

## APPENDIX L

### **PALEONTOLOGICAL RESOURCES TECHNICAL REPORT**

---

Portions of this report are confidential and are not appropriate for public distribution. Copies of this report that include all confidential material have been provided to the California Energy Commission under separate cover.

TECHNICAL REPORT

EL SEGUNDO POWER  
REDEVELOPMENT PROJECT  
PALEONTOLOGICAL RESOURCES

APPENDIX L

(CONFIDENTIAL: NOT FOR PUBLIC  
DISTRIBUTION)

*Prepared by*  
David Lawler  
Paleontologist  
Lawler and Associates Applied Geoscience

*Prepared for*  
California Energy Commission  
Sacramento, California

December 2000

**URS**

500 12th Street, Suite 200  
Oakland, California 94607

66-0000030.01 01070

## TABLE OF CONTENTS

<b>PALEONTOLOGY RESOURCE ASSESSMENT SUMMARY.....</b>	<b>L-1</b>
<b>INTRODUCTION.....</b>	<b>L-1</b>
<b>METHODS .....</b>	<b>L-2</b>
<b>PROJECT DESCRIPTION .....</b>	<b>L-3</b>
<b>GEOLOGIC SETTING.....</b>	<b>L-5</b>
Regional Geology-Summary.....	L-5
<b>PALEONTOLOGY-PROJECT SETTING.....</b>	<b>L-6</b>
Significance of Paleontological Resources .....	L-6
Criteria for Determination of Potential .....	L-7
<b>PALEONTOLOGICAL RESOURCES .....</b>	<b>L-8</b>
Cenozoic Age Rock Units.....	L-8
San Pedro Formation and Palos Verdes Sand .....	L-8
Quaternary Alluvial Deposits .....	L-9
Holocene/Post Holocene Age Sediments.....	L-10
Results – Paleontology Sensitivity Ratings.....	L-10
Paleontology Sensitivity Ratings .....	L-11
<b>MANAGEMENT CONSIDERATIONS - PALEONTOLOGY RESOURCES ....</b>	<b>L-13</b>
Mitigation Measures.....	L-13
<b>DATA SOURCES.....</b>	<b>L-16</b>
<b>REFERENCES .....</b>	<b>L-17</b>

### **TABLES**

(Table L-1) Geologic Units within Project Area

(Table L-2) Paleontological Sensitivity & Geologic Units

### **ATTACHMENTS**

Attachment L(A)1 - (LACM) Paleontological Data - Vertebrate Locality & Specimen Data

### **FIGURES**

(Figure L-1) Project Area - Location Map and Paleontological Sites and Areas Surveyed

# **EL SEGUNDO POWER REDEVELOPMENT PROJECT**

## **PALEONTOLOGICAL RESOURCE TECHNICAL REPORT (APPENDIX L)**

### **SUMMARY**

A paleontological sensitivity analysis of the El Segundo Power Redevelopment Project (ESPR) has been performed using available published scientific literature and unpublished archival records and data. This has included the corridor areas of potential disturbance along specified, water, aqueous ammonia, and reclaimed pipeline routes as well as the designated power plant site. In addition, a limited field survey was conducted on November 3<sup>rd</sup>, 2000, on the majority of the project right-of-way (ROW) and staging areas. Paleontological Assessment Rating (low, medium, and high) have been assigned to portions of the project areas underlain by unconsolidated and consolidated alluvial units of Pleistocene (*Qal*) and Holocene geologic ages.

Paleontological resource sensitivity likewise varies according to geologic rock unit. Fossil vertebrate resources are considered rare in respect to the identified geological formations and geologic periods.

From a regional perspective, scanty occurrences of paleontological resources from the Quaternary alluvium unit (*Qal*) record evidence of Pleistocene age fossil vertebrates in this part of the Los Angeles Basin - Santa Monica Bay region of southern California.

Background research and prior paleontological project reports provided the scientific data necessary for prediction of the location of probable paleontological resources within the project area.

### **INTRODUCTION**

Mr. David Lawler, a professional paleontologist, has undertaken a Paleontological Resources Sensitivity Analysis of the ESPR project area that is based on (1) museum repository data and paleontological collection material, (2) a published and unpublished scientific literature survey to provide relevant environmental overview data, and (3) a paleontological field survey.

The paleontological study was conducted in conformance with California Energy Commission Guidelines (CEC, 1992) and *Rules of Practice and Procedure & Power Plant Site Certification Regulations* (CEC, 1997). Guidelines and significance criteria issued in 1994 by the Society for Vertebrate Paleontology (SVP) (1994) – a national professional organization – and a 1978 memorandum from Griswold E. Petty (then acting director of the Bureau of Land Management) set forth the following evaluative parameters to determine the significance of a paleontological resource. A paleontological resource may be significant under the following conditions:

- Provides important information on evolutionary trends; relating living organisms to extinct organisms.
- Provides important information pertaining to biological community development and zoological/botanical biota interaction.
- Demonstration of unusual circumstances in biotic history
- Existence of limited sample size, in danger of depletion or destruction by natural processes, vandalism or commercial exploitation, found in no other geographic location

Under California Environmental Quality Act (CEQA) guidelines a significant effect on paleontological resources can occur when a proposed project will “Directly or indirectly destroy ...a unique paleontological resource.” In addition, all vertebrate fossils are categorized as being of significant scientific value, in keeping with the significance criteria of the SVP (1994).

Paleontological resources are classified as a non-renewable scientific-cultural resource and are protected most notably by the 1906 Federal Antiquities Act and other subsequent federal legislation and policies and California Environmental Quality Act (CEQA) environmental provisions. Significant paleontological resources are defined in this report to include the interpretation outlined by the SVP (1994), wherein vertebrate fossils are considered significant.

The compiled data have been vital in assessing paleontological resource sensitivity issues in relation to proposed project construction activities. The assessment is based both on known paleontological sites within the project area, as well as extrapolated biostratigraphic information derived from rock units in adjacent areas or areas of regional context. Data sources vary from informant, archival and published and unpublished technical reports, to technical information housed in designated museum repositories.

## **METHODS**

The paleontological potential of the ESPR plant site and associated facilities have been assessed in this report.

