8.16 Paleontological Resources

8.16.1 Introduction

This section addresses the requirements of the California Energy Commission (CEC) for assessment of potential impact to paleontological resources (fossils) from the construction and operation of the proposed South Bay Replacement Project (SBRP), and demolition of the existing South Bay Power Plant (SBPP).

This section of the Application for Certification (AFC) considers the potential for sediments containing significant fossil remains to be within the area of potential effect from earth moving associated with construction of the SBRP and the relocated SDG&E substation, and the demolition of the existing SBPP. In the case of the SBRP, there are essentially no off-site laterals that may expand the impact zone to areas of differing geology and paleontologic potential Operation of the SBRP will not involve further ground disturbing activities, and therefore no impacts to paleontologic resources would occur during the operational phase of this Project.

The SBRP project consists of three phases:

- **The Construction Phase**—The first phase is the demolition of existing structures and foundations associated with the former Liquefied Natural Gas (LNG) Facility, preparation of construction lay down areas, and the construction of the SBRP. Initial operations of SBRP will include an interim interconnection to the San Diego Gas & Electric Company (SDG&E) transmission system through a new 230-kilovolt ampere (kVA) substation on approximately 0.6 acre (interconnecting to SDG&E's planned new 230-kilovolt [kV] transmission line) and an underground interconnection to the existing SDG&E South Bay 138/69 kV substation.[1]

- **The Demolition Phase**—The second phase of Project construction activities will occur after the SBRP achieves commercial operation. The construction activity during this phase will be the demolition of the existing SBPP facilities, excluding SDG&E's existing South Bay Substation which will remain in service until the new Substation is constructed.

- **The New Substation Phase**—The final phase of the Project will involve the construction of the SDG&E substation on approximately 6.5 acres south of and adjacent to the SBRP site. This construction will be performed after the start up of the SBRP and demolition of SBPP. After the new SDG&E substation construction is completed and operational, and the SBRP generator leads are attached to the new facilities, SDG&E could then initiate demolition activities on the South Bay Substation, located north of the SBRP site. These demolition activities, however, are not part of the scope of this AFC. They are part of a separate project of unknown timing and scope.

[1] SDG&E was granted a Certificate of Public Convenience and Necessity (CPCN) for the Otay Mesa Power Purchase Agreement (OMPPA) Transmission Project. The CPCN is for the construction of two new 230-kV electric transmission circuits to connect SDG&E's Miguel Substation with both the Sycamore Canyon Substation and the Old Town Substation in San Diego County. The circuit to the Old Town Substation is planned to pass within approximately 100 feet of the proposed SBRP. This project is under construction. The SBRP interconnection plan is based in part on interconnecting to this circuit.

The reason there are two interconnect steps is to ensure that interconnection can be secured by the proposed on-line date of SBRP (2010). Also, SDG&E holds certain obligations associated with a new substation as part of its Memorandum of Understanding with the City of Chula Vista, but these obligations occur after the demolition of SBPP.

This Paleontological Resources Section of the AFC meets the requirements of the CEC (2000) and conforms with the recommendations of the Society of Vertebrate Paleontology (1991, 1995, 1996) that address mitigating impacts to paleontological resources resulting from earth moving activities. Subsequent to presenting the results of the paleontologic sensitivity assessment, measures will be described to mitigate adverse impacts from earth moving on paleontological resources at the Project site.

This section of the AFC summarizes the potential environmental impacts on paleontological resources that may result from construction of the SBRP, the construction of the relocation SDG&E substation, and the demolition of the existing SBPP. This paleontological resources inventory and impact assessment was conducted by W. Geoffrey Spaulding, Ph.D. a senior paleontologist with CH2M HILL. Dr. Spaulding has advanced degrees in geology with emphases in paleobiology, and is a recognized expert of the glacial-age environments of the American West. He previously has completed paleontological resource surveys and prepared paleontological resource impact assessments in support of energy generation and other large construction projects in southern California, including San Diego County.

8.16.1.1 The Nature of Paleontological Resources

Paleontological resources (fossils) are the remains or traces of prehistoric plants and animals. They may range from the actual bones and shells of ancient organisms, to mineral replacements of a once-living organism, to simple impressions. They range in size and abundance from many thousands per cubic centimeter for microfossils such as pollen, diatoms, and radiolaria, to very rare large-mammal bones exceeding a meter in length. Fossils are important scientific and educational resources because of their use in: (1) documenting the presence and evolutionary history of particular groups of now extinct organisms, (2) reconstructing the environments in which these organisms lived, (3) and in determining the relative ages of the strata in which they occur and the geologic events that resulted in the deposition of the sediments that formed these strata. In the Project area, the fossils of marine organisms as well as those of terrestrial animals and plants are important in the paleontological record. They have helped define the age and sequences of deposition and uplift along San Diego County's prominent shoreline, which in many areas consists of cliffs of fossiliferous marine sedimentary rock.

