subject Inventions) and that no inventions or discoveries (Subject Inventions) are deemed to be disclosed in this document except as stated below:

a. Attention should be directed to pages _____ of this document.

b. This document describes matter relating to an invention:

i. Contractor Invention Docket No. _____.
ii. A disclosure of the invention was submitted to DOE on _____ (date)
iii. A disclosure of the invention will be submitted shortly _____ (approximate date)
iv. A waiver of DOE's patent rights to the contractor:
☐ has been granted, ☐ has been applied for; or ☐ will be applied for _____ (date)

XX 5. This document is being submitted, but no review has been made by me of this document for possible inventive subject matter.

6. Remarks:

Reviewing/Submitting Official: Name (Print/Type) S. D. Elliott, Jr., Director
Title DOE Project Office, Barstow
Signature S D Elliott Jr. Date 30 March, 1984

TO: INITIATOR OF REQUEST

FROM: ASSISTANT CHIEF FOR PROSECUTION
Office of Patent Counsel/Livermore Office

☐ No patent objection to above-identified release.

☐ Please defer release until advised by this office.

Signed _____ Date Mailed _____

DEPARTMENT OF ENERGY
SAN FRANCISCO OPERATIONS OFFICE

CONTRACTOR REQUEST FOR PATENT CLEARANCE
FOR RELEASE OF UNCLASSIFIED DOCUMENT

Prime Contract No.	DE-FC03-77SF10501
Subcontract No.	(N/A)
Report No.	DOE/SF/10501-005 (STMPO-488)
Date of Report	January, 1980
Name & Phone No. of DOE Technical Representative	S. D. Elliott, Jr. (619) 254-2672

TO: Roger S. Gaither, Asst. Chief for Prosecution
Office of Patent Counsel/Livermore Office
P.O. Box 808, L-376
Livermore, California 94550

FROM: DOE Project Office, Barstow
Post Office Box 366
Daggett, CA 92327

1. Document Title:
"Paleontologic Salvage; Southern California Edison Company Ten Megawatt Solar Generating Pilot Plant; Daggett, San Bernardino County, California"
2. Type of Document: ☒ Technical Report, ☐ Conference Paper, ☐ Journal Article, ☐ Abstract or Summary, ☐ Copy of Oral Presentation, ☐ Other (please specify): _____
3. In order to meet a publication schedule or submission deadline, patent clearance by (Routine) would be desired.

SENDER IS TO CHECK BOX #4 OR #5 BELOW.

☐ 4. I have reviewed (or have had reviewed by technically knowledgeable personnel) this document for possible inventive subject matter (Subject Inventions) and that no inventions or discoveries (Subject Inventions) are deemed to be disclosed in this document except as stated below:

a. Attention should be directed to pages _____ of this document.

b. This document describes matter relating to an invention:

i. Contractor Invention Docket No. _____.
ii. A disclosure of the invention was submitted to DOE on _____ (date)
iii. A disclosure of the invention will be submitted shortly _____ (approximate date)
iv. A waiver of DOE's patent rights to the contractor:
☐ has been granted, ☐ has been applied for; or ☐ will be applied for _____ (date)

☒ 5. This document is being submitted, but no review has been made by me of this document for possible inventive subject matter.

6. Remarks:

Reviewing/Submitting Official: Name (Print/Type) S. D. Elliott, Jr., Director
Title DOE Project Office, Barstow
Signature S D Elliott Jr. Date 30 March, 1984

TO: INITIATOR OF REQUEST

FROM: ASSISTANT CHIEF FOR PROSECUTION
Office of Patent Counsel/Livermore Office

☒ No patent objection to above-identified release.

☐ Please defer release until advised by this office.

Signed Harold M. Dwyer Date Mailed 4/25/84

COPY FOR CONTRACTOR'S (SENDER'S) FILES AFTER OPC RELEASE