Geologic units (mappable rock formations) occurring within a one half mile wide radius of the project area and their respective interpreted paleontological sensitivity are shown on Figure L-1 on a 1:24,000 scale (7.5 minute) topographic map base as geologic contacts and specific sensitivity ratings. Known paleontological sites are also shown on the base map where identified. Since these scientific data are considered sensitive, this map graphic should be considered confidential and map distribution should be limited.

Geologic map data covering the Venice Quadrangle 1:24,000 scale, and Long Beach Sheet 1:250,000 scale (CDMG 1970) has been used as the most recently published or

currently available references for paleontological resource sensitivity and stratigraphic analysis.

Specific technical paleontological and detailed lithologic data was derived from both local geoscientist informants at California colleges and universities, and designated museum repositories Los Angeles County Museum (LACM) and the California Academy of Sciences.

Paleontological assessment was developed on the basis of information provided by (1) existing geologic maps, (2) interviews with key personnel at scientific or educational institutions visited or contacted by Mr. Lawler, and (3) paleontological and geological literature pertinent to the formations identified in the review of these sources and field surveys.

A site visit was conducted on November 3, 2000 by David Lawler; professional paleontologist. The project components were subjected to a pedestrian survey where open exposures afforded the potential for observation of undisturbed native substrate. Restricted access precluded observation at the Kramer Staging Area, Federal Express Staging/Parking Area, LAX Imperial Staging Area, and the LAX Pershing Staging/Parking Area. However, cursory observation indicated these areas are either partially or fully paved, graveled, or highly disturbed and have low potential to yield significant surface discoveries. The various potential parking areas are all paved and preclude observation of native surfaces. Current surface conditions for each project element are described below, under Project Description. Areas subject to survey are depicted on Figure L-1.

## **PROJECT DESCRIPTION**

The ESPR area is located in the southwestern portion of Los Angeles County, south of the Los Angeles International Airport and adjacent to the Chevron Marine Terminal facilities. The topography is very flat lying and represents part of a coastal plain that extends south to the San Diego area. The project area is approximately 2.5 miles southwest of the Los Angeles International Airport and west of the San Diego Freeway on the eastern shore of Santa Monica Bay. The power plant site is bordered by Vista Del Mar to the east, 45<sup>th</sup> Street in Manhattan Beach to the south, Santa Monica Bay on the west, and the Chevron Refinery on the north, in Los Angeles County, California.

Surface conditions at various proposed and existing linear facilities, power plant site and potential staging areas are described as follows:

### **Pipeline Routes**

#### **Potable/Reclaimed Water Line – Route 1**

Two new water supply pipelines will be constructed. The proposed 12-inch diameter potable water pipeline will link water from the City of El Segundo at Eucalyptus Drive and El Segundo Boulevard to the El Segundo power plant site. This project component is located underneath city streets and therefore has 0% ground visibility. The proposed 8-inch diameter reclaimed water supply pipeline will link the West Basin Municipal Water

District on El Segundo Boulevard, adjacent to the Chevron Refinery to the El Segundo power plant site. This project component is located underneath city streets and therefore has 0% ground visibility. A maximum excavation depth of six feet for the majority of the underground pipeline route is estimated.

### **Sanitary Discharge Line – Route 2**

The new sanitary pipeline route will discharge sanitary wastes from the existing plant site and proposed combined cycle plant into the municipal sanitary sewer that is operated by the City of Manhattan Beach. Approximately 150 feet of forced flow sewer line will need to be constructed to route sewage discharge from site to an existing manhole at the intersection of Strand and 45<sup>th</sup> St. This pipeline is built underneath sand and rip-rap and has 0% ground visibility. A maximum excavation depth of six feet for the majority of the underground pipeline route is estimated.

### **Aqueous Ammonia Supply Line – Route 3**

A new aqueous ammonia supply pipeline will be constructed from a tie-in point within the Chevron Refinery, then routed to the north perimeter fence line of the power plant site (R3-MP0.0) via the Vista Del Mar overpass and then to the plant site; a total distance of 1.15 miles. This supply line is located underneath asphalt and/or imported gravels and has 0-2% ground visibility. A maximum excavation depth of six feet for the majority of the underground pipeline route is estimated.

## **Areas**

### **Kramer Staging Area – Area 1**

The 11.5 acre Kramer staging area site is located in southern El Segundo and may be utilized for staging and parking. It is delimited by Rosecrans Blvd on the south, El Segundo Blvd on the north, Aviation Blvd. on the east and Sepulveda Blvd on the west. The site surface is paved and is disturbed from prior industrial activity and infrastructure development. The eastern end of the property, which is the area that will be used as a staging area has been completely sealed with an asphalt covering.

### **Federal Express Staging/Parking Area – Area 2**

This 46 acre site is located on the northeast corner of Mariposa Ave. and Nash Streets in the municipality of El Segundo. A perimeter fence encompasses the parcel and the site surface appears disturbed from prior agricultural and/or industrial activity.

### **LAX Pershing Staging/Parking Area – Area 3**

The Pershing site is located on the east side of Pershing Ave, roughly 0.5 miles north of Imperial Highway, within the western runway path of the Los Angeles International Airport. Total acreage and parcel boundaries are still pending. A perimeter fence encompasses the parcel and the entire site surface is paved. Access was not available for field survey of this area.

### **Marina Del Ray Boat Launch Parking Area – Area 4**

The Marina Del Ray Marina boat launch, parking lot site is located on the Admiralty Way north of Fiji Ave. The site is under consideration only for automobile parking use for the plant construction crew. The total area of concern encompasses 442 parking spaces. The site surface is entirely paved and has 0% ground visibility.

#### **Dockweiler State Beach Parking Area – Area 5**

The Dockweiler State Park - parking lot site is located between Vista Del Mar Ave. and the beach. The site is under consideration only for automobile parking use for the plant construction crew. The total area of concern encompasses three parking lots, each containing 300 spaces for a total of 900 parking spaces. The site surface is entirely paved and has 0% ground visibility.

#### **Hyperion Parking Area – Area 6**

The Hyperion Corporation parking lot site is located between Vista Del Mar Ave. and the beach, south of site #6. The site is under consideration only for automobile parking use for the plant construction crew. The total area of concern encompasses 461 parking spaces. The site surface is entirely paved and has 0% ground visibility.