8.16.1.2 LORS

Among the local LORS discussed in this section are certain ordinances, plans or policies of the City of Chula Vista. For informational purposes, this section reviews compliance of the Project with such requirements even though the Applicant understands that they are not applicable to the Project as a matter of law. (*See* Section 8.4 — Land Use for a discussion of this issue.) The analysis of City LORS in this section is informational and does not address the jurisdictional issues which are discussed in Section 8.4 — Land Use.

Paleontological resources are non-renewable scientific resources and are protected by several federal and state statutes (California Office of Historic Preservation 1983; see also

Marshall 1976, Fisk and Spencer 1994), most notably by the 1906 Federal Antiquities Act and other subsequent federal legislation and policies, and by State of California's environmental regulations (CEQA, Section 15064.5). Professional standards for assessment and mitigation of adverse impacts to paleontological resources have been established by the Society of Vertebrate Paleontology (1991, 1995, 1996). Design, construction, and operation of the SBRP, including transmission lines, pipelines, and ancillary facilities and the subsequent demolition of the existing SBPP, will be conducted in accordance with all laws, ordinances, regulations, and statutes (LORS) applicable to paleontological resources in the context of this Project. Federal, state and LORS applicable to paleontological resources are summarized in Table 8.16-1 and discussed briefly below, along with professional standards for paleontological resources assessment and impact mitigation.

Regarding local LORS in Table 8.16-1, for informational purposes the local LORS would be applicable, but for the CEC's exclusive siting jurisdiction.

TABLE 8.16-1
LORS Regarding Paleontological Resources

LORS	Applicability	AFC Reference	Project Conformity
Antiquities Act of 1906	Not applicable – No federal land involved, or federal entitlement required	—	—
CEQA, Appendix G	Applicable – Fossil remains may be encountered by earth-moving activities	Subsections 8.16.2, 8.16.5, and 8.16.6	Yes
Public Resources Code, Sections 5097.5/5097.9	Not applicable – Applies to state-owned land	—	—
San Diego County General Plan, Part X "Conservation Element"	Applicable – Calls for the identification and protection of unique geological features including fossil localities.	Subsections 8.16.2, 8.16.5, and 8.16.6	Yes
City of Chula Vista General Plan	Applicable – Policy EE.10.1 calls for the assessment and mitigation of impacts to paleontological resources.	Subsections 8.16.2, 8.16.5, and 8.16.6	Yes

8.16.1.2.1 Federal LORS

Federal protection for significant paleontological resources would apply to the SBRP only if any construction or other related project impacts occur on federally owned or managed lands, or if a federal entitlement or other permit is required. Federal legislative protection for paleontological resources stems from the Antiquities Act of 1906 (PL 59-209; 16 United States Code 431 et seq.; 34 Stat. 225), which calls for protection of historic landmarks, historic and prehistoric structures, and other objects of historic or scientific interest on federal lands. In addition, the National Environmental Policy Act of 1969 (United States Code, section 4321 et seq.; 40 Code of Federal Regulations, section 1502.25), as amended, requires analysis of potential environmental impacts to important historic, cultural, and natural aspects of our national heritage.

8.16.1.2.2 California LORS

The CEC environmental review process under the Warren-Alquist Act has been approved as a Certified Regulatory Program under the California Environmental Quality Act (CEQA). This means that it is considered "functionally equivalent" to that of CEQA such that the CEC process substitutes for preparation of the traditional CEQA documents and reviews. (CEQA; Public Resources Code Sections 21000 et seq.). CEQA requires that public agencies and private interests identify the environmental impacts of their proposed projects on any object or site of significance to the scientific annals of California (Division I, California Public Resources Code: 5020.1 [b]). Guidelines for the Implementation of CEQA (Public Resources Code Sections 15000 et seq.) defines procedures, types of activities, persons, and public agencies required to comply with CEQA. Appendix G in Section 15023 provides an Environmental Checklist of questions that a lead agency should normally address if relevant to a project's environmental impacts. One of the questions to be answered in the Environmental Checklist (Section 15023, Appendix G, Section V, part c) is the following: "*Would the project directly or indirectly destroy a unique paleontological resource or site…*?"

Although CEQA does not define what is "a unique paleontological resource or site", Section 21083.2 defines "unique archaeological resources" as "…any archaeological artifact, object, or site about which it can be clearly demonstrated that, without merely adding to the current body of knowledge, there is a high probability that it meets any of the following criteria:

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

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

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

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

Other state requirements for paleontological resource management are in California Public Resources Code Chapter 1.7, Section 5097.5 (Stats. 1965, c. 1136, p. 2792), entitled Archaeological, Paleontological, and Historical Sites. This statute defines any unauthorized disturbance or removal of a fossil site or remains on public land as a misdemeanor and specifies that state agencies may undertake surveys, excavations, or other operations as necessary on state lands to preserve or record paleontological resources. This statute would apply to the SBRP only if any construction or other related project impacts occur on state owned or managed lands or if the state or a state agency were to obtain ownership of project lands during the term of the project license.

