

ATTACHMENT G

PALEONTOLOGICAL RESOURCES MATERIALS

- **PALEONTOLOGICAL RESOURCES
(SECTION 5.8 FROM 99-AFC-7)**
- **SUMMARY OF CONSTRUCTION COMPLIANCE
RELATED PALEONTOLOGICAL RESOURCES INFORMATION**

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(SECTION 5.8 FROM 99-AFC-7)

5.8 PALEONTOLOGICAL RESOURCES

This paleontological sensitivity analysis of the Pastoria Energy Facility (PEF) project was performed using available published scientific literature and unpublished archival records and data. This assessment includes the corridor areas of potential disturbance along specified transmission line, water, gas, and wastewater pipeline routes as well as the designated power plant site and construction laydown area. 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. Paleontological Assessment Ratings (low, medium, and high) have been assigned to the project based on identified resources within the sedimentary units ranging in age from Miocene to undifferentiated Quaternary units of Pleistocene geologic age. Fossil vertebrate resources are considered rare in respect to the identified geological formations and geologic periods.

From a regional perspective, occurrences of paleontological resources in the Miocene age Vaqueros, Santa Margarita and Chanac Formations and undifferentiated Quaternary units are significant. Resources in the Tejon Hills District represent an important record of vertebrate taxa from the Miocene to Pleistocene geological periods in the southern California region.

Certain paleontological evidence – including locational information – is considered confidential and should be made available only on a need-to-know basis. A complete description of the sensitive locational information and related paleontological data can be found in the confidential PEF Technical Report, Appendix K. Mr. David Lawler, professional paleontologist, has undertaken the Paleontological Resources Sensitivity Analysis of the PEF area based on (1) museum repository data and paleontological collection material, (2) a published and unpublished scientific literature survey to provide relevant environmental overview data, and (3) a paleontological field survey.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 1989 by the Society for Vertebrate Paleontology (SVP) – a national professional organization – and a 1994 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:

- If it provides important information on the evolutionary trends among organisms, relating inhabitants of the earth to extinct organisms
- If it provides important information regarding development of biological communities or interaction between botanical and zoological biota

- If it is in short supply and in danger of being depleted or destroyed by the elements, vandalism, or commercial exploitation, and is not found in other geographic localities.

Under 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 Society of Vertebrate Paleontology in 1994, wherein vertebrate fossils are considered significant.

The California Energy Commission paleontological resource significance guidelines cited in California Energy Commission Guidelines (CEC, 1992) and “Rules of Practice and Procedure & Power Plant Site Certification Regulations (CEC, February 1997), 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
- Demonstrates unusual circumstances in biotic history
- Exists in limited sample size, in danger of depletion or destruction by natural processes, vandalism or commercial exploitation, found in no other geographic locations.

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, published and unpublished technical reports, to technical information housed in designated museum repositories.

5.8.1 Affected Environment

5.8.1.1 Overview

The southern San Joaquin Valley topography west of the Tejon Hills District is nearly flat lying, while the alluvial fan surface from the crest of the Tejon Hills and adjacent Tehachapi Mountains to the Buttonwillow District represents a series of broad, inclined ridges that

gradually descend in elevation westerly towards the Highway 5 and 99 corridors. These broad, inclined tablelands and ridges are dissected by a series of incised stream valleys ranging from Pastoria Creek in the south to Tejon and Comanche Creek in the north. The Tejon Hills and adjoining Tehachapi Mountains to the east and south represents the most prominent, erosional resistant landform. The project area also includes portions of the Tejon Oil Field. The various proposed and existing linear power facilities and power plant site areas and substations are illustrated on Map 5.8-1.

The south central Kern County - southwestern San Joaquin Valley region contains a diverse record of geologic and biologic history, which spans more than 35 million years, dating from the Miocene period. This region has been subjected to the combined influences of regional tectonic events ranging from creation of the San Joaquin Valley Basin to uplift of the Tehachapi Range and adjoining Sierra Nevada and Transverse Ranges. The semi-continuous deposition of marine and terrestrial sedimentary sequences has preserved organic remains (fossils) of vertebrate, invertebrate and botanical organisms and thus has produced a significant record of prehistoric life.

Much of the vertebrate paleontological interest within the project area vicinity stems from the well known discoveries of Miocene age fossil vertebrate faunas derived from interfingering marine and nonmarine deposits of the Santa Margarita and Chanac Formations in the Tejon Hills District of Kern County. Identification and scientific description of the Miocene age fossil mammal assemblages has been undertaken by scientists including Merriam (1915 and 1916), Stock (1935), Drescher (1941), and Stirton (1939). Fine-grained marine and continental sedimentary facies provided favorable conditions for preserving vertebrate fossils in these geologic units.

5.8.1.2 Paleontological Literature and Locality Records Review

Specific technical paleontological and detailed lithologic data were derived from both local geoscientist informants at California colleges and universities, and designated museum repositories including University of California Museum of Paleontology (UCMP), Los Angeles County Museum (LACM), and the California Academy of Sciences (CAS). Paleontological specimens were also inspected at these institutions, whenever possible. Geologic map data covering the Pastoria Creek, Tejon Hills, and Arvin 7.5 minute quadrangles was useful in paleontological resource sensitivity assessment and stratigraphic analysis ranges and derived from maps published by Drescher (1941), Hoots (1930), and Bartow and Dibblee (1981).

Data for the following descriptions of paleontological resources within the project area were compiled from published records of previous geologic and paleontological investigations. These references are included in the bibliography. Also included are 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, 1:62,500, and 1:250,000 scale USGS and CDMG geologic maps available for the project area. The 1:24,000 scale USGS OFR 81-297 geologic map (Bartow and Dibblee, 1981) and the 1:62,500 scale Tejon Hills-Southern Border of the San Joaquin Valley Region prepared by Hoots (1930) served as the standard for geologic map data for this study.

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) University of California Museum of Paleontology (UCMP)

Ms. Patricia Holroyd - Vertebrate Collections Manager and Ms. Karen Whitmore - Invertebrate Collections Manager, were helpful in providing computerized paleontological data and collections access on August 24 and September 24, 1999.

2) California Academy of Sciences (CAS)

Ms. Jean DeMouthe, Mineralogical Collections Curator, and Ms. Annette Fortin, Curatorial Assistant were extremely helpful in providing data on paleontological collections during September, 1999.

3) Los Angeles Museum of Natural History (LACM)

Dr. Samuel McLeod, Vertebrate Collections Manager, was helpful in providing access to paleontological collections and records as well as providing computerized paleontological data on August 6, 1999

4) Mr. George Saucedo, Geologist, California Division of Mines and Geology – San Francisco Office was helpful in providing information on published and ongoing geological research in the Tejon Hills region of Kern County, on September 23, 1999

5.8.1.3 Methods

The paleontological potential of the PEF and associated transmission line, gas, and water pipeline rights of way (ROW), and access roads within one mile on either side of each proposed and/or existing facilities has been assessed in this report. The actual project Area of Potential Effects (APE) was considered to be within the footprint of any proposed excavation activities and construction rights of way (ROW). Paleontological resources are lithologically dependent; that is, deposition and preservation of paleontological resources is tied to the

lithologic unit in which they occur. If the rock types representing a depositional environment conducive to deposition and preservation of fossils are not favorable, fossils will not be present. The potential for paleontological resources to be present is described as the 'paleontological sensitivity' of the lithologic unit.

Sensitivity Assessment

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 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.

Field surveys were conducted by project paleontologist, Mr. David Lawler, during the period from July 27 to August 8, 1999. The pre-survey paleontological assessment consisted of an evaluation of the paleontological potential within one mile on either side of all proposed block and linear facilities (plant site and construction laydown area, and routes 1 – 5). The field survey investigation focused on discerning whether sensitive fossil materials were evident in rock outcrops derived from the Vaqueros (*Tvq*), Chanac Formation (*Tch*), Santa Margarita Formation (*Tsm*), Quaternary tar seep (*Qts*) and Quaternary alluvium (*Qal*) geologic units.

Field surveys were conducted at all project components. The conditions and coverage of the project area are given in Table 5.8.1. However, it should be noted that most of the project area is heavily vegetated with grasslands and shrubs and thus, few visible rock outcrops or tar seep areas were readily available for inspection. The project paleontologist made a series of east-west systematic pedestrian transects of the plant site and construction laydown area, inspecting rock exposures such as stream and arroyo banks, backhoe and bulldozer trench cuts and rodent burrow tailings for evidence of fossiliferous materials. Each linear facility was subject to a pedestrian transect on each side of the centerline of the facility to a distance of 100 feet on each side. Where concrete, or elements of the built environment (e.g., irrigation water canals) precluded full coverage the survey corridor was narrowed to exposed surfaces.

5.8.1.4 Findings

The sensitivity ratings for paleontological resources, arranged by rock unit, within the project area are indicated in Table 5.8-2 and illustrated on Map 5.8-1. The Vaqueros Formation (*Tvq*) Santa Margarita Formation (*Tsm*), Chanac Formation (*Tch*), and Quaternary alluvium (*Qal*) are all geological units assigned high sensitivity ratings. Analysis of previous paleontological field survey data, museum records, specimen collections, distribution of known fossil localities in the region in combination with known geologic formation outcrop patterns, permitted classification of the paleontological resource sensitivity areas. This methodology provides a coarse-scale resolution of areas likely to contain fossils in particular types of sedimentary faces within the project area.