#### **Grand Avenue Parking Area – Area 7**

The Hyperion Corporation parking lot site is located between Vista Del Mar Ave. and the beach, south of site #7. The site is under consideration only for automobile parking use for the plant construction crew. The total area of concern encompasses 115 parking spaces. The site surface is entirely paved and has 0% ground visibility.

#### **Chevron Marine Terminal Staging Area – Area 8**

The Chevron Marine Terminal laydown area is located approximately 1/4 mile north of the ESPR plant site and is bordered by Vista Del Mar Ave. on the east, Santa Monica Bay bike path on the west, and. Portions of the site has been previously leveled by heavy equipment. A spoils pile containing an estimated 10,000 cubic yards of material that was excavated from a nearby sump feature is located near the center of the laydown area. This staging area has 0-5% ground visibility. It is mostly covered in asphalt, with some minor surface exposures.

#### **Power Plant Site – Area 9**

The ESPR plant site is approximately 32.8 acres in size. It is located between Vista Del Mar Ave. and the beach, just north of the 45<sup>th</sup> St. intersection. The entire facility is built environment and has 0% ground visibility. A maximum excavation depth of 25 - 30 feet is estimated for power plant components.

## **GEOLOGIC SETTING**

### **REGIONAL GEOLOGY - SUMMARY**

Surficial sedimentary units of predominantly Pleistocene and Holocene age underlie the entire project area. These sediments include deposition that range from continental, alluvial fan-derived sediments to subaerial floodplain to marine terrace and near-shore

deposits. Lithologies include sand, gravel, silt and clay; all of which are potentially favorable to the preservation of paleontological resources.

Pleistocene age geologic units occur as surficial deposits in the project area. Subsurface sedimentary deposits as old as Miocene age along the portion of the Los Angeles County coastal plain area. These sedimentary units that have been described and mapped previously by Dall (1898), Arnold (1903), Kiew (1923), Tiejie (1926), Woodring et. al. (1936, 1946), Brandy and Emery (1954), Kundert (1955), Poland and Piper (1956), Yerkes et. al. (1965), Allen (1974), Cleveland (1976) and Reiter (1984).

There are a successive series of Pleistocene marine terraces that have been subsequently dissected by the major west flowing river drainages. The lateral extent of these units has been determined from petroleum exploration and development by geological subsurface mapping (Wright 1987).

The Cenozoic rock formations range in facies type from conglomerates to sandstones to unconsolidated siltstone and clays, all of which are either fossiliferous or potentially fossiliferous.

Gradual, long-term erosion has removed parts of the Tertiary and Quaternary rock formations so that these rocks and their contained fossils are now at or near the surface throughout most of the project area. These formations or parts of the formations now exist at or near the surface as rock outcrops with varying width across the project area terrain, but are obscured in most areas by industrial development and surficial sediments. Visual detection of fossils is possible in those areas where natural erosion or man-made excavations during road, pipeline, or building site excavation or grading operations have removed artificial fill material. The majority of the project area is reportedly overlain by imported fill material or unconsolidated sediments of Holocene age.

## **PALEONTOLOGY- PROJECT SETTING**

### **SIGNIFICANCE OF PALEONTOLOGICAL RESOURCES**

The southwestern Los Angeles County region contains a diverse record of geologic and biologic history, which spans more than 30 million years, dating from the Miocene period. Under the combined influences of regional tectonic event, such as the Los Angeles Basin deposition of sedimentary sequences and fluctuating worldwide sea level changes, fossils of marine and terrestrial organisms have accumulated to produce a significant record of prehistoric life.

The area of greatest paleontological interest within the Los Angeles County coastal region are the well known discoveries of Pleistocene age fossil vertebrate faunas in both the Palos Verdes Sand and the San Pedro Formation. Identification and scientific description of both of these diverse fossil vertebrate assemblages provide the best known record of late Pleistocene faunas in California. Preservation of near shore marine as well as continental sedimentary deposits provided favorable conditions for preserving vertebrate fossil remains in these geologic units.

As noted above, paleontological resources are classified as a non-renewable scientific-cultural resource and are protected most notably by the 1906 Federal Antiquities Act and

other subsequent federal legislation and policies and State of California (CEQA) environmental provisions. Significant paleontological resources are defined in this report to include the interpretation outlined by the Society of Vertebrate Paleontology in 1994, wherein vertebrate fossils are considered significant.

The California Energy Commission paleontological resource significance guidelines (1978) can be summarized according to the following criteria:

- Provides important information on evolutionary trends; relating living organisms to extinct organisms.
- Provides important information pertaining to biological community development and zoological/botanical biota interaction.
- Demonstration of unusual circumstances in biotic history.
- Existence of a limited sample size, in danger of depletion or destruction by natural processes, vandalism or commercial exploitation, found in no other geographic locations.

## **CRITERIA FOR DETERMINATION OF POTENTIAL**

Three categories of paleontological potential are used in this report according to California Energy Commission standards: Rating categories are to be considered interpretive and subject to change as new information is obtained. High potential, Moderate potential, and low potential ratings are defined as follows:

### **High Potential Rating**

Rock units with a high potential for significant paleontological resources are known to have yielded vertebrate fossils within the project area or region. This does not necessarily imply that vertebrate fossils will always be recovered from a high-potential rated rock unit, but only that there are recorded occurrences within the unit. Additional factors that are considered pertain to inferred depositional environment and lithology.

### **Moderate Potential Rating**

Rock units possessing some degree of potential such as favorable depositional environment for resource preservation or lithologically similar rock units in the region have yielded vertebrate fossils. All moderate potential rated rock units are recommended for field survey and construction monitoring.

### **Low Potential Rating**

Rock units containing lithologies that do not commonly preserve significant fossil resources (i.e. coarse conglomerates, welded or ignimbrite volcanic ash deposits). Igneous rocks, such as the granodiorite outcrops in the northern part of the project area, are precluded from preservation of paleontological resources, due to their genesis within a magmatic environment.