8.16.1.2.3 County and City LORS

The *San Diego County General Plan* (San Diego County, n.d.) addresses paleontological resources in the course of noting that paleontological localities are types of "unique geological features", and that the Natural Resource Inventory of the County includes a number of fossil localities. Action Program 8.1 under the County's *Policies and Action Programs* (ibid.) calls for a program to identify geologic formations and fossil localities. As described in the *Final EIR for The City of Chula Vista General Plan Update* (City of Chula Vista, 2005), for a number of years the City has required construction-phase paleontological resources monitoring and mitigation as a condition of permitting residential development and larger commercial projects. The *City of Chula Vista General Plan* (City of Chula Vista, 2005) has mitigation requirements that specifically address potential adverse impacts to paleontological resources.

8.16.1.2.4 Professional Standards

The Society of Vertebrate Paleontology (SVP), an international organization of professional paleontologists, has established standard guidelines (SVP 1991, 1995, 1996) that outline acceptable professional practices in the conduct of paleontological resource assessments and surveys, monitoring and mitigation, data and fossil recovery, sampling procedures, and specimen preparation, identification, analysis, and curation. Most practicing paleontologists in the nation adhere to the SVP's guidelines, and extend those to address other types of fossils of scientific significance, such as invertebrate fossils and paleobotanical specimens. Many federal and state regulatory agencies, including the CEC, have informally adopted the SVP standard guidelines.

8.16.2 Affected Environment

8.16.2.1 Physiographic Setting

The site area lies on a relatively narrow strip of land west of the Interstate-5 (I-5) corridor and immediately east of the east shoreline of southern San Diego Bay, within the City of Chula Vista, San Diego County, California. As noted previously, construction of all pipelines and electrical transmission lines associated with this Project will be restricted to the Project site and existing SBPP site.

Fenneman (1931) originally termed this region the Lower Californian Physiographic Province and described its salient large scale features as the north-south trending Peninsular Ranges to the east, the eroded granitic upland flanking it to the west and, then, a terraced lowland 12 to 18 miles wide bordering the Pacific Ocean. Currently this area is often referred to as the Peninsular Ranges Geomorphic Province (e.g. Sweetwater Authority,

2003) and area that is physiographically distinct from the great rift occupied by the Salton Trough and Gulf of California immediately east of the Peninsular Ranges.

Approaching the San Diego County coast from the ocean, however, the mountains in the distance are often obscured and the most prominent topographic feature seen is the slightly elevated and deeply dissected coastal plain, formed by a series of broad mesas rising immediately behind the shoreline. The plain maintains an elevation of approximately 330 feet along its seaward margin and ascends to the east as a series of terraces as much as 3 miles wide (LaJoie et al., 1991). These terraces are ancient sea-level strandlines, each with at least one large beach ridge, and each marking a separate period of high sea level in the geologically recent past (ibid.). Their height, often hundreds of feet above current sea level, reflects the tectonic uplift that is the dominant geomorphology of North County. South of about La Jolla, however, these marine terraces descend toward San Diego Bay and are truncated south around Rose Canyon. In the vicinity of San Diego Bay the coastal plain is displaced downward to the west along the La Nacion Fault Zone, creating a lowland occupied currently by San Diego Bay on the west, and by the "Coastal Terraces Region" between the shore and Interstate-805 (City of Chula Vista, 2005). Because of its low-lying topography, exposures of ancient marine sediment are much less common in the Chula Vista area, where geochronological data suggest an absence of uplift in the last 200,000 to 500,000 years (Deméré, 1981 cited in Lajoie et al., 1991). Therefore fewer paleontological sites are known in the lowland area including San Diego Bay and most of Chula Vista (City of Chula Vista, 2005).

8.16.2.2 Resource Inventory Methods

To develop a baseline paleontological resource inventory of the Project area and surrounding lands, and to assess the potential paleontological productivity of the stratigraphic units that may be present, the published as well as available unpublished geological and paleontological literature was reviewed. These included geological maps, satellite and aerial photography, technical and scientific reports, and assessments of existing conditions in relevant environmental documents. In addition, a records search was performed at the San Diego Natural History Museum (SDNHM). The Project area was also surveyed by Dr. W. G. Spaulding, the Paleontological Resources Specialist (PRS) on February 9, 2006. These tasks were conducted in compliance with CEC (2000) and Society of Vertebrate Paleontology (SVP 1991, 1995) guidelines for assessing the importance of paleontological resources in areas potentially impacted by construction-related excavations.

No subsurface exploration was conducted to obtain information for this assessment. However, it is recommended that further paleontological assessment be done in conjunction with pre-construction geotechnical surveys conducted to better define the subsurface geological features of the SBRP area. These geotechnical borings could help confirm the presence of, as well as the vertical and horizontal distribution of paleontologically sensitive subsurface units, and provide additional data to better anticipate their potential for producing scientifically important paleontological resources.