It should be noted that sensitivity ratings may change as future paleontological resource surveys are undertaken. Identification of significant vertebrate or microvertebrate sites and materials of scientific significance will elevate a particular rock unit's paleontological resource rating.

5.8.1.4.1 Overview of Lithologic Units. Surficial sedimentary units of predominantly Miocene and Pleistocene to Recent are exposed within the entire project area. These sediments include deposition that range from marine and estuarine to continental alluvial, fluvial, subaerial floodplain, terrace, and fan-derived sediments. Lithologies include sand, gravel, silt and clay and asphalt; all of which are potentially favorable to the preservation of paleontological resources.

Rock outcrops of Cretaceous to Pleistocene and Holocene age occur as surficial and subsurface deposits flanking the San Andreas Fault zone on the west and the Temblor Range on the east, forming the west margin of the San Joaquin Valley. These deformed and faulted sequences of sedimentary units have been previously described and mapped by Buwalda (1916), Merriam (1915), Pack (1920), Hoots (1930), White (1964), and Bartow and Dibblee (1981). These authors have collectively described the geomorphic development of the successive series of anticlinal and synclinal structures forming the various topographic features corresponding to the respective oil and gas fields in the region. Hoots's (1930)

published geologic map of the southern border of the San Joaquin Valley is considered to be the most definitive geologic base map for the project area. The aerial extent of the Quaternary alluvial (*Qal*) units may be accurately determined from this geological map.

The Vaqueros Formation contains marine sediments that are characterized by massive, light-gray sandstones and conglomerates that contain little or no bedding. These beds are overlain by the Santa Margarita Formation rock unit, which varies in facies type from grayish-white marine sediments in the northern part of the project area to the greenish nonmarine gravels to the southeast. The Chanac Formation rock units also vary in facies type from conglomerates to angular coarse sandstones and claystone, all of which are either fossiliferous or potentially fossiliferous. The Quaternary age alluvial units contain lithologies that range from sandstone to unconsolidated siltstone, and clay. Potentially fossiliferous natural tar-seep or asphalt deposits can include the full suite of lithologies, depending upon local geological structure and faulting.

Gradual, long-term erosion and previous construction activity related to development of the oil fields has removed various parts of the Santa Margarita Formation, Chanac Formation, and overlying Quaternary rock units, resulting in the contained fossils being exposed or at or near the surface throughout most of the project area. However, much of the exposed areal extent of these rock units are now presently obscured by soil, vegetation, or thin, surficial deposits of Recent age. Thus, 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 this cover.

The potential paleontological sensitivity of a particular site within the project has been determined from a matrix of data including the distribution of known nearby fossil localities, and available geological mapping. The Vaqueros Formation (*Tvq*), Santa Margarita Formation (*Tsm*), Chanac Formation (*Tch*), Quaternary alluvium (*Qal*), and potential Quaternary tar-seep deposits (*Qts*) are geological units which have been assigned high sensitivity ratings.

Cenozoic Rock Units

Vaqueros Formation (Tvq). The Vaqueros Formation represents the oldest known Cenozoic age sedimentary units outcropping in the project area. This Oligocene to Miocene age marine formation in the Tejon Hills region was extensively described by Hoots (1930) along the southern border of the San Joaquin Valley as well as the Tejon Hills - Comanche Point area in relation to regional occurrences of oil and gas. The Vaqueros Formation contains marine sediments that are characterized by massive, light gray sandstones and conglomerates that contain little or no bedding. The beds are reported by Hoots to attain a thickness of 600-700 feet east of Comanche Point, where the Tertiary rocks have been folded into a prominent anticline. The middle, brown shale member and the two upper sandstone members are exposed on Comanche Point. The contact with the overlying Santa Margarita Formation is

not exposed, but is presumed to be represented by an unconformity. The interpreted regional depositional environment represents a combination of marine, continental, and transitional paleoenvironmental conditions. The Tejon Hills portion of the Vaqueros is regarded as the stratigraphic near-shore equivalent of the Maricopa Shale.

While no fossil vertebrates remains are known from the Vaqueros Formation within the project area, this geological unit has yielded fossil terrestrial vertebrate assemblage west of the project area and Interstate Highway 5 in the vicinity of Teyuca Creek. Deslauriers (1965) and Brattstrom (1961) have reported on the occurrences of fossil tortoises, age equivalent "Teyuca beds" and the Bopesta Formation, respectively. Stock (1932) and White (1988) have also described fossil mammals taxa and lagomorphs (rabbit group) from "Teyuca beds", respectively. Stock emphasized the importance of the mammalian fauna as representing a transitional period between faunas of Oligocene and Miocene age. Hoots (1930) considers the Teyuca beds to represent the lower Vaqueros Formation.

A high probability exists for discovery of either isolated, larger, fossil mammal bones (vertebra, jaws, teeth) or smaller (microvertebrate remains of rodents, reptiles, amphibians, etc) within the project area, where favorable preservation conditions exist.

Santa Margarita Formation (Tsm). The Santa Margarita Formation represents the next youngest Cenozoic age sedimentary units in the project area. This Miocene age marine formation in the Tejon Hills region was described by Hoots (1930) in relation to oil and gas occurrences in the Tejon Oil Field in the southern San Joaquin Valley. Hoots characterized these formations as consisting of 100 - 1,000 feet of dominantly grayish-white marine sands and silts which are best exposed in the Comanche Point area. Greenish nonmarine gravels to the southeast represent the stratigraphic equivalent of the white marine sand lithology. The interpreted depositional environment represents marine, terrestrial, and transitional paleoenvironmental conditions. Farther north, deposits of this formation in the Santa Cruz region of northern California have yielded a diverse fossil terrestrial and marine vertebrate assemblage. Marine vertebrate range in diversity from large bony fish and chondrichthyan rays to marine mammals (dolphin, otter, whale). Terrestrial mammals are represented by horse and camel taxa. Some unidentified avian material has also been collected. Reptiles are represented by remains of a tortoise (*Geochelone*).

An assemblage of fossil mammalian taxa have been recovered from sites within or adjacent to the project area by field parties of the University of California Museum of Paleontology (UCMP), and the California Institute of Technology (CIT), during the 1910 – 1942 period. Drescher (1941) studied the fossil equid (horse) material from the Tejon Hills region and divided the taxa into two distinct faunas, which originally were derived from the Santa Margarita Formation as well as the overlying Chanac Formation. The specific equid taxa assigned to the Santa Margarita Formation are listed in Figure K-2 of the Technical Report and are compared with the Caliente Formation equid taxa (Kelly, 1995).

A diverse invertebrate fossil fauna from the Tejon Hills section of the Santa Margarita Formation has been studied and briefly described by B. L. Clark within the project area (see Merriam, 1916).

Deslauriers (1965) and Brattstrom (1961) have reported on the occurrences of fossil tortoises from the regionally adjacent, age-equivalent Teyuca beds and Bopesta Formations, respectively. Stock (1920 and 1932), Schultz and Falkenbach (1950), and White (1988) have also described fossil mammals taxa and lagomorphs (rabbit group) from the age equivalent Teyuca beds, respectively.

A high probability exists for discovery of either isolated bones of large mammals (camel, horse, carnivores) or microvertebrate (rodents, reptiles, amphibians, etc) remains within the project area, where favorable preservation conditions exist.

Chanac Formation (Tch). The Chanac Formation represents the next stratigraphically older Cenozoic age sedimentary unit outcropping in the project area. This Miocene age continental and marine formation in the Tejon Hills region was described by Hoots (1930) and Smith (1964) in relation to oil and gas occurrences in the Tejon Oil Field in the southern San Joaquin Valley. Hoots characterized this formation as consisting of 400 - 6000 feet of poorly sorted and poorly bedded coarse angular sandstone, claystone, conglomerate and rhyolitic fragments. The formation is best exposed in the northern part of the project area between Comanche Creek and Tejon Creek (see Barton and Dibblee, 1981 USGS geologic map). The interpreted depositional environment represents marine, terrestrial, and transitional (estuarine) paleoenvironmental conditions. This geologic unit is correlated with Kern River Formation deposits in northern Kern County as well as the Ricardo Formation in the western Mojave Desert.

Merriam (1915) reports that R. W. Pack, a USGS geologist, originally discovered the fossil vertebrate material in the northern Tejon Hills District in 1911. This material was identified and subsequently described by Merriam, professor at the Paleontology Department, University of California at Berkeley. In his 1919 paper he compared the Tejon fauna with similar fossil mammalian faunas in the nearby Mojave desert region.

More specifically, Merriam (1915 and 1916) described the remains of vertebrate taxa recovered from the Tejon Hills District as including equid (horse), antilocaprid (antelope), peccary (pig), rhinocerotid (rhino), proboscidian (elephant), camelid (camel) and pisces (shark). Drescher (1941) has noted that mammalian taxa are representing an indeterminate carnivore has also been recovered from a CIT locality in the Comanche Point area.

A high probability exists for discovery of either isolated bones of large mammals (camel, horse, carnivores) or microvertebrate (rodents, reptiles, amphibians, etc) remains within the project area, where favorable preservation conditions exist.