## PALEONTOLOGICAL RESOURCES

### CENOZOIC ROCK UNITS

#### **San Pedro Formation (Qsp) and Palos Verdes Sands (Qpv)**

The San Pedro Formation represents the oldest known Cenozoic sedimentary unit of Pleistocene age in the Los Angeles Coastal Region. This formation was originally described by Dall (1898) for outcrops at Harbor Hill, in the vicinity of nearby San Pedro Harbor and then applied to extensive beds of unconsolidated sand containing abundant molluscan shells of Pleistocene age outcropping as far south as San Diego and as far north as Santa Monica.

The formation name was redescribed by Arnold (1903) and Kew (1923) in greater detail for beds in the vicinity of San Pedro and redefined it by dividing it into two members, separated by an unconformity.

Tieje (1926) formally defined the two stratigraphic members and assigned the name *Palos Verdes Sands* to the upper member of typical San Pedro Formation and restricted *San Pedro or San Pedro Sand* to the lower member of Arnold's San Pedro Formation.

It is important to note that in this report the stratigraphic nomenclature and redefinition of both the San Pedro Formation and Palos Verdes Sand of Tieje (1926) is followed, since this is the present approved definition of the U. S. Geological Survey.

Tieje also describes the Palos Verde Sand as consisting of massive and loosely cemented marine sands varying from coarse sand to gravelly quartzose sands with pebbles. Maximum thickness in the Palos Verdes Hills section is 50 feet. Fossil sand dollars of the taxon *Echinarachnius exoentricus* are highly abundant and found in association with the Palos Verdes invertebrate fauna, consisting of at least 70 species.

The San Pedro Formation as consisting of poorly consolidated coarse sands and gravels, sandy silts, clays and silty clays. Over 75% of the formation is composed of sands and pebble to cobble gravels.

The La Brea Tar Pit fossil mammal assemblage of upper Pleistocene age is well known world-wide and is derived from the Palos Verdes Sand (upper part of Arnold's San Pedro Formation) in the northwestern portion of the Los Angeles Basin. This assemblage includes a wide variety of carnivores (canids and felids), small to large ungulate herbivores (cervids, antilocaprids, camelids, equids, suuids), edentates (sloths), and a myriad of small mammals including lagomorphs (rabbits), rodents, insectivores and a

variety of birds and lower vertebrates (frogs, lizards and snakes). Many of the fossil specimens represent the best preserved specimens of particular taxa found to date.

The geology of the La Brea deposit has been recently described by Wright (1987) and Woodward and Marcus (1973). These workers have subdivided the Palos Verdes Sand into three members (units A, B and C) that document the gradual transition from deep water marine conditions to non-marine alluvial plain deposition in this area of the Los Angeles Basin. None of the scientific literature reviewed to date has recognized these subdivisions of the Palos Verdes Sand in the project area.

Nearly 75 years of fossil vertebrate collecting in the Los Angeles Harbor region has produced one of the most extensive databases for understanding the fossil vertebrate record of the southern California coastal plain. Only the Newport Beach area of Orange County as yielded as much information on the Pleistocene coastal vertebrates of North America (Langenwalter 1975). The first record of a fossil vertebrate from this region was a fossil mammoth tooth from the San Pedro area, as reported by Blake (1855).

Mammalian assemblages collected from both the San Pedro Sands and Palos Verdes Sands in the vicinity of the project area within the San Pedro townsite contains fossil remains of most of the above mentioned Rancho La Brea terrestrial vertebrate groups, as described by Hay (1927) and Miller (1971). Also included at these sites are aquatic mammalian taxa including otter, whale, and dolphin as well as shark and teleost fish taxa, and birds.

A well-represented marine and shore birds faunas from both the San Pedro Sands and Palos Verdes have been described in detail by Miller (1912, 1914, 1930) and Miller and DeMay (1942); with the most complete avian faunal record derived from the Palos Verdes Sand.

The bony fish (or osteichthyan fish) record from these formations has been extensively described by Fitch (1967, 1969, 1970). The 1967 paper compares the San Pedro Sand fish fauna with other modern faunas of this area and concludes (with some exceptions) that they are similar in composition, but that ocean temperatures were cooler than presently.

A composite invertebrate fauna has been collected from both rock units includes a diverse mollusc (pelecypod and gastropod) and echinoderm fauna with many taxa identified to the family and genera taxonomic level well represented. San Pedro Formation invertebrate faunas have been described by Bramlette et. al. (1946) and more recently by Kennedy (1975).

Artificial fill and cement materials at the ESPR site as well as at the proposed laydown areas are expected have either removed or obscured potentially fossiliferous exposures of *Qal* in some areas. Occurrence of these stratigraphic units at shallow depths is quite likely, given the known depths at which vertebrate fossils have been recovered in areas adjacent to the project site.

Construction phase paleontological field monitoring is recommended for areas where surface and subsurface disturbance is anticipated.

### **Quaternary Alluvial Deposits (Qal)**

Stream terrace deposits of Pleistocene age occur locally include unconsolidated sand and

gravel derived from adjacent strata. This unit has yielded fragmentary remains of both large mammalian taxa including horse, bison, mammoth, as well as the remains of microvertebrate taxa including rabbits, rodents and fish. (See LACM collection data - Appendix A). The rock-unit lithologies would be favorable to the preservation of fossil resources such as large vertebrate and/or microvertebrate remains.

While Quaternary alluvium deposits of Pleistocene age occur locally within the project area, usage of the Qal geologic symbol designation on available geologic maps of the El Segundo region - Los Angeles Coastal Plain region is highly variable. It includes numerous geologic units, such as stratigraphic equivalents of the Palos Verde Sand (*Qpv*), San Pedro Fm. (*Qsp*), Lakewood Fm. (*Qlw*), and Quaternary Stream deposits (*Qt*). It also include more recently recognized hydrogeologic subdivisions such as the Old Dune Sand, Manhattan Beach Clay, Gage Sand, El Segundo Clay, and the Silverado Sand. Paleontological resources are known to vary widely in stratigraphic distribution within this generalized geologic unit.