8.16.2.3 Resource Inventory Results

The history of sedimentation along the coastal San Diego region during the Cenozoic (the last 64 million years) has been governed by local tectonism as well as fluctuations in the

global sea level. At times when the relative position of the land surface was below sea level, deposition of fossil bearing marine sediments occurred. Erosion occurred at other times when the land surface was above sea level, and these periods are usually represented by gaps in the rock stratigraphic record, and less often by terrestrial sediments. The fossil-bearing rock units of coastal San Diego County date back to the beginning of the Eocene Epoch and represent major portions of the Tertiary and Quaternary geological records. Most of the exposed rock units were deposited in marine or estuarine environments. These rock units include, from oldest to youngest, the following:

- The Delmar Formation—representing lagoon/estuarine environments, middle Eocene in age
- The Torrey Sandstone—reflecting a deepening of water, and an environment related to near-shore littoral environments, middle Eocene age and contemporaneous in part with the Ardath Shale
- The Ardath Shale—primarily outer continental shelf, but also near-shore marine environments, middle Eocene in age
- The Scripps Formation—continental shelf, middle Eocene in age
- The Capistrano Formation—deep continental shelf or adjacent continental slope, late Miocene in age;
- The San Mateo Formation—near-shore marine, spanning the Miocene and Pliocene transition
- The San Diego Formation—open marine embayment, late Pliocene
- The Lindavista Formation—fluvial and shallow, near-shore marine sediments, early to middle Pleistocene
- The Bay Point Formation—near-shore marine sediments as well as terrestrial facies, middle to late Pleistocene in age
- Unnamed beach terrace deposits (near-shore marine, littoral, and terrestrial, middle to late Pleistocene in age (700,000 to 10,000 years B.P.; Lajoie et al., 1991)
- Other terrestrial and near-shore marine sediments of Late Quaternary and Holocene age.

Although not discussed frequently in the literature, it is possible that the youngest sedimentary units, the Bay Point Formation and the unnamed Quaternary sediments, are at least in part penecontemporaneous.

8.16.2.3.1 Paleontological Sensitivity of Sediments Potentially Present in the Project Area

The paleontological sensitivity of the stratigraphic units in the area has been well described in a number of recent planning documents (City of Chula Vista, 2005; Sweetwater Authority, 2003) based on the records. Additional information comes from the results of a records search for this Project carried out by the SDNHM, and the results of the site survey by the PRS. In general, the paleontological record of San Diego County is rich and varied by virtue of the fact that there are so many marine sedimentary sequences exposed. However,

within three miles of the Project area there has been less uplift and exposure of these rocks, and consequently few fossil sites are known from the immediate area.

The rock stratigraphic record potentially present in the Project area includes the following units, with their relative level of paleontological sensitivity assigned based on their known fossil record. The sensitivity ratings follow the criteria established for this region where fossil-bearing sediments are very common (Table 18.16-2).

TABLE 8.16-2
Definitions of Paleontological Sensitivity Ratings Employed in this Assessment
(adopted from the Sweetwater Authority, 2003).

Sensitivity	Definition
High	Assigned to geological formations known to contain paleontological resources that include rare, well-preserved, and/or fossil materials important to on-going scientific studies. They have the potential to produce, or have produced, vertebrate remains that are the particular research focus of many paleontologists, and can represent important educational resources as well.
Moderate	Stratigraphic units that have yielded fossils that are moderately well-preserved, are common elsewhere, and/or that are stratigraphically long-ranging would be assigned a moderate rating. This evaluation can also be applied to strata that have an unproven but strong potential to yield fossil remains based on its stratigraphy and/or geomorphologic setting.
Low	These include units that are relatively recent, or that represent a high-energy subaerial depositional environment where fossils are unlikely to be preserved. A low abundance of invertebrate fossil remains, or reworked marine shell from other units, can occur but the paleontological sensitivity would remain low due to their lack of potential to serve as significant scientific or educational purposes.
Marginal and Zero	Stratigraphic units with marginal potential include pyroclastic flows and soils that might preserve traces or casts of plants or animals. Most igneous rocks, however, have zero paleontological potential. Other stratigraphic units deposited subaerially in a high energy environment (such as alluvium) may also be assigned a marginal or zero sensitivity rating.

The following brief descriptions of the sedimentary units and their paleontological sensitivity begins with the oldest unit, the Delmar Formation exceeding 50 million years in age, and then lists the remaining units by decreasing age:

> The Delmar Formation was deposited in lagoonal and estuarine environments. The fine-grained (clays to fine sand) clastic sediment comprising this formation was brought down by rivers draining the land to the east. The soft sediment was deposited in a relatively shallow, still-water environment creating a habitat suitable for oysters, clams, worms, and other marine invertebrates. Other fossils found in this formation are estuarine vertebrates, aquatic reptiles, and terrestrial mammals. The rock is highly fossiliferous and possesses high paleontological sensitivity (Givens and Kennedy, 1979; Hanna, 1927).
>
> The Torrey Sandstone was formed as sea level changes brought the shoreline closer, allowing a shorter distance for the water to travel to the sea. This increased the water velocity allowed the water to carry larger grains (sand sized) to the sea. The sand accumulated in offshore bars and submarine canyons. The Torrey Sandstone has yielded important plant and marine invertebrate fossils (Myers, 1991), but the higher-energy depositional regime represented by the sandstone does not lead to the

extensive fossil preservation seen in the Delmar Formation. Therefore, the Torrey Sandstone is assigned a moderate sensitivity rating for paleontological resources.