Quaternary Alluvium - Undifferentiated (Qal). Geologic contacts and paleontological sensitivity data displayed on Map K-1 of the Technical Report reflect that the Quaternary age undifferentiated alluvium unit is designated as *Qal*. This convention was adopted for the purpose of maintaining geologic map unit continuity on the base map, since previous geologists and paleontologists have often interchanged stratigraphic nomenclature in the project area region. Geologic units ranging from Quaternary age stream, terrace, fluvial, and alluvial fan and floodplain facies have been grouped under this designation, particularly where geologic data have been scarce. This unit is estimated to cover 70-75% of the project area.

Isolated bones of several large Pleistocene mammals (horse, camel, proboscidian) have been recovered from this unit outside the project area in the Bakersfield region of Kern County. While no known *Qts* paleontological site exists within one-quarter mile of the project area, a high probability exists for discovery of either isolated bones of large Pleistocene mammals or microvertebrate (rodents, reptiles, amphibians, etc) remains within the project area, where favorable preservation conditions exist. For example, Reynolds (1990) recovered numerous microvertebrate taxa during paleontological mitigation program operations on the Sunset-Midway Cogeneration Project in the McKittrick area, Kern County in similar age and sediment lithologies. The taxa recovered mainly represented microvertebrates, such as rodents, reptiles, and birds.

The best record of Pleistocene faunas has been derived from three main regional areas in California; namely the San Francisco Bay, Los-Angeles -southern California region, and the southern San Joaquin Valley.

Pleistocene age fossil vertebrate sites in the San Francisco Bay Region of California that contain large mammalian taxa have been extensively described in the scientific literature (Stirton 1939,1951, Savage 1951, and Jefferson 1991a, b). The Blancan-Irvingtonian age vertebrate sites in the Hercules-Rodeo districts have yielded significant microvertebrate material. This diverse microvertebrate fauna has been extensively studied most recently by Wolf (1971, 1973, 1975) and consists of numerous 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.

In comparison, the La Brea Tar Pit fossil mammal assemblage of upper Pleistocene age in the Los Angeles Basin 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), birds, rodents and lower vertebrates that have been exhaustively reported and described in the scientific literature.

The southern California - Los Angeles Basin - Newport Beach area has yielded considerable information on the California Pleistocene coastal vertebrate faunas (Langenwalter, 1975; Miller, 1971). Sites exclusive of Rancho La Brea also include aquatic vertebrates such as otter, whale, and dolphin, as well as shark and teleost fish taxa.

Potential Quaternary Tar Seep - Undifferentiated (Qts). Potential unmapped geologic units of tar seep deposits of Quaternary age are designated as *Qts*. The paleontological sensitivity for this unit has been assigned a high potential sensitivity. The Quaternary/Tertiary age convention was adopted for the purpose of maintaining geologic map unit continuity on the base map, while noting that the fossil resources contained in the deposits may range in age from late Pliocene age to late Pleistocene (Rancholabrean land-mammal age) to extend into the Holocene. Asphalt hydrocarbon compounds that have formed in fissures in sandstone, silt, and clay lithologies are favorable for exceptional preservation of vertebrate, microvertebrate, invertebrate, and paleobotanical fossil resources.

It should be noted that over 140 years of scientific fossil vertebrate collecting has occurred in the tar seep deposits of the McKittrick and Maricopa Districts of Kern County. The net result of these extensive field collecting expeditions has been to produce an extensive paleontological database that has served to provide a better understanding of the California Pleistocene fossil faunal and floral record and specifically the southern San Joaquin Valley - southern California region.

The McKittrick tar seep deposits have yielded tremendously diverse late Pleistocene (Rancholabrean Land Mammal Age) fauna and flora, since their scientific discovery at the turn of the century.

The most extensive treatment of all McKittrick faunal and floral taxa tar seep deposits was published by Schultz (1938), who extensively compares the fauna, flora, and paleoecology of McKittrick with the other known tar seep fossil deposits at Rancho La Brea and Carpinteria. In addition, he provides a complete listing of modern mammalian taxa for comparison with fossil mammal taxa.

Mammalian faunas of the McKittrick tar seep deposits have served as a scientific reference standard for the Pleistocene. Hay (1927), Hibbard (1957), and more recently, Jefferson (1991a,b) have included the McKittrick faunas in their compendiums on California and North American Pleistocene faunas.

The Tejon Hills Oil Field industrial facilities and infrastructure features are expected to have either removed or obscured surface exposures of potential *Qts* deposits in most areas. Occurrences of additional potential *Qts* deposits at or near the surface are quite probable, given the fact that weak to strong structural folding of the entire Pleistocene - Miocene geologic section within and immediately adjacent to the project area has been documented by structural geological as well as oil and gas investigations (Hoots, 1930).

Holocene and Post-Holocene Age Sediments. Sediments of probable Holocene or post-Holocene age that form the thin, surficial cover (exclusive of *Qts* deposits) are considered to be of limited paleontological interest and thus considered inconsequential.

5.8.1.4.2 Plant Site and Construction Laydown Area. The plant site and construction laydown areas are roughly 30 and 25 acres in size, respectively. Both are located at the southern end of the project area, entirely within the *Qal* geologic unit. These areas also encompass flood prevention berms. No fossil resources were observed during the field survey.

5.8.1.4.3 Transmission Line Route.

Route 1 – Proposed 230 kV Transmission Line. A new 230 kilovolt (kV) switchyard will be constructed at the power plant site and a new 1.38-mile long 230 kV overhead electric transmission line will be built to interconnect the project with Southern California Edison's (SCE) electrical transmission system. Connection to the system will occur at the existing Pastoria substation located just south and west of the power plant.

The Route 1 segment is within the *Qal* geologic unit. The area to the south of the plant site along the proposed transmission corridor route represents a broad, slightly inclined plain that gradually descends in elevation easterly to the north. No fossil resources were observed during the field survey

5.8.1.4.4 Offsite Pipelines.

Route 2 – Proposed Water Supply Pipeline. This 0.05 mile long water supply line will originate at the west edge of the plant site and connect to the plant site. The Route 2 segment is entirely within the *Qal* geologic unit.

Route 3 – Proposed Fuel Gas Pipeline. This proposed 11.65-mile long natural gas pipeline will originate at the northeastern corner of the plant site, then proceed in a northeasterly, northerly, and then northwesterly direction to a point near its intersection with Caparell Creek, then proceed westerly on Sebastian, to its connection point with an existing gas pipeline at the intersections of Sebastian Road and Rancho Road. The proposed underground fuel gas line will be built entirely within the *Qal* geological unit. No fossil resources were identified on this route during the July-August 1999 field survey.

Route 3A – Alternate Fuel Gas Pipeline. This 13.8-mile long alternate natural gas pipeline route originates at the northeasterly corner of the plant site, then proceeds north and northwesterly to just west of the intersections of David and El Rancho Roads Road, which represents the tie-in point to an existing 42-inch fuel gas line. No fossil resources were identified on this route during the July-August 1999 field survey.

Route 3B - Alternate Fuel Gas Pipeline. The 18.2 -mile long alternate natural gas pipeline route proceeds northeasterly from MP 11.9 of Route 3A, then proceeds southeasterly to its tie-in point to an existing 42-inch gas pipeline just east of the intersections of Little Sycamore Canyon Creek and an irrigation canal.

While no identifiable *in-situ* fossil resources were found during the July-August 1999 field survey, a fossil limb bone fragment of an unidentifiable fossil mammal was recovered from the intersection of this proposed pipeline route and Comanche Creek. This paleontological site is designated as field number DALPASTCOMANCK8799 and the locality name of “Comanche Creek 1”. This site is located within the proposed pipeline ROW and occurred as a “float” occurrence within the main Comanche Creek arroyo. This alluvial wash contains large amounts of sand, which along with the fragmentary specimen, are undoubtedly derived from the adjacent Miocene age Chanac Formation outcrops.

Previously identified paleontological localities include LACM/CIT localities 104, 302, and 305 and are described by Drescher (1941) in his technical paper on the equid (horse family) faunas of the Tejon Hills. Locality 302 is geographically the closest to the “Comanche Creek 1” site, located within one-quarter mile of the pipeline ROW. The latter two localities are within one mile of the pipeline ROW corridor. All sites occur within the Miocene age Chanac Formation (*Tch*), a sedimentary unit which is exposed along areas adjacent to the northern portions of Route 3B. Identifiable fossil mammalian taxa recovered from these sites are listed in Figure K-2 of the Technical Report.

Route 4 - Wastewater Discharge Pipeline. This 1.7-mile long wastewater discharge pipeline route proceeds from the northwest corner of the power plant site to an injection well area within the Tejon Oil Field. The entire line crosses through the *Qal*, geologic unit. No fossil resources were identified on this route during the July-August 1999 field survey.

5.8.1.4.5 Route 5 – Access Road. The proposed 0.85-mile long access road connects the power plant site to the existing paved Edmonston Pump Station Road. The entire access road is within the *Qal* geologic unit. No fossil resources were identified on this route during the July-August 1999 field survey.