While no paleontological resources are known from the project site, numerous sites occur within a five-mile radius of it. A fossil proboscidian (elephant family) (bone) was found at site designated as LACM 6896, located in the middle of the Los Angeles International Airport. In the vicinity of West Century Blvd. and Ballanca Ave, a fossil baby mammoth jaw was recovered at the LACM 7332 site. The LACM 3789 site, located on Bellanca Ave. south of Manchester Ave., produced fossil mammoth, rodent, and fish material. Fossil mammal bones at site LACM 1180 and LACM 4942 near the intersections of Airport Blvd and Manchester Ave, produced fossil horse, mammoth, bison, and rabbit remains at depths of 13-16 feet.

These paleontological localities occurring within a five-mile radius contain scientifically important paleontological resources that represent a wide variety of terrestrial and aquatic vertebrate taxa (fossil horse, bison, rabbit, and rodent terrestrial mammalian taxa and fossil marine fish (flounder) taxa (See LACM confidential fossil locality and specimen data). The sandstone, silt, and clay lithologies of the known Pleistocene age geologic units are favorable for exceptional preservation of vertebrate, microvertebrate, and invertebrate fossil resources.

With one exception, no other projects with a designated paleontological component are known to have conducted previous field or literature surveys or produced sensitivity maps or reports within or adjacent to the ESPR site. A paleontological literature review was conducted in support of an EIR prepared for the Los Angeles International Airport Property (Raschke and Stadum 1995).

Construction phase paleontological field monitoring is advised for areas that are slated for surface and subsurface disturbance.

## **HOLOCENE AND POST-HOLOCENE AGE SEDIMENTS**

Sediments of probable Holocene or post-Holocene age that form the thin, surficial cover are considered of limited paleontological interest and thus considered inconsequential. These are represented by the Holocene Dune Sand unit (*Qsr*), which is considered a subset of the (*Qal*) geological unit.

## **RESULTS - PALEONTOLOGY SENSITIVITY RATINGS**

The sensitivity ratings are shown on both Table L-1 and L-2 are arranged from the youngest to oldest rock unit. Analysis of pre-construction field survey data and museum record and specimen collections data combined with the distribution of known fossil localities in the region in combination with geologic maps, permitted classification of paleontological resource sensitivity areas, coincident with known geologic formation outcrop patterns. This methodology provides a coarse-scale resolution of areas likely to contain fossils in particular types of sedimentary facies.

It should be noted that sensitivity ratings change as paleontological surveys are undertaken in the future and add to the existing database. Identification of significant vertebrate or microvertebrate sites and materials of scientific significance can elevate a particular rock unit's paleontological resource rating.

## **PALEONTOLOGICAL SENSITIVITY RATINGS**

Table L-2 summarizes the paleontological sensitivity ratings for all proposed El Segundo Power Redevelopment Project facilities and associated infrastructure.

### **Pipeline Routes**

#### **Potable/Reclaimed Water Line – Route 1**

The water supply pipeline routes traverse a formation that is assigned a high sensitivity rating, where pipeline excavations are not in artificial fill material. A maximum excavation depth of 6 feet for the majority of the underground pipeline route is estimated.

#### **Sanitary Discharge Line – Route 2**

The reclaimed water supply pipeline route traverses a formation that is assigned a high sensitivity rating, where pipeline excavations are not in artificial fill material. A maximum excavation depth of 6 feet for the majority of the underground pipeline route is estimated.

#### **Aqueous Ammonia Supply Line – Route 3**

A proposed pipeline ROW area within the western portion of the Chevron El Segundo Refinery was subjected to a limited field survey on November 3, 2000. Much of the ROW area was covered with a thin veneer of asphalt, for erosion control purposes. The underlying sedimentary unit appeared to represent modern, stabilized sand dunes as well as ancient sand dune deposits. The formation traversed by the proposed aqueous ammonia pipeline route is assigned a high sensitivity rating where pipeline excavations penetrate modern sand dune deposits and artificial fill material. A maximum excavation depth of 6 feet for the majority of the underground pipeline route is estimated.

### **Areas**

### **Kramer Staging Area – Area 1**

The site surface is paved and is disturbed from prior industrial activity and infrastructure development. The eastern end of the property has been completely sealed with an asphalt covering. The surface in this area has low sensitivity due to surface disturbance and/or artificial fill, however the formation below the fill has high paleontological sensitivity.

### **Federal Express Staging/Parking Area – Area 2**

Observations from the perimeter indicate the site surface appears highly disturbed from prior agricultural and/or industrial activity as well as leveled for pending industrial development. The surface in this area has low sensitivity due to surface disturbance and/or artificial fill, however the formation below the fill has high paleontological sensitivity.

### **LAX Pershing Staging/Parking Area – Area 3**

The formation underlying the Pershing Staging/Parking area is assigned a high sensitivity rating. The site is located on the east side of Pershing Ave, roughly 0.5 miles north of Imperial Highway, within the western runway path of the Los Angeles International Airport. Total acreage and parcel boundaries are still pending. A perimeter fence encompasses the parcel and the entire site surface is paved.

### **Marina Del Ray Boat Launch Parking Area – Area 4**

The formation underlying the Marina Del Ray Marina boat launch parking area is assigned a high sensitivity rating. It is located on the Admiralty Way north of Fiji Ave. The site is under consideration only for automobile parking use for the plant construction crew. The total area of concern encompasses 442 parking spaces. The site surface is entirely paved and has 0% ground visibility.

### **Dockweiler State Beach Parking Area – Area 5**

The formation underlying the Dockweiler State Park - parking area is assigned a high sensitivity rating. The site is located between Vista Del Mar Ave. and the beach. The site is under consideration only for automobile parking use for the plant construction crew. The total area of concern encompasses three parking lots, each containing 300 spaces for a total of 900 parking spaces. The site surface is entirely paved and has 0% ground visibility.

### **Hyperion Parking Area – Area 6**

The formation underlying the Hyperion Corporation parking area is assigned a high sensitivity rating. The site is located between Vista Del Mar Ave. and the beach. The site is under consideration only for automobile parking use for the plant construction crew. The total area of concern encompasses 461 parking spaces. The site surface is entirely paved and has 0% ground visibility.

### **Grand Avenue Parking Area – Area 7**

The formation underlying the Grand Avenue parking area is assigned a high sensitivity rating. It is located between Vista Del Mar Ave. and the beach. The site is under consideration only for automobile parking use for the plant construction crew. The total

area of concern encompasses 115 parking spaces. The site surface is entirely paved and has 0% ground visibility.