The following marine sedimentary rocks all possess high paleontological sensitivity:

> Ardath Shale, consisting of predominately of weakly fissile, olive-gray shale, is indicative of a return to deeper and quieter water. Concretionary beds containing molluscan fossils are common. Ardath Shale has produced a diverse and well-preserved assemblage of marine microfossils (Bukry and Kennedy, 1969; Steineck et al., 1972), microinvertebrates (Givens and Kennedy, 1979; Hanna, 1927), and vertebrates.
>
> The Scripps Formation is consistently yellowish brown, silty fine- to medium- grained sandstone with interbeds of siltstone and claystone and occasional cobble conglomerate. Fossils form this formation include remains of marine mollusks, crustaceans, sharks, rays, and bony fish as well as fossil reptiles, land mammals, and occasionally wood (Givens and Kennedy, 1979; Golz and Lillegraven, 1977; Walsh, 1991).
>
> Capistrano Formation has produced diverse assemblages of fossil marine vertebrates including sharks, rays, bony fish, sea birds, toothed whales, baleen whales, sea cows, fur seals, and walruses. Unusual occurrences of fossil marine algae have also been reported in the Capistrano Formation.
>
> San Mateo Formation has yielded the abundant remains of many kinds of fossil marine vertebrates including rays, sharks, bony fishes (Fierstine and Welton, 1988), sea birds (Howard, 1982), dolphins, sperm whale, baleen whales (Barnes, 1976; Barnes et al., 1981), sea cow (Domning and Deméré, 1984), fur seals, walrus, and sea otter (Berta and Morgan, 1985). In addition, terrestrial mammal's remains have been recovered from these deposits.
>
> San Diego Formation is yellowish-gray, fine-grained, friable sandstone and it is an important source of the fossils of Pliocene marine organisms, allowing detailed understanding of the paleoenvironments at that time. Some of the types of fossils found in this formation are an array of marine clams, scallops (Hertlein and Grant, 1972), crabs, barnacles, sand dollars (Hertlein and Grant, 1960), sharks (Deméré and Cerutti, 1981), rays, bony fish, sea birds (Chandler, 1990), walrus (Deméré, 1994), fur seal (Berta and Deméré, 1986), sea cow (Domning and Deméré, 1984), dolphins (Barnes, 1973), and baleen whales (Deméré, 1986). In addition, rare remains of terrestrial mammals including cat, wolf, skunk, peccary, camel, antelope, deer, horse, and gomphothere have also been recovered from the formation. Fossil wood has also been found including remains from pine, oak, laurel, cottonwood, and native avocado (Axelrod and Deméré, 1984).

The Lindavista Formation (Pleistocene) consists of a number of different lithologies, including rust-colored, very well sorted dune sands, course-grained, often poorly sorted sands and sandstones, pebbly sandstones, and pebble-cobble conglomerates. Fossils are not common in the Lindavista formation due to the subaerial and high-

energy depositional regimes represented by the lithologies of this formation. It is therefore assigned a moderate sensitivity rating.

The Bay Point Formation (Pleistocene) is made up of poorly cemented, light brown sandstone. In the vicinity of Torrey Pines State Park, deposits of the Bay Point Formation within 100 feet of present sea level typically have strata yielding fossil marine mollusks (Deméré, 1981; Hertlein and Grant, 1939; Stephens, 1929; Valentine, 1959), while the layers above that elevation have none. The marine and non-marine facies of the Bay Point Formation extend throughout most of coastal San Diego County, and the latter have been recorded by the SDNHM within the study area (Appendix 8.16A). The extensive molluscan fauna from the Bay Point Formation has been assigned to the last interglaciation (Oxygen Isotope Stage 5; U.S. Geological Survey, n.d.) and terrestrial vertebrate remains, including those of the extinct mammoth, tapir, and horse, have been recovered from sediments assigned to the Bay Point Formation. While these terrestrial vertebrate remains are not common in the Bay Point Formation (SDNHM, 2006), it is assigned a high sensitivity rating because of the importance of these remains in understanding the complex paleoenvironmental and tectonic history of the area during the Pleistocene.

Unnamed terrace deposits (Quaternary) consisting of geologically young, unconsolidated fine-grained to course-grained terrestrial and marine facies representing the sediments of beach ridges and terraces, and a range of environments from surf zone to coastal dunes (Deméré, n.d.; Lajoie et al., 1991). These are assigned a moderate sensitivity level, while later Quaternary deposits that have accumulated in topographic lows are assigned a low sensitivity. This ranking of low sensitivity also applies to Holocene-age estuarine and bay mud (Table 8.16-2).