5.8.2 Environmental Consequences

Table 5.8-2 summarizes the paleontological sensitivity ratings for all proposed Pastoria Energy Facility project components. This information is also graphically depicted on Map 5.8-1.

5.8.2.1 Plant Site and Construction Laydown Area

The power plant site and associated construction laydown area are underlain by *Qal* and are assigned a High sensitivity rating.

5.8.2.2 Transmission Line

Route 1 - Proposed 230 kV Transmission Line. The proposed 230 kV power line route is entirely within the *Qal* geological unit (High sensitivity). *Qal* sediments have the potential to produce identifiable vertebrate and microvertebrate faunal material. However, the area has been subject to considerable past disturbance associated with agricultural, road, and water aqueduct activities. Limited ground disturbance from the proposed project will occur at tower pad locations.

5.8.2.3 Offsite Pipelines

Route 2 - Proposed Water Supply Pipeline. The proposed 0.05 mile water supply pipeline route is entirely within *Qal* (High sensitivity). The area has been subject to considerable past disturbance associated with agricultural activities. A limited probability of discovery of resources during construction is assessed. *Qal* sediments have the potential to produce identifiable vertebrate and microvertebrate faunal material

Route 3 - Proposed Fuel Gas Pipeline. The proposed fuel gas supply pipeline route traverses *Qal* sedimentary units (High sensitivity). However, the area has been subject to considerable prior disturbances associated with aggregate mining operations activities between MP 0.0 and MP 0.75. In addition, disturbances related to prior construction of an underground water pipeline exist within the same corridor area between MP 1.0 and MP 4.0. Nonetheless, numerous areas containing undisturbed *Tvq* sedimentary units exist within the corridor between MP 0.6 and MP 3.3. Thus, proposed construction activity associated with this gas pipeline route may yield additional paleontological resources.

Route 3A - Alternate Fuel Gas Pipeline. The natural gas supply pipeline route also traverses *Qal* sedimentary units (High sensitivity), with several areas containing undisturbed *Qts* sedimentary units exist within the corridor. Proposed construction activity associated with this gas pipeline may yield additional paleontological resources.

Route 3B - Alternate Fuel Gas Pipeline. It should be noted that while this alternative natural gas supply pipeline route traverses *Qal* between MP 16.5 and 16.85, sedimentary units of the Santa Margarita (*Tsm*), Vaqueros Formations (*Tvq*), and Chanac Formations (*Tch*) exist under these surficial *Qal* deposits.

While no identifiable *in-situ* fossil resources were found during the July-August 1999 field survey, a fossil limb bone fragment of an unidentifiable fossil mammal was recovered from the intersection of this proposed pipeline route and Comanche Creek. This paleontological site is designated as field number DALPASTCOMANCK8799 and the locality name of "Comanche Creek 1". This site is located within the proposed pipeline ROW and occurred as a "float" occurrence within the main Comanche Creek arroyo. This alluvial wash contains

large amounts of sand, which along with the fragmentary specimen, are undoubtedly derived from the adjacent Miocene age Chanac Formation outcrops.

Previously identified paleontological localities include LACM/CIT localities 104, 302, and 305 and are described by Drescher (1941) in his technical paper on the equid (horse family) faunas of the Tejon Hills.. Locality 302 is geographically the closest to the “Comanche Creek 1” site, located within one-quarter mile of the pipeline ROW. The latter two localities are within one mile of the pipeline ROW corridor. All sites occur within the Miocene age Chanac Formation (*Tch*), a sedimentary unit which is exposed along areas adjacent to the northern portions of Route 3B. Identifiable fossil mammalian taxa recovered from these sites are listed in the Technical Report.

Additionally, fragmentary microvertebrate fossils were discovered during the August, 1999 survey on the surface of rip-rap boulders, which presumably were transported by heavy equipment to the west bank of Tejon Creek for erosion control purposes. Unfortunately, these boulders are out of stratigraphic context and no locality information is available; thus, their scientific value is compromised. It is possible that the boulders are derived from the Miocene age Santa Margarita/Vaqueros Formations that outcrop within the project area, since they contain marine invertebrate fossils in a sandstone matrix that closely resembles lithologies described for these sedimentary units.

Route 4 - Wastewater Discharge Pipeline. The wastewater discharge pipeline is entirely within *Qal* sediments. No fossil resources were identified on this route during the July-August 1999 field survey. The area has been subject to considerable past disturbance associated with agricultural activities.

Proposed construction activity associated with this pipeline may yield paleontological resources below the level of agricultural disturbance

5.8.2.4 Route 5 - Access Road

The entire proposed access road route is within the *Qal* geologic unit. No fossil resources were identified on this route during the July-August 1999 field survey. The area has been subject to considerable past disturbance associated with agricultural activities. Proposed construction activity associated with this roadway may yield paleontological resources below the level of previous agricultural disturbance.

5.8.3 Mitigation Measures

The following general recommendations are provided:

- Those areas containing geologic units designated with a potentially moderate or high sensitivity 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. Monitoring activity should be targeted on areas most likely to encounter in situ rock units. 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 areas of project facility construction or surface disturbance.

Field monitoring activities noted below should also include:

- Pre-construction meetings with key construction personnel to provide brief discussions pertaining to paleontological resource significance, visual identification, and discovery notification procedures
- Assembly of representative collections of significant paleontological resources
- If deemed warranted, removal of bulk matrix samples to extract microvertebrate fossil remains by screenwashing process methods and subsequent fossil concentrate sorting, identification and curation
- Laboratory preparation of significant non-microvertebrate paleontological specimens and preliminary identification and curation of these specimens
- Curation of fossil specimens into state-designated scientific repository. Locality data are regarded as confidential (for protection of the resources); details will be provided to those responsible for reviewing museum archival and curatorial data.

PA-1. Reduction of Impact Through Design Modification: If a paleontological locality is discovered in a direct impact area, an attempt will be made to modify facility design or placement to avoid the impact. Modifications could include placement of fill to replace grading or minor resiting of a structure or road.

PA-2. Protection During Construction Through Access Restrictions, Construction Restrictions: If a significant paleontological locality is discovered near a direct impact area, the resource will be protected during the construction period through temporary or permanent measures, which may include construction period covenants against vehicular traffic and excavation within the locality, and/or permanent or temporary fencing. Measures of this type will be incorporated in the mitigation monitoring plan described below, for review by the CEC prior to construction.

PA-3. Construction Crew Education: Prior to the beginning of construction, a paleontologist will meet with construction crew to provide them with information on the appearance of fossils, research values, and regulatory responsibilities. The crew will also be briefed on procedures to follow in the event that a potentially significant

fossil locality or fossil find is uncovered during construction. The contractor briefing will be videotaped for education of new personnel, as applicable.

PA-4. Emergency Discovery Procedures: In the event that fossils are uncovered during construction, and a paleontologist is not onsite, work in the vicinity will halt and a paleontologist will be called. The paleontologist will examine the find and assess its significance in accordance with the resource significance criteria discussed above (Section 5.8.1.2). If the resource is determined to be significant, unavoidable impacts will be mitigated through data recovery or other means, in consultation with the CEC. Mitigation measures could include data recovery, or “set-aside” and long-term protection for another similar resource outside the impact zone.

PA-5. Paleontological Monitoring, Construction Period Sampling, and Data Recovery: A paleontologist will monitor excavation activity by periodic examination of excavation spoils along selected areas of certain project components in areas that have been confirmed through archival research to have high or moderate sensitivity and where fossil-bearing deposits are likely to be encountered. If tower-footing bores or other excavations bring paleontological materials to the surface, a paleontologist will be provided the opportunity to collect samples for data recovery and analysis. In the event that a major significant find is uncovered, emergency discovery procedures described above will also apply.

5.8.3.1 Plant Site and Construction Laydown Area

PA-6. Given the high sensitive rating of the *Qal* unit, it is recommended that a paleontological monitor intermittently spot-check excavation spoils for significant paleontological materials during site grading and excavation activity.

5.8.3.2 Transmission Line Route

Route 1

PA-7. Route 1 is within *Qal* (High sensitivity). Due to the degree of prior surface disturbance in this area, it is recommended that a paleontological monitor intermittently inspect excavation spoils piles at transmission tower locations.

5.8.3.3 Offsite Pipelines

Route 2

PA-8. The water supply line route is within *Qal* (High sensitivity). Due to the degree of prior surface disturbance, intermittent monitoring is recommended for construction activity and spot-checking of excavation spoils along the remainder of the pipeline.

Route 3

PA-9. The proposed fuel gas supply pipeline route traverses *Qal* sedimentary units (High sensitivity), with several areas containing undisturbed *Tvq* sedimentary units existing within the corridor between MP 0.6 and MP 3.4. Periodic monitoring is recommended during construction activity for this area and spot-checking of excavation spoils along the remainder of the pipeline to MP 11.65. Due to the degree of prior agricultural surface disturbance in the corridor area between MP 8.4 and MP 11.3, it is recommended that a paleontological monitor periodically inspect excavation spoils piles.

Route 3A

PA-10. This alternative fuel gas supply pipeline route also traverses *Qal* sedimentary units (High sensitivity), containing several areas of undisturbed *Qal* sedimentary units within the corridor between MP 9.0 and MP 12.0. Intermittent monitoring is recommended during construction activity for this area and spot-checking of excavation spoils elsewhere.