### **Chevron Marine Terminal Staging Area – Area 8**

The formation underlying the Chevron Marine Terminal laydown area is assigned a high sensitivity rating. It is located approximately 1/4 mile north of the ESPR plant site and is bordered by Vista Del Mar Ave. on the east, Santa Monica Bay bike path on the west, and. Portions of the site has been previously leveled by heavy equipment. A spoils pile containing an estimated 10,000 cubic yards of material that was excavated from a nearby sump feature is located near the center of the laydown area. This staging area has 0-5% ground visibility. It is mostly covered in asphalt, with some minor surface exposures.

### **Power Plant Site – Area 9**

The majority of the power plant area is paved and contains a highly developed industrial infrastructure. The area was subjected to a limited field survey on November 3, 2000. However, the sedimentary exposures forming the steep slopes on the eastern border of the plant site adjacent to Vista Del Mar Ave are assigned a high sensitivity rating, since they represent deep cuts in the underlying Quaternary sedimentary deposits (*Qal*). Elsewhere within the plant site, high sensitivity rating is assigned for areas or pipeline linears slated for excavations beneath asphalt and artificial fill material.

## **MANAGEMENT CONSIDERATIONS - PALEONTOLOGICAL RESOURCES**

### **MITIGATION MEASURES**

**The following general recommendations are provided:**

- All areas containing geologic units designated with a potentially sensitive rating, should be monitored by a professional paleontologist when initial ground disturbance occurs, to insure that subsurface paleontological resources are adequately assessed as to their significance. If deemed significant, these should be salvaged according to professional paleontological standards (e.g. Society of Vertebrate Paleontology standards).
- Mitigation salvage efforts to conserve scientifically significant specimens should be implemented in area of project facility construction or surface disturbance, particularly when *Qal* units are encountered, (including the stratigraphic equivalents of the Palo Verde Sand or San Pedro Fm.), which possess a high paleontological sensitivity rating.
- A workforce education program will also apply to crews responsible for the construction, operation and maintenance phases of the project. Key points in the program will include:
  1. procedures to follow if resources are discovered during any construction-related activities,

2. a description of known resources in the area,
3. clarification that these resources are protected by law and that there is a strict prohibition against collection or disturbance of any paleontological resource, and
4. protocols set forth for the notification of appropriate project and lead agency officials in the event of a discovery of a previously unidentified paleontological resource locus.

**Construction Phase Mitigation - On-Site Field Monitoring - activities should include:**

- 1) Intermittent field monitoring of sites slated for subsurface disturbance (for example, pipeline right-of-way spoils and power plant facilities).
- 2) Representative collections of significant paleontological resources should be assembled of all identifiable paleontological resources.
- 3) Removal bulk matrix samples to extract microvertebrate fossil remains by screen washing process methods and subsequent fossil concentrate sorting, identification and curation.
- 4) Laboratory preparation of significant non-microvertebrate paleontological specimens and preliminary identification and curation of these specimens.
- 5) Curation of fossil specimens into state-designated scientific repository. Locality data is regarded as confidential (for protection of the resources); details will be provided to those responsible for reviewing museum archival and curatorial data.
- 6) Pre-construction meetings with key construction personnel to provide brief discussions pertaining to paleontological resource significance, visual identification, and fossil discovery notification procedures.

**Pipeline Routes**

**Potable/Reclaimed Water Line – Route 1**

Due to the high sensitivity rating of the formation traversed by these pipelines there is a potential for significant paleontological resources to occur below surface. It is possible that previously unidentified paleontological resources present on the pipeline route could be disturbed or destroyed during construction as the result of excavation activity. Monitoring of excavation activities by a paleontologist is recommended.

**Sanitary Discharge Line – Route 2**

Due to the high sensitivity rating of the formation traversed by this pipeline there is a potential for significant paleontological resources to occur below surface. It is possible that previously unidentified paleontological resources present on the pipeline route could

be disturbed or destroyed during construction as the result of excavation activity. Monitoring of excavation activities by a paleontologist is recommended.

### **Aqueous Ammonia Supply Line – Route 3**

Due to the high sensitivity rating of the formation traversed by this pipeline there is a potential for significant paleontological resources to occur below surface. It is possible that previously unidentified paleontological resources present on the pipeline route could be disturbed or destroyed during construction as the result of excavation activity. Monitoring of excavation activities by a paleontologist is recommended.

### **5.8.3.3 Areas**

#### **Kramer Staging Area – Area 1**

Due to the high sensitivity rating of the formation underlying this staging area, it is possible for significant paleontological resources to occur below surface. If any groundbreaking activities are proposed for this staging and parking area, monitoring of excavation activities by a paleontologist is recommended.

#### **Federal Express Staging/Parking Area – Area 2**

Due to the high sensitivity rating of the formation underlying this staging/parking area, it is possible for significant paleontological resources to occur below surface. If any groundbreaking activities are proposed for this staging and parking area, monitoring of excavation activities by a paleontologist is recommended.

#### **LAX Pershing Staging/Parking Area – Area 3**

Due to the high sensitivity rating of the formation underlying this staging/parking area, it is possible for significant paleontological resources to occur below surface. If any groundbreaking activities are proposed for this staging and parking area, monitoring of excavation activities by a paleontologist is recommended.

#### **Marina Del Ray Boat Launch Parking Area - Area 4**

Due to the high sensitivity rating of the formation underlying this staging area, it is possible for significant paleontological resources to occur below surface. If any groundbreaking activities are proposed for this staging and parking area, monitoring of excavation activities by a paleontologist is recommended.

#### **Dockweiler State Beach Parking Area – Area 5**

Due to the high sensitivity rating of the formation underlying this staging area, it is possible for significant paleontological resources to occur below surface. If any groundbreaking activities are proposed for this staging and parking area, monitoring of excavation activities by a paleontologist is recommended.

#### **Hyperion Parking Area – Area 6**

Due to the high sensitivity rating of the formation underlying this staging area, it is possible for significant paleontological resources to occur below surface. If any

groundbreaking activities are proposed for this staging and parking area, monitoring of excavation activities by a paleontologist is recommended.