8.16.2.3.2 Results of the Records Search

In accordance with standard guidelines a records search was conducted to identify previously recorded paleontological sites within a three-mile distance from the Project site. The records search was conducted by the SDNHM, and the results returned to the PRS on January 4, 2006. Only one paleontological site is recorded within a three-mile radius of the Project site, and that is about 2.8 miles distant to the northeast. A site in the Pleistocene-age Bay Point Formation is exposed on the south slope of the Sweetwater River arroyo, in the town of Sunny Vista. This is the non-marine portion of the Bay Point Formation, and the SDNHM notes that rare but significant fossils of terrestrial vertebrates have been recovered from the non-marine portion of the Bay Point Formation. These remains have the potential to elucidate the complex history of sea level rise and fall, as well as local tectonism, in the San Diego area (Deméré, n.d.). They can also provide important information on environmental change in the San Diego area since the last glacial age.

8.16.2.3.3 Results of Site Survey

The "Project site" for the purposes of this paleontological resources assessment includes the entire SBPP and the former LNG site area identified for the SBRP construction and the area identified for the relocation of the SDG&E substation. The survey of the site focused on areas where bare soil was observable, and incorporated the understanding that there has been considerable construction-related disturbance in the area in the past. Most recently there have been excavations associated with the dismantling and removal of the LNG tanks

in the south, as well as the removal of the oil storage tanks in the northern portion of the existing SBPP site.

The Project site rests on a mix of imported fill and Holocene-age sediment dredged from San Diego Bay. That this site is characterized by a mixture of dredge spoils and fill is expected given that the elevation of the site had to be raised sufficiently above sea level to allow secure development. The dredge spoil from the adjacent bay and channel outfalls is a silty (muddy) sand, gray to light brown in color, and contains common gastropod shells and occasional pelecypod shell fragments. The shells are white, and neither stained by the host sediment nor mineralized, and therefore are recent in age and not fossil material. The dredge spoil material often appears to be mixed with imported fill, the latter identifiable by the common to abundant, highly angular gravel fragments within it, or by the exotic pea gravel used in some areas.

No fossils or fossil-bearing sediment were identified during the course of the field survey, and exposures of native sediment unaffected by prior excavation could be located in only one area. This single exception is in the northern portion of the Project area, where excavations to remove the foundations of petroleum storage tanks left fill and sediment exposed to depths of approximately 7 to 10 feet. At several areas here a dark gray, horizontally-laminated sandy mud is exposed in the walls of the excavations, at the base of the section. Discontinuously overlying this bay mud is a matrix-supported, sandy conglomerate which displays a light ferruginous staining, and consists of sub-rounded to rounded cobble-sized clasts of varying lithologies. Although it initially appeared to be native sediment, closer inspection revealed asphalt, concrete rip-rap, and iron distributed widely within it. Therefore, while this conglomerate may be local, the recent debris shows that it is not of primary origin and is artificial fill. The bay mud beneath it, however, appears to be native sediment and its occurrence and appearance accord well with what would be expected to occur beneath industrial fill at this locality on the margin of San Diego Bay.

8.16.2.4 Paleontologically Sensitive Units Present

Site survey, records search, and geological maps (Kennedy and Tan, 1977) were used to determine what sediments may be present at or near the Project area, and to determine their level of paleontological sensitivity. The sediments present, or potentially present at the site include the following:

- Artificial Fill: Currently the site is about 12 feet above sea level. Given that it is immediately adjacent to mud flats that are below the high-tide line, approximately 10 feet of fill is anticipated to be present across the site. This fill has zero paleontological sensitivity.
- Estuarine mud and muddy sands representing Holocene sediments of historic and postglacial San Diego Bay, and likely containing fluvial facies near the (presently channelized) drainages crossing the Project area, such as Telegraph Creek. This sediment is anticipated to underlie the artificial fill throughout the site and possesses low paleontological sensitivity.
- The Bay Point Formation is likely present at below the Holocene sediments of current San Diego Bay. Geotechnical soundings indicate a transition to markedly stiffer sediments about 100-feet below the surface (Black & Veatch, 2005), but it is unknown

whether this represents the Bay Point Formation. Given the fact that current sea level was attained only within the last 6,000 years and that during the last glacial age (75,000 to 10,000 B.P.) sea level was as much as 390 feet below that of present, it is likely that terrestrial, as well as marine facies of the Bay Point Formation may be encountered at depth. The Bay Point Formation is assigned high paleontological sensitivity.

8.16.3 Environmental Analysis

The environmental impacts on paleontological resources from both construction and operation of the SBRP, and the demolition of the existing SBPP and its support facilities are presented in the following subsections.

8.16.3.1 Paleontological Resource Significance Criteria

In its standard guidelines for assessment and mitigation of adverse impacts to paleontological resources, the SVP (1995) notes that an individual fossil specimen is considered scientifically important and significant if it is: 1) identifiable, 2) complete, 3) well preserved, 4) age diagnostic, 5) useful in paleoenvironmental reconstruction, 6) a type or topotypic specimen, 7) a member of a rare species, 8) a species that is part of a diverse assemblage, and/or 9) a skeletal element different from, or a specimen more complete than, those now available for that species. For example, identifiable land mammal fossils are considered scientifically important because of their potential use in determining the age and providing input to paleoenvironmental reconstructions for the sediments in which they occur. Moreover, vertebrate remains are comparatively rare in the fossil record. Fossil plants are also important in this regard and, as sedentary organisms, are actually more sensitive indicators of their paleoenvironment and, thus, more important than mobile mammals for paleoenvironmental reconstructions. For marine sediments, invertebrate fossils, including marine microfossils, are scientifically important for the same reasons that land mammal and/or land plant fossils are valuable in terrestrial deposits. The value or importance of different fossil groups varies depending on the age and depositional environment of the stratigraphic unit that contains the fossils, their abundance in the record, and their degree of preservation.