Route 3B

PA-11. Alternative fuel gas supply pipeline route 3B traverses *Qal* between MP 12.0 and MP 16.2. Sedimentary units of the Santa Margarita (*Tsm*), Vaqueros (*Tvq*) and Chanac Formations (*Tch*) exist under surficial *Qal* deposits along the corridor route between MP 16.2 and MP 17.0.

While no identifiable *in-situ* fossil resources were found during the July-August 1999 field survey, it is probable that “float” occurrences of fossil vertebrate may be recovered in surficial *Qal* deposits derived from the adjacent Miocene age Chanac Formation and Santa Margarita Formation outcrops along MP 12.0 to MP 18.5.

Previously identified paleontological localities include LACM/CIT localities 104, 302, and 305 and are described by Drescher (1941) in his technical paper on the equid (horse family) faunas of the Tejon Hills.. Locality 302 is geographically the closest to the “Comanche Creek 1” site, located by David Lawler within one-quarter mile of the pipeline ROW. The latter two localities are within one mile of the pipeline ROW corridor. Continuous monitoring is recommended for construction activity within 0.25 mile of these sites and spot-checking of excavation spoils along the remainder of the pipeline.

Route 4

PA-12. The wastewater discharge line route is entirely within *Qal* sediments (High sensitivity). Periodic monitoring is recommended for spot-checking of excavation spoils for the possible presence of resources.

5.8.3.4 Route 5

PA-13. The access road route is located within *Qal* (High sensitivity). Periodic monitoring is recommended for spot-checking of road grader and excavation spoils.

With implementation of the mitigation methods listed above, no significant unavoidable adverse impacts to paleontological resources would be expected to occur. If, during construction, previously undiscovered resources are exposed, the mitigation measures described above will address any unforeseen impacts.

5.8.4 LORS Compliance

The literature search and field assessments already completed and the subsequent mitigation measures described above will minimize potential impacts of the project upon paleontological resources. These measures will result in project conformance with the regulations and the intent of the applicable LORS, which are also detailed in Section 7.0 of this AFC.

5.8.5 References

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TABLE 5.8-1

SURVEY COVERAGE BY PROJECT COMPONENT AND FIELD CONDITIONS

Project Component	Milepost	Field Conditions	Comments
Route 1 (from Plant Site to Pastoria Substation)	0.0 to 1.38	0-10 percent ground visibility; grass coverage throughout most of the survey corridor	Pedestrian survey transects 20 –30 m wide
Plant Site and Construction Laydown Area	55 +/- acres	0-10 percent ground visibility; grass coverage throughout most of the survey corridor	Pedestrian survey transects 20 –30 m wide
Route 2	0.0 to 0.85	0-15 percent ground visibility; grass coverage throughout most of the survey corridor, southern section had some areas with topsoil exposure	Pedestrian survey transects 20 –30 m wide
Route 4	0.0 to 1.7	0-15 percent ground visibility; grass coverage throughout most of the survey corridor, scattered sections had some topsoil exposure, creek bed area had good visibility.	Pedestrian survey transects 20 –30 m wide
Route 5	0.0 to 0.85	0-10 percent ground visibility; grass coverage throughout most of the survey corridor	Pedestrian survey transects 20 –30 m wide
Fuel Gas Pipeline: Route 3	R3 0.0 to 5.2	0-15 percent ground visibility; grass coverage throughout most of the survey corridor, scattered sections had some topsoil exposure, creek bed areas had better visibility, some areas immediately adjacent to the existing dirt road had ground exposure.	Pedestrian survey transects 20 –30 m wide
Fuel Gas Pipeline: Route 3	R3 5.2 to 6.4	0-15 percent ground visibility; soil exposure on the shoulder of the paved road, between pistachio trees in the orchards, and in limited fallow areas.	Pedestrian survey transects 20 –30 m wide
Fuel Gas Pipeline: Route 3	R3 6.4 to 8.4	0-15 percent ground visibility; grass and tarweed coverage throughout most of the survey corridor, scattered sections had topsoil exposure, drainage areas had better visibility, some areas immediately adjacent to the existing dirt road had ground exposure.	Pedestrian survey transects 20 –30 m wide
Fuel Gas Pipeline: Route 3	R3 8.4 to 11.2	Sebastian Road segment had soil exposure on the shoulder of the paved road, between orchard/ vineyard rows, and in fallow fields. Some sections of vineyard areas not surveyed due to fresh pesticide warnings and crop density.	Pedestrian survey transects 20 –30 m wide

TABLE 5.8-1**(Continued)**

Project Component	Milepost	Field Conditions	Comments
Fuel Gas Pipeline: Route 3	R3 11.2 to 11.65	95-100% visibility on north segment, from Sebastian Road to Fuel Gas Tie-in Point. Area is mostly sandy alluvium and fallow/recently plowed fields.	Pedestrian survey transects 20 –30 m wide
Fuel Gas Pipeline: Route 3A (Route 3, as discussed above excluding Sebastian Road, with 'A' extension to David Road)	R3A 8.27 to 12.0	0-10 percent ground visibility; grass coverage throughout most of the survey corridor, some areas immediately adjacent to the existing dirt road had ground exposure.	Pedestrian survey transects 20 –30 m wide
Fuel Gas Pipeline: Route 3A	R3A 12.0 to 13.8	David Road segment had soil exposures on the shoulder of the paved road, between orchard/ vineyard rows, and in fallow fields. Good visibility on unpaved sections of David Road. Survey constrained by active agriculture in limited areas adjacent to David Road.	Pedestrian survey transects 20 –30 m wide
Fuel Gas Pipeline: Route 3B (excluding Sebastian Road and David Road segments)	R3B 12.0 to 15.0	0-15 % ground visibility in most areas due to grass surface cover, 0-40 % in the northern areas of Tejon Creek floodplain and areas adjacent to the existing dirt road.	Pedestrian survey transects 20 –30 m wide
Fuel Gas Pipeline: Route 3B	R3B 15.0 to 18.5	0-35 % ground visibility due to recent grass fire, presence of sandy alluvium, dispersed surface vegetation, or exposures from slope wash.	Pedestrian survey transects 20 –30 m wide

TABLE 5.8-2
PASTORIA ENERGY FACILITY
GEOLOGIC UNITS WITHIN PROJECT AREA

Symbol	Rock Unit	Age	Rating
<i>(Tvq)</i>	Vaqueros Fm.	OligoMiocene	(High) (Known vertebrate fauna)
<i>(Tsm)</i>	StaMargarita Fm	Miocene	(High) (Known vertebrate fauna)
<i>(Tch)</i>	Chanac Fm.	Miocene	(High) (Known vertebrate fauna)
<i>(Qal)</i> ¹	Alluvium	Pleistocene	(High) (Known vertebrate fauna)
<i>(Qts)</i> ²	Tar Seep	Plio-Pleist	(High) (Known vertebrate fauna)

¹While Quaternary alluvium deposits of Pleistocene age occur locally within the project area, usage of the *Qal* geologic symbol designation on available geologic maps is highly variable and suggests that geologic units ranging from Quaternary age stream, terrace, fan, and floodplain deposits may be lumped under this designation, particularly where geologic data has been scarce, due to either petroleum field or agricultural tract development. Thus, paleontological resources within this geologic unit can potentially vary greatly in distribution and taxa as a result of this generalization or lumping of geologic units. Furthermore, data pertaining to stratigraphic position of the tar seep deposits (*Qts*) containing faunal and floral accumulations in relation to the Quaternary undifferentiated alluvial (*Qal*) mapped units has not been investigated to date by scientific workers.

²*Qts* deposits could potentially occur within the project area, but are obscured by *Qal*. No *Qts* deposits have been observed to date.

TABLE 5.8-3
PASTORIA ENERGY FACILITY
PALEONTOLOGICAL SENSITIVITY & GEOLOGIC UNITS

CUMULATIVE ACRES OR MP	SEGMENT LENGTH	ROCK FORMATION	SENSITIVITY RATING
<u>Plant Site and Construction Laydown Area</u>			
55+/-	n/a	Qal	high
<u>Route 1 – Proposed 230 kV Transmission Line</u>			
0 - 1.38	1.38	Qal	high
<u>Route 2 - Proposed Water Supply Pipeline</u>			
0 – 0.05	0.5	Qal	high
<u>Route 3 – Proposed Fuel Gas Pipeline</u>			
0 - 0.6	0.6	Qal	high
0.6 – 1.25	0.65	Tvq	high
1.25 – 1.35	0.1	Qal	high
1.35 – 1.8	0.45	Tvq	high
1.8 – 2.25	0.45	Qal/Tvq	high
2.25 – 2.8	0.6	Tvq	high
2.8 – 3.05	0.25	Qal/Tvq	high
3.-5 – 3.4	0.35	Tvq	high
3.4 – 6.9	3.5	Qal	high
6.9 – 7.8	0.9	Tch	high
7.9 – 11.65	3.85	Qal	high
<u>Route 3A - Alternate Fuel Gas Pipeline¹</u>			
8.27 – 13.8	5.53	Qal	high
<u>Route 3B - Alternate Fuel Gas Pipeline^{1,2}</u>			
11.9 – 16.2	4.3	Qal	high
16.2 – 16.5	0.3	Tch	high