#### **Grand Avenue Parking Area – Area 7**

Due to the high sensitivity rating of the formation underlying this staging area, it is possible for significant paleontological resources to occur below surface. If any groundbreaking activities are proposed for this staging and parking area, monitoring of excavation activities by a paleontologist is recommended.

#### **Chevron Marine Terminal Staging Area – Area 8**

Due to the high sensitivity rating of the formation underlying this staging area, there is a high potential for significant paleontological resources to occur below surface. It is possible that previously unidentified paleontological resources present could be disturbed or destroyed during construction as the result of excavation activity. If any groundbreaking activities are proposed for this staging and parking area, monitoring of excavation activities by a paleontologist is recommended.

#### **Power Plant Site – Area 9**

Due to the high sensitivity rating of the formation underlying this site there is a high potential for significant paleontological resources to occur below surface. It is possible that previously unidentified paleontological resources present on the plant site could be disturbed or destroyed during construction as the result of excavation activity. Monitoring of excavation activities by a paleontologist is recommended.

### **DATA SOURCES**

Data for the following descriptions of paleontological resources within the project area were compiled from published records of previous geologic and paleontological investigations; with these references included in the attached bibliography. Also included were additional published descriptions of the geology (including geologic maps), unpublished paleontological research papers, museum records, and interviews conducted with individuals having first-hand knowledge of resources within the project area.

Sources consulted on the general geology of the area included regional geologic maps compiled by the California Division of Mines and Geology. More specific geologic information in the form of 1:24,000 and 1:62,500 scale USGS and CDMG geologic maps available for the project area.

Fossil locality records were reviewed and fossil specimens inspected (when possible) at the following institutions, which provided most of the data concerning distribution of known fossil resources:

#### 1) Los Angeles Museum of Natural History (LACM)

Dr. Samuel McLeod, Vertebrate Paleontologist, was helpful in undertaking a paleontological resources record data search on October 31, 2000. A letter report detailing the results of the data search was sent to the author the same day.

#### 2) California Academy of Sciences, (CAS)

Ms. Jean DeMouthe, Mineralogical Collections Curator, was very helpful in providing information on paleontological collection and record access in the Santa Monica Bay region.

## REFERENCES

- Allen, D. 1974. Oil Field Structure and Subsidence Bowl, Long Beach, California, *In* Guidebook to Selected Features of the Palos Verdes Peninsula and Long Beach, California, SOUTH COAST GEOLOGICAL SOCIETY, pp. 36-41, 4 figs.
- Arnold, R., 1903. The Paleontology and Stratigraphy of the Marine Pliocene and Pleistocene of San Pedro Bay, California, CALIF. ACADEMY OF SCIENCE MEM., Vol. 3.
- Blake, W. P. , 1855. Remains of the Mammoth and Mastodon in California, AMER. JOUR. SCI. ARTS, Series 2, Vol. 19, No. 55, 133p.
- Brandy, O. L. and Emery, K. L., 1954. Southwestern Part of the Los Angeles Basin, Geologic Guide No. 4 *In* Geology of Southern California, CALIF. DIV. MINES GEOL., BULL. 170, 14 p.
- California Energy Commission (CEC). 1992. Instructions to the California Energy Commission Staff for the Review of and Information Requirements for an Application for Certification. Energy Facilities Siting and Environmental Protection Division, Sacramento.
- California Energy Commission (CEC). 1997. *Rules of Practice and Procedure & Power Plant Site Certification Regulations*. Sacramento.
- Cleveland, G. B. , 1976. Geologic Map of the Northeast Part of the Palos Verdes Hills, Los Angeles County, California, CALIF. DIV. MINES GEOL., MAP SHEET 27, Plate 1, 1:24,000 scale.
- Dall, W. H. , 1898. San Pedro Formation. U. S. GEOLOGICAL SURVEY, 18th Annual Report, Part 2.
- Fitch, J. E. , 1967. The Marine Fish Fauna, Based Primarily on Otoliths of a Lower Pleistocene Deposit at San Pedro, California. LOS ANGELES CO. MUS. NAT HIST. CONTRIB. SCI. 128, 23 p.

- ibid. 1970. Fish Remains, Mostly Otoliths and Teeth, from the Palos Verdes Sand (Late Pleistocene) of California. LOS ANGELES CO. MUS. NAT HIST. CONTRIB. SCI. 199, 41 p.
- Hay, O. P. , 1927. The Pleistocene of the Western Region of North America and Its Vertebrated Animals. CARNEGIE INSTITUTE - WASHINGTON. PUBLIC. 322B, 346 p.
- Jennings, C. W., 1962. Geologic Atlas of California – El Segundo Sheet, CALIF. DIV. MINES GEOL., MAP SHEET 7, 1:250,000 scale (reprinted 1992)
- Kennedy, G. L., 1975. Paleontology - Part 9 *In* San Pedro Bay - Marine Studies, California (Soule, D.F. and Oquri, M. - editors). Hancock Foundation Publications, pp. 1-35.
- Kew, W. S, San Pedro Formation AMER. ASSOC. PETROL GEOL. , Vol. 7, p. 420.
- Kundert, C. J., 1955. Geologic Map of California - El Segundo Sheet, CALIF. DIV. MINES GEOL., MAP SHEET, 1:250,000 scale.
- Langenwalter II, P. E., 1975. The Fossil Vertebrates of the Los Angeles - El Segundo Harbors Region, *In* San Pedro Bay - Marine Studies, California (Soule, D.F. and Oquri, M. - editors). Hancock Foundation Publications, pp. 119-119.
- Miller, L. H., 1912. Contributions of Avian Paleontology from the Pacific Coast of North America. UNIV. CALIF. PUBL. BULL. DEPT. GEOL. SCI., Vol. 7, No. 5, pp. 61-115.
- Miller, L. H. and DeMay, I, 1942. The Fossil Birds of California: An Avifauna and Bibliography with Annotations. UNIV. CALIF. PUBL. ZOOL. Vol. 47, No. 4, pp. 47-142.
- Miller, W. E. 1971. Pleistocene Vertebrates of the Los Angeles Basin and Vicinity (Exclusive of Rancho La Brea). LOS ANGELES CO. MUS. NAT HIST. SCI. BULL. Vol. 10, No. 4, pp. 47-142.
- Poland, J. F. and Piper, A.M., 1956. Ground-Water Geology of the Coastal Zone, Long Beach - Santa Ana Area, California, U. S. GEOLOGICAL SURVEY, WATER SUPPLY PAPER 1109, Pl.3, (1:31,000), 162 p.
- Raschke, R and C. Stadum. 1995. Paleontological and Archaeological Resources Reconnaissance of the Los Angeles International Airport Property, Los Angeles, California. RMW Paleo Associates. Mission Viejo, California.
- Reiter, M. 1984. The Palos Verdes Peninsula: A Geologic Guide and More, KENDALL HUNT PUBLISHING COMPANY, 61p.