To establish the paleontological sensitivity of each stratigraphic unit likely to be present in or near the Project site the recorded paleontological productivity of those formations was assessed, based on the abundance of fossil remains in that unit elsewhere in southern San Diego County, including previously recorded localities near the Project site. This assessment was completed above (see Sections 8.16.2.3 and 8.16.2.4). According to SVP (1995) standard guidelines, sensitivity comprises both (a) the potential for yielding abundant or significant vertebrate fossils or for yielding a few significant fossils, large or small, vertebrate, invertebrate, or botanical, and (b) the importance of recovered evidence for new and significant taxonomic, phylogenetic, ecologic, or stratigraphic data.

Using the criteria of the SVP (1995) and the sensitivity ratings provided in Section 8.14.2.4, the significance of potentially adverse impacts of earth moving on the paleontological resources was assessed. This assessment reflects the paleontological importance (sensitivity) of the stratigraphic unit, which, in turn, reflects the potential for fossil remains and fossil sites being encountered during earth moving. Any unmitigated impact on a fossil site or a fossil-bearing rock unit during construction/demolition activities would be considered

significant, regardless of the previously determined paleontologic importance of the rock unit in which the site or fossiliferous layer occurs.

8.16.3.2 Paleontological Resource Impact Assessment

The significance of potential adverse impacts of project-related activities on the paleontological resources of each stratigraphic unit anticipated to be present at the Project site is presented in this section. This assessment includes the entirety of the Duke SBPP, include the area proposed for the SBRP; all project-related laterals are anticipated to be within this boundary as well.

- **Artificial Fill—**Construction-related excavations within artificial fill will not result in any adverse impacts to paleontological resources. Reworked and disturbed fossil material may be present in the artificial fill, but lack of stratigraphic context and likely mechanical damage would compromise all scientific values. This would apply to all excavations within 10 feet of current ground surface.
- **Holocene estuarine sediment of San Diego Bay—**Excavations including drilling and trenching extending to depths below 10 feet are likely to affect Holocene-age estuarine or littoral sediments of the ancestral San Diego Bay. This unit has low paleontological sensitivity, but uncontrolled excavation of identifiable and in situ fossils present at depth in this unit would nevertheless be an adverse impact.
- **Bay Point Formation Sediments—**Inferred to be present at depth below Holocene-age bay mud and sands, construction-related disturbance of this unit by trenching, auguring, or other means would constitute a significant adverse impact to paleontological resources because of the potential for the loss of scientifically important fossil remains, unrecorded fossil sites, and associated specimen data and corresponding geologic and paleoenvironmental data where sediments of this formation are affected.

Potential impacts on paleontological resources resulting from implementation of the SBRP can be divided into construction/demolition-related impacts and impacts related to plant operation. Construction/demolition-related impacts to paleontological resources primarily involve terrain modification (excavations, drilling, and drainage diversion measures). No impacts to paleontological resources are expected to occur from the operation of the SBRP or any of its ancillary facilities.

Paleontological resources, including an undetermined number of fossil remains and unrecorded fossil sites; associated specimen data and corresponding geologic and geographic site data; and the fossil-bearing strata, could be adversely affected by (i.e., would be sensitive to) direct environmental impacts resulting from ground disturbance and earth moving associated with construction of the SBRP and the demolition of the SBPP. Direct impacts would result from trenching; augering for concrete pilings and the foundations, installation of electrical towers or poles; and any other earth-moving activity that would disturb previously undisturbed fossiliferous sediments, compromising the scientific value of the paleontological resources affected. Although earth moving associated with construction of the Project site and demolition of the existing SBPP would be a comparatively short-term activity, the loss of fossil remains, unrecorded fossil sites, associated specimen data and corresponding geologic and geographic site data, and the fossil-bearing strata would be a significant and adverse environmental impact.

The SBRP site and the existing SBPP proposed for demolition are located on artificial fill composed of imported material and dredge spoils from San Diego Bay. The depth of this deposit appears greater than ten feet in most areas, and it possesses no paleontological sensitivity. Therefore any construction related disturbance within 10 feet of the current surface would have no effect on paleontological resources. However, deeper excavations at the plant site for foundations for the electrical generators and excavations for pipelines and other facilities may disturb high-sensitivity sediment of the Bay Point Formation, likely to be present below Holocene-age San Diego Bay muds and sands. Thus, project-related excavations could potentially have adverse impacts on significant paleontological resources in the absence of mitigation described below.