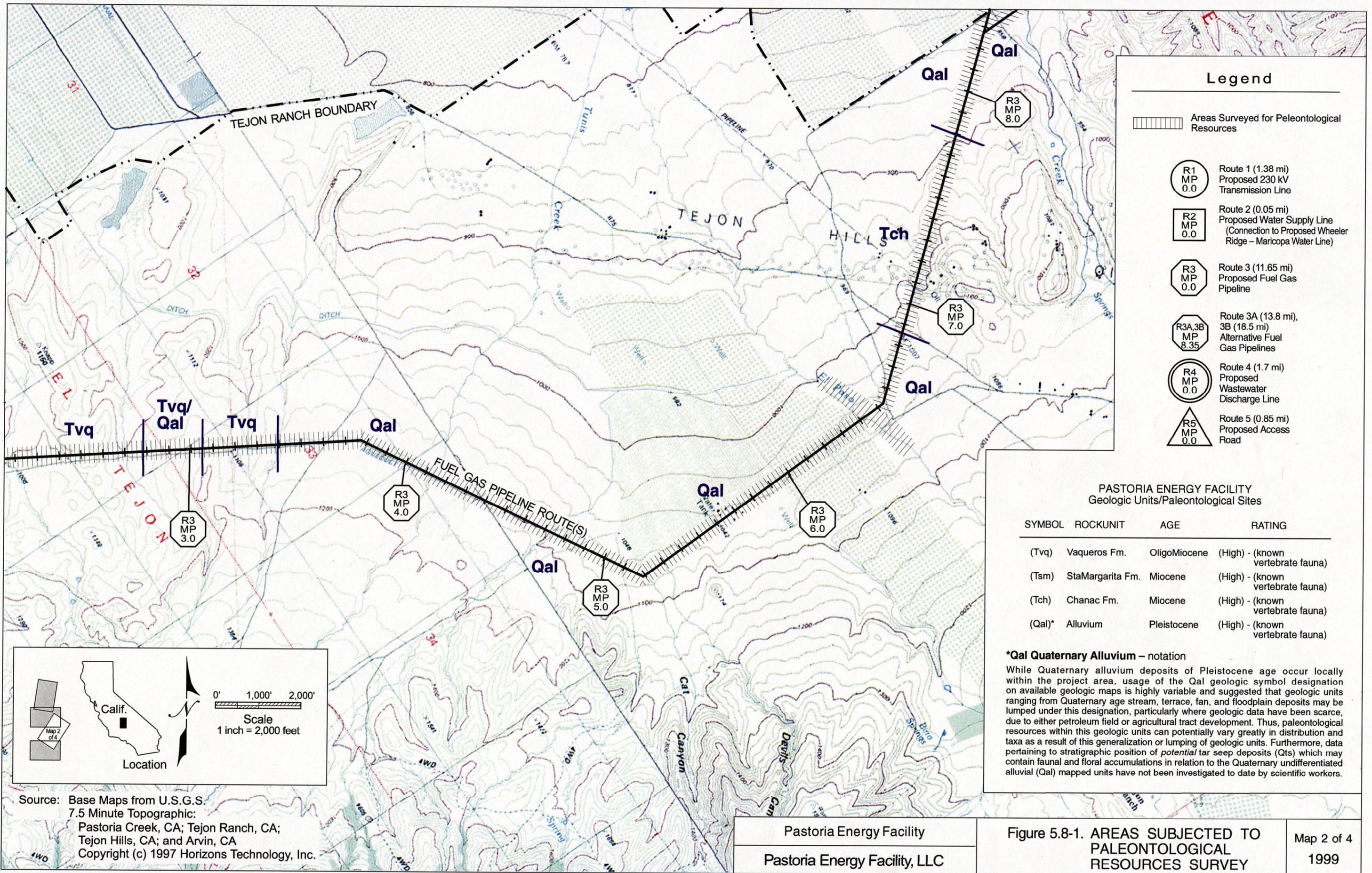
TABLE 5.8-3

(Continued)

CUMULATIVE ACRES OR MP	SEGMENT LENGTH	ROCK FORMATION	SENSITIVITY RATING
<u>Route 3B (continued)</u>			
16.5 – 16.85	0.35	Qal	high
16.85 – 17.1	0.25	Tch	high
17.1 – 18.5	1.4	Qal	high
<u>Route 4 – Proposed Wastewater Discharge Pipeline</u>			
0.0 - 1.7	1.7	Qal	high
<u>Route 5 – Proposed Access Road</u>			
0.0 - 0.85	0.85	Qal	High

¹ Refer to Route 3, MP 0.0-8.27 for initial 8.27 miles of this alternate route.

² Refer to Route 3A, MP 8.27-11.9 for this portion of this alternate route.



- ### Legend
- Areas Surveyed for Paleontological Resources
 - Route 1 (1.38 mi) Proposed 230 kV Transmission Line
 - Route 2 (0.05 mi) Proposed Water Supply Line (Connection to Proposed Wheeler Ridge - Maricopa Water Line)
 - Route 3 (11.65 mi) Proposed Fuel Gas Pipeline
 - Route 3A (13.8 mi), 3B (18.5 mi) Alternative Fuel Gas Pipelines
 - Route 4 (1.7 mi) Proposed Wastewater Discharge Line
 - Route 5 (0.85 mi) Proposed Access Road

PASTORIA ENERGY FACILITY Geologic Units/Paleontological Sites

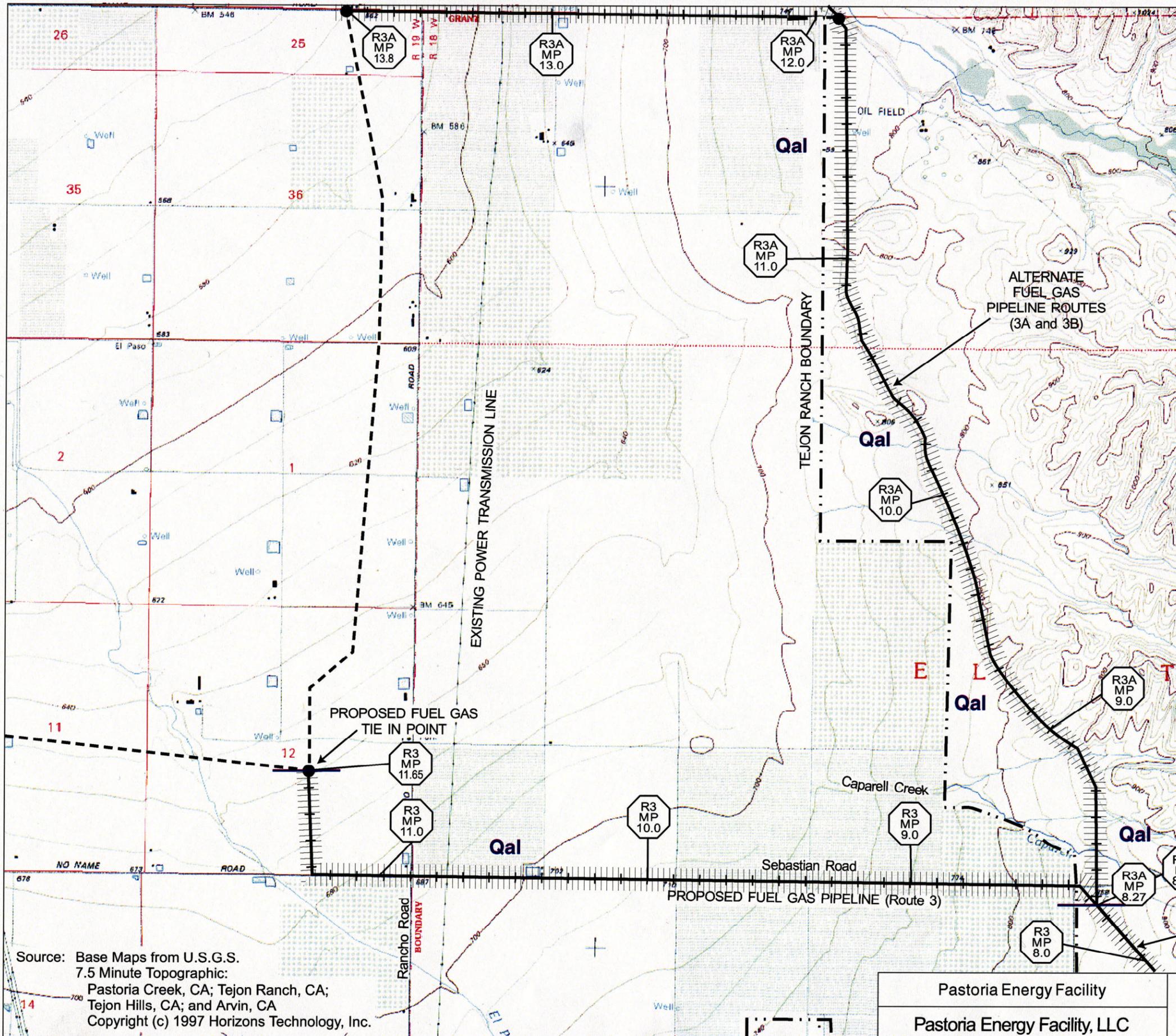
SYMBOL	ROCKUNIT	AGE	RATING
(Tvq)	Vaqueros Fm.	OligoMiocene	(High) - (known vertebrate fauna)
(Tsm)	StaMargarita Fm.	Miocene	(High) - (known vertebrate fauna)
(Tch)	Chanac Fm.	Miocene	(High) - (known vertebrate fauna)
(Qal)*	Alluvium	Pleistocene	(High) - (known vertebrate fauna)

***Qal Quaternary Alluvium - notation**
 While Quaternary alluvium deposits of Pleistocene age occur locally within the project area, usage of the Qal geologic symbol designation on available geologic maps is highly variable and suggested that geologic units ranging from Quaternary age stream, terrace, fan, and floodplain deposits may be lumped under this designation, particularly where geologic data have been scarce, due to either petroleum field or agricultural tract development. Thus, paleontological resources within this geologic units can potentially vary greatly in distribution and taxa as a result of this generalization or lumping of geologic units. Furthermore, data pertaining to stratigraphic position of potential tar seep deposits (Qts) which may contain faunal and floral accumulations in relation to the Quaternary undifferentiated alluvial (Qal) mapped units have not been investigated to date by scientific workers.