- Tieje, A. J. , 1926. San Pedro Formation, AMER. ASSOC. PETROL GEOL. , Vol. 10, p. 502-512.
- Society of Vertebrate Paleontology. 1994 Newsletter of the Society of Vertebrate Paleontology: 152.
- Woodring, W. P., Bramlette, M. N., and Kleinpell, R. M., 1936. Miocene Stratigraphy and Paleontology of the Palos Verdes Hills, California, AAPG, BULL., Vol. 20, No. 2, pp. 125-149.
- Woodward, G. D. and Marcus, L. F. , 1973. Rancho La Brea Fossil Deposits, A Reevaluation from Stratigraphic and Geologic Evidence, JOUR. PALEO., Vol. 47, No.1, pp.54-69.
- Wright, T. 1987a. Geologic Summary of the Los Angeles Basin, *In* Petroleum Geology of Coastal Southern California, (Wright, T. and Heck, R. - editors) AAPG - Pacific Section, Los Angeles, Guidebook No. 60, pp. 21-31.
- Wright, T. 1987b. Geologic Setting of the La Brea Tar Pits, *In* Petroleum Geology of Coastal Southern California, (Wright, T. and Heck, R. - editors) AAPG - Pacific Section, Los Angeles, Guidebook No. 60, pp. 87-91.
- Yerkes R. F., McCulloh, T. H. , Schoellhamer, J. E., and Vedder, J. G. (1965). Geology of the Los Angeles Basin - An Introduction, U. S. GEOLOGICAL SURVEY, PROFESSIONAL PAPER 420-A, p.57.

**TABLE L-1**

**EL SEGUNDO POWER REDEVELOPMENT PROJECT  
GEOLOGIC UNITS WITHIN PROJECT AREA**

<b>SYMBOL</b>	<b>ROCK UNIT</b>	<b>AGE</b>	<b>SENSITIVITY RATING</b>
(Qal) 1	<b>Alluvium</b>	Pleistocene	(Mod-High)-(Known vertebrate fauna)

---

1 While Quaternary alluvium deposits of Pleistocene age occur locally within the project area, usage of the Qal geologic symbol designation on available geologic maps covering the El Segundo-Santa Monica Bay-Palos Verdes Peninsula region is highly variable. Geologic units ranging from the San Pedro Fm., Palos Verdes Sand, Quaternary Stream deposits, and recently designated hydrogeologic units such as the Old Dune Sand, Manhattan Beach Clay, the Gage Sand, the El Segundo Clay, and the Silverado Sand may be lumped under this designation, particularly where regional geologic data is scarce, due to urban development. (see Jennings (1962) and Cleveland (1976) for comparison). Paleontological resources can potentially vary greatly in stratigraphic distribution within this grouping of geologic units.

**TABLE L-2**

**EL SEGUNDO POWER REDEVELOPMENT PROJECT  
PALEONTOLOGICAL SENSITIVITY & GEOLOGIC UNITS**

**Pipeline Routes**

**Potable/Reclaimed Water Line – Route 1**

LENGTH	ROCK FORMATION	SENSITIVITY RATING
Pending	<i>Qal</i>	High

**Sanitary Discharge Line – Route 2**

LENGTH	ROCK FORMATION	SENSITIVITY RATING
150 Ft.	<i>Qal</i>	High

**Aqueous Ammonia Supply Line – Route 3**

LENGTH	ROCK FORMATION	SENSITIVITY RATING
0.7 Mile	<i>Qal</i>	High

**Areas**

**Kramer Staging Area –Area 1**

AREA	ROCK FORMATION	SENSITIVITY RATING
11.5 Acres	<i>Qal</i>	High

**TABLE L-2 (Continued)**

**EL SEGUNDO POWER REDEVELOPMENT PROJECT  
PALEONTOLOGICAL SENSITIVITY & GEOLOGIC UNITS (CONTINUED)**

**Federal Express Staging/Parking Area – Area 2**

AREA	ROCK FORMATION	SENSITIVITY RATING
46 Acres	<i>Qal</i>	High

**LAX Pershing Staging/Parking Area – Area 3**

AREA	ROCK FORMATION	SENSITIVITY RATING
TBD	<i>Qal</i>	High

**Marina Del Rey Boat Launch Parking Area – Area 4**

AREA	ROCK FORMATION	SENSITIVITY RATING
442 Spaces	<i>Qal</i>	High

**Dockweiler State Beach Parking Area – Area 5**

AREA	ROCK FORMATION	SENSITIVITY RATING
900 Spaces	<i>Qal</i>	High

**Hyperion Parking Area – Area 6**

AREA	ROCK FORMATION	SENSITIVITY RATING
461 Spaces	<i>Qal</i>	High

**TABLE L-2 (Continued)**

**EL SEGUNDO POWER REDEVELOPMENT PROJECT  
PALEONTOLOGICAL SENSITIVITY & GEOLOGIC UNITS (CONTINUED)**

**Grand Avenue Parking Area – Area 7**

AREA	ROCK FORMATION	SENSITIVITY RATING
115 Spaces	<i>Qal</i>	High

**Chevron Marine Terminal Staging Area – Area 8**

AREA	ROCK FORMATION	SENSITIVITY RATING
115 Spaces	<i>Qal</i>	High

**Power Plant Site – Area 9**

AREA	ROCK FORMATION	SENSITIVITY RATING
32.8 Acres	<i>Qal</i>	High

Attachments L (A) 1 and Figure L-1 are confidential and are provided to the California Energy Commission under separate cover.