8.16.4 Cumulative Impacts

Widespread recent development in San Diego County has resulted in proportionately extensive impacts to paleontological resources, and this is anticipated to continue. The extensive nature of these cumulative impacts is in part due to the widespread presence of a number of fossiliferous sedimentary units (see Section 8.16.2.3.1). There are, however, measures implemented pursuant to both County and City statutes (Table 8.16-1) to realize the scientific and educational potential of these resources and therefore mitigate the cumulative as well as direct impacts of continued development.

If paleontological resources were encountered during project-related ground disturbance, the potential contribution to cumulative impacts to paleontological resources would be negligible, given implementation of the mitigation measures proposed in Section 8.16.5. Full implementation of these measures would effectively recover the value to science of significant fossils discovered during Project construction. Thus, the proposed Project would not cause or contribute substantively to cumulative impacts to paleontological resources.

8.16.5 Mitigation Measures

8.16.5.1 Environmental Checklist

Guidelines for the Implementation of CEQA (Public Resources Code Sections 15000 et seq.) include among the questions to be answered in the Environmental Checklist (Section 15023, Appendix G) the following: "*Would the project directly or indirectly destroy a unique paleontological resource or site*?" and "*Does the project have the potential to... eliminate important examples of the major periods of California... pre-history*?" These questions are answered in the affirmative based on the data and considerations provided above. Because construction of the SBRP and demolition of the SBPP may have potential adverse impacts on significant paleontological resources, mitigation measures are necessary.

8.16.5.2 Proposed Mitigation Measures

This section describes proposed mitigation measures that will be implemented to reduce potential adverse impacts to significant paleontological resources resulting from Project construction. These proposed paleontological resource impact mitigation measures will reduce, to an insignificant level, the direct, indirect, and cumulative adverse environmental impacts on paleontological resources that might result from Project construction. The mitigation measures proposed below for the SBRP are in compliance with CEC

environmental guidelines (CEC, 2000) and with SVP standard guidelines for mitigating adverse construction-related impacts on paleontological resources (SVP, 1991; 1995; 1996):

PALEO-1. Further paleontological assessment is to be done in conjunction with pre-construction geotechnical surveys to better define the subsurface geological features of the SBRP site. Data from drill logs could help confirm the presence of, as well as the vertical and horizontal distribution of, paleontologically sensitive subsurface units, and provide additional data to better anticipate monitoring needs.

PALEO-2. Paleontological Monitoring. Prior to construction/demolition, a qualified paleontologist will be retained as Project PRS to design and implement a monitoring program during project-related earth-moving activities at depths exceeding 10 feet below the current surface. Prior to construction, the paleontologist will review excavation plans to determine whether sensitive stratigraphic units will be disturbed by project-related earth movement. Earth moving construction activities will be monitored where these activities will potentially disturb previously undisturbed sediment. Monitoring will not be conducted in areas where the ground will not be disturbed.

PALEO-3. Paleontological Resources Monitoring and Mitigation Program. The Paleontological Resources Monitoring and Mitigation Program (PRMMP) will be developed for review and approval by the CEC prior to implementation. The PRMMP will include: construction monitoring and coordination; emergency discovery procedures; sampling and data recovery, if needed; museum storage coordination for any specimen and data recovered; preconstruction coordination; and reporting. Reporting requirements will include monthly monitoring reports as well as a final report.

PALEO-4. Construction Personnel Education. Prior to working on the site for the first time, all personnel involved in earth-moving activities will be provided with Paleontological Resources Awareness Training as a module in their worker environmental awareness training. They will be informed that fossils may be encountered, provided with information on the appearance of fossils, the role of paleontological monitors, and on proper notification procedures. This worker training will be prepared and initially presented by a qualified paleontologist. Subsequent training may be conducted using recorded and hard copy training materials.

Implementation of these mitigation measures will reduce the potential impact from project-related ground disturbance on paleontological resources to an insignificant level by allowing for the recovery of fossil remains and associated specimen data, and corresponding geologic and paleoenvironmental site data, that otherwise might be lost to earth moving and to unauthorized fossil collecting. These scientific and associated educational values constitute the chief significance of the resource, and their recovery therefore mitigates the impacts to that resource.

With a well-designed and implemented PRMMP, Project construction could potentially result in beneficial impacts to paleontological resources through the recovery of fossil remains that would otherwise not have been exposed and, therefore, would not have been available for study. This consideration is particularly applicable to this area with its complex geological history as well as a paucity of fossil sites in western Chula Vista. The recovery of fossil remains as part of project construction could help answer important questions regarding the geographic distribution, stratigraphic position, and age of fossiliferous sediments in the area.

8.16.5.3 Significant Unavoidable Adverse Impacts

No significant unavoidable adverse impacts on paleontological resources are anticipated as a result of the construction and/or operation of the SBRP and related facilities.

8.16.6 Involved Agencies and Agency Contacts

The CEC has jurisdiction over paleontological resources for this Project. In light of the City of Chula Vista and San Diego County emphases on paleontological resources documentation, copies of the final paleontological resources report will be provided to those agencies, and well as to the SDNHM.

8.16.7 Permits Required and Permit Schedule

No state, county, or city agency requires a paleontological collecting permit to allow for the recovery of fossil remains discovered as a result of construction-related earth moving on this Project site.

8.16.8 References

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