Location

Scale
1 inch = 2,000 feet

Source: Base Maps from U.S.G.S. 7.5 Minute Topographic: Pastoria Creek, CA; Tejon Ranch, CA; Tejon Hills, CA; and Arvin, CA
 Copyright (c) 1997 Horizons Technology, Inc.



Legend

Areas Surveyed for Paleontological Resources

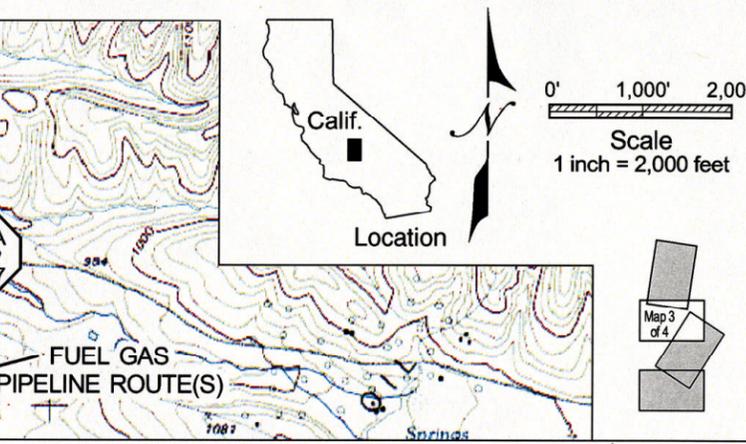
**PASTORIA ENERGY FACILITY
Geologic Units/Paleontological Sites**

SYMBOL	ROCKUNIT	AGE	RATING
(Tvq)	Vaqueros Fm.	OligoMiocene	(High) - (known vertebrate fauna)
(Tsm)	StaMargarita Fm.	Miocene	(High) - (known vertebrate fauna)
(Tch)	Chanac Fm.	Miocene	(High) - (known vertebrate fauna)
(Qal)*	Alluvium	Pleistocene	(High) - (known vertebrate fauna)

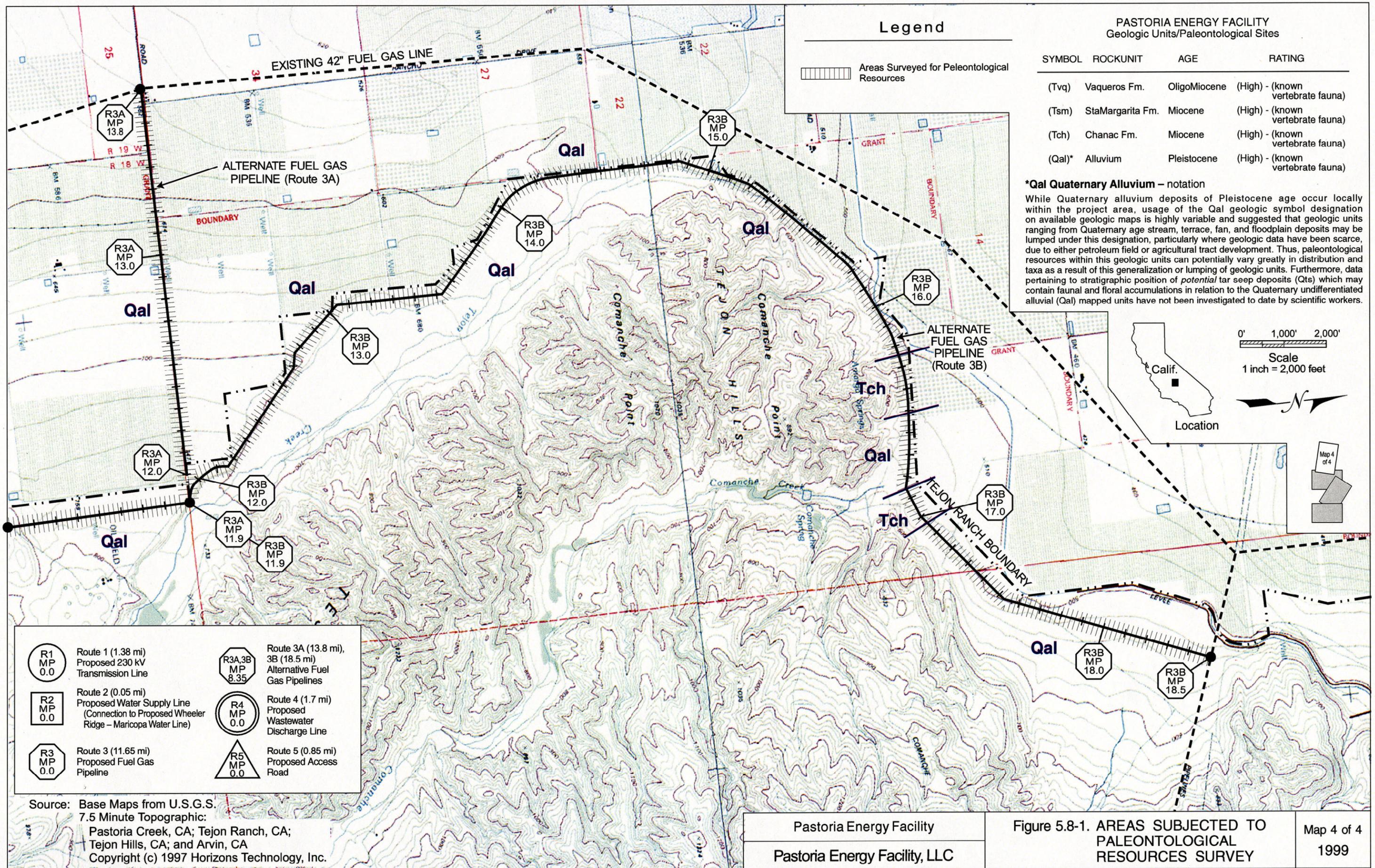
***Qal Quaternary Alluvium – notation**

While Quaternary alluvium deposits of Pleistocene age occur locally within the project area, usage of the Qal geologic symbol designation on available geologic maps is highly variable and suggested that geologic units ranging from Quaternary age stream, terrace, fan, and floodplain deposits may be lumped under this designation, particularly where geologic data have been scarce, due to either petroleum field or agricultural tract development. Thus, paleontological resources within this geologic units can potentially vary greatly in distribution and taxa as a result of this generalization or lumping of geologic units. Furthermore, data pertaining to stratigraphic position of *potential* tar seep deposits (Qts) which may contain faunal and floral accumulations in relation to the Quaternary undifferentiated alluvial (Qal) mapped units have not been investigated to date by scientific workers.

- Route 1 (1.38 mi) Proposed 230 kV Transmission Line
- Route 2 (0.05 mi) Proposed Water Supply Line (Connection to Proposed Wheeler Ridge – Maricopa Water Line)
- Route 3 (11.65 mi) Proposed Fuel Gas Pipeline
- Route 3A (13.8 mi), 3B (18.5 mi) Alternative Fuel Gas Pipelines
- Route 4 (1.7 mi) Proposed Wastewater Discharge Line
- Route 5 (0.85 mi) Proposed Access Road



Source: Base Maps from U.S.G.S.
7.5 Minute Topographic:
Pastoria Creek, CA; Tejon Ranch, CA;
Tejon Hills, CA; and Arvin, CA
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Legend

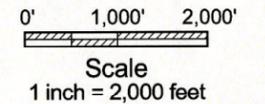
Areas Surveyed for Paleontological Resources

**PASTORIA ENERGY FACILITY
Geologic Units/Paleontological Sites**

SYMBOL	ROCKUNIT	AGE	RATING
(Tvq)	Vaqueros Fm.	OligoMiocene	(High) - (known vertebrate fauna)
(Tsm)	StaMargarita Fm.	Miocene	(High) - (known vertebrate fauna)
(Tch)	Chanac Fm.	Miocene	(High) - (known vertebrate fauna)
(Qal)*	Alluvium	Pleistocene	(High) - (known vertebrate fauna)

***Qal Quaternary Alluvium – notation**

While Quaternary alluvium deposits of Pleistocene age occur locally within the project area, usage of the Qal geologic symbol designation on available geologic maps is highly variable and suggested that geologic units ranging from Quaternary age stream, terrace, fan, and floodplain deposits may be lumped under this designation, particularly where geologic data have been scarce, due to either petroleum field or agricultural tract development. Thus, paleontological resources within this geologic units can potentially vary greatly in distribution and taxa as a result of this generalization or lumping of geologic units. Furthermore, data pertaining to stratigraphic position of *potential* tar seep deposits (Qt) which may contain faunal and floral accumulations in relation to the Quaternary undifferentiated alluvial (Qal) mapped units have not been investigated to date by scientific workers.



Location

R1 MP 0.0	Route 1 (1.38 mi) Proposed 230 kV Transmission Line	R3A,3B MP 8.35	Route 3A (13.8 mi), 3B (18.5 mi) Alternative Fuel Gas Pipelines
R2 MP 0.0	Route 2 (0.05 mi) Proposed Water Supply Line (Connection to Proposed Wheeler Ridge – Maricopa Water Line)	R4 MP 0.0	Route 4 (1.7 mi) Proposed Wastewater Discharge Line
R3 MP 0.0	Route 3 (11.65 mi) Proposed Fuel Gas Pipeline	R5 MP 0.0	Route 5 (0.85 mi) Proposed Access Road

Source: Base Maps from U.S.G.S.
7.5 Minute Topographic:
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ATTACHMENT G

**PALEONTOLOGICAL RESOURCES
MATERIALS**

SUMMARY OF CONSTRUCTION COMPLIANCE
RELATED PALEONTOLOGICAL RESOURCES INFORMATION

ATTACHMENT G – SUMMARY OF CONSTRUCTION COMPLIANCE RELATED PALEONTOLOGICAL RESOURCES INFORMATION

1.0 PURPOSE

This Attachment provides a summary of paleontological resources materials submitted as part of 99-AFC-7 as well as construction compliance proceedings regarding paleontological resources for the existing PEF. This summary has been provided to describe the extensive documentation and compliance activities that have occurred as part of the processing of 99-AFC-7, as well as to comply with construction-related requirements. Copies of the reports summarized below are on file at the California Energy Commission (CEC) of the compliance proceedings for the existing PEF (99-AFC-7C).

2.0 OVERVIEW

Construction compliance-related activities passed through two owners, Enron Corporation and, later, Calpine Corporation. Consequently, work for this project was conducted in multiple phases. As originally configured the PEF comprised a 30-acre power plant site, 25-acre construction laydown area, a 1.38-mile long 230 kV transmission line, a 0.5-mile long water supply line, a 11.65-mile long fuel gas pipeline, or alternate fuel gas pipelines of either 13.8 miles or 18.5 miles, a 1.7-mile long wastewater discharge line, and a 0.85-mile long access road. The final project was reconfigured to include a modified 14.01-mile gas pipeline that by-passed part of the original gas pipeline, and expanded construction laydown area, and a modified 0.05-mile water supply pipeline. Construction and operation of the existing PEF is conducted under a license granted by the CEC. CEC staff developed Conditions of Certification (COC) to ensure that construction of the project would not create significant direct, indirect, or cumulative adverse impacts to paleontological resources. This summary describes compliance activities completed to date at the existing PEF.

Paleontological resources compliance activities were guided by a CEC-approved Paleontological Resources Mitigation and Monitoring Plan (PRMMP). Compliance activities consisted of a standard paleontological construction monitoring program. These activities were managed by a Paleontological Resources Specialist (PRS). The PRS recovered several fossil vertebrate paleontological resources during paleontological monitoring of construction disturbance areas within the PEF plant site during 2001-2002. Several unidentifiable fossil bone fragments and numerous unidentifiable fossil root casts were also recovered during subsequent lab processing of the 2001-2002 period from bulk sedimentary samples analyzed during September-November 2004. Consistent with CEC COCs, monthly compliance reports were filed summarizing compliance related activities. A brief summary of the surveys and monitoring activities that were conducted as part of PEF construction are provided below.

3.0 PRIOR SURVEYS AND MONITORING

The original paleontological resource surveys encompassing the PEF and associated linear components were conducted in April 1998 by Lawler Associates Geoscience (LAG). This report was filed subject to confidentiality agreement as part of 99-AFC-7 (Appendix K). Field surveys were conducted within survey corridors and block areas that encompassed the project area of potential effect (APE) as defined at the time of the survey. The project components at that time included:

- 30-acre power plant site
- 25-acre construction laydown area
- Route 1 – 230 kV electrical transmission interconnection
- Route 2 – Water supply and discharge facilities
- Route 3/3A/3B – Fuel Gas Pipeline
- Route 4 – Wastewater Discharge
- Route 5 – Plant Site Access Road
- Flood detention berms and stream crossing

The original paleontological resources technical report determined that paleontological resource monitoring would be intermittently conducted during the construction phase of the PEF plant site and associated project components.

During May 2001 to March 2002 PaleoResource Consultants (PRC) monitors conducted paleontological resource onsite monitoring of construction disturbance activities at the PEF. Monitoring of PEF components included grading for access road and laydown areas as well as cooling tower, cooling water sump, oily water separator tank pit, electrical duct bank conduit systems, water supply pipeline system, stormwater drainage pipeline system and the telephone line system. The fuel gas and water supply pipelines were constructed from October 2003 to May 2004 and as also subject to paleontological resource monitoring.

4.0 PALEONTOLOGICAL MITIGATION AND MONITORING PLAN

The PRMMP was prepared to guide the compliance phase of the paleontological resources program (URS 1999). The purpose of the PRMMP was to provide for the identification, evaluation, and treatment of paleontological resources that might be affected during construction activities. The paleontological resources monitoring and mitigation procedures discussed in that report were outlined in 99-AFC-7 and prescribed in CEC COCs related to paleontological resources.

The key elements of the PRMMP include:

- The general PEF project description
- A brief summary of previous paleontological investigations in and near the project area, and the findings of those investigations (note: these were previously discussed in the paleontological resources technical report)
- A monitoring plan to be employed throughout the construction phases of the PEF
- A mitigation plan that covers the treatment of paleontological resources discovered during the construction monitoring, their handling, processing, and delivery to an institution for curation

5.0 WORKFORCE EDUCATION PROGRAM

In addition to the PRMMP, a workforce education program was prepared to satisfy the CEC COCs. The designated PRS, Dr. Lanny Fisk, from PRC, was required to augment an existing employee-training program to raise awareness of paleontological resources within the project APE. The program also required that all new employees brought onto the project after initial excavation commencement, including construction supervisors, project managers, and any other workers who operate – or will operate – ground moving equipment, be given the training program. This was accomplished by the PRC PRS providing in-person training during the PEF project kick-off, in May 2003, and by means of a CEC-approved training video that was also utilized by Calpine’s environmental compliance staff.

6.0 LAB ANALYSIS PROGRAM

Bulk samples of sedimentary materials were taken from the spoils piles at selected excavation site at the PEF by PRC monitors during the May 2001 to March 2002 period. The largest of these samples was a 6000 pound bulk sample, collected in the southwest corner of the PEF plant sites, where two fossil equid (horse) teeth and several rodent limb bone fragments were found by monitors in September 2001. This bulk sample material was collected and transported to the PRC laboratory facility for processing. The sample materials were wet-sieved into size fractions between mesh screen, then dried for subsequent analysis.

During September-November 2004 these sample materials were analyzed by David Lawler, (PRS for the PEF starting in November 2003) at the Lawler Associates Geoscience laboratory. The sedimentary materials from each sample screen size fraction were analyzed separately under a binocular-type dissecting microscope. While microvertebrate fossil bone fragments were recovered in some of the sample materials, no significant, identifiable paleontological resources were recovered during lab processing of bulk sample materials.

Unidentifiable fossil root casts were also frequently recovered during lab analysis of the bulk samples, but these also were not incorporated into the museum repository collection.

7.0 RESULTS OF MONITORING PROGRAM

A paleontological resources construction-phase monitoring program was implemented by PRC for the PEF during 2001-2002, in order to satisfy CEC COCs. The PRS was required to undertake development and coordination of the monitoring programs to insure that the effects of construction on paleontological resources within the project APE were mitigated.

The Paleontological Resources Monitors (PRM) made periodic inspections of areas subjected to ground disturbance for paleontological resources during 2001-2002. The paleontological resources monitoring team included: Dr. Lanny Fisk (PRS), and several monitors.

Two fossil equid (horse) teeth and several unidentifiable rodent limb bone fragments were found by PRMs in September 2001. Numerous unidentifiable fossil mammal bone fragments were also recovered during construction monitoring. However, only identifiable fossil vertebrate specimens (horse teeth) have been curated into the collections of the University of California Museum of Paleontology (UCMP).

8.0 CONCLUSION

The Final Paleontological Resources Report has been filed with the CEC to complete the paleontological resource compliance requirements for the PEF. The protocols set forth in the CEC COCs have been satisfied. No significant paleontological resources were impacted by project construction within those areas monitored by the PRC team. All LORS applicable to paleontological resources on this project have been satisfied.