5.8 Paleontological Resources

This section presents the potential effects on paleontological resources (fossils) from the construction and operation of the Contra Costa Generating Station (CCGS). Section 5.8.1 discusses the affected environment, including the resource inventory and its results. Section 5.8.2 presents the environmental analysis and impact assessment. Section 5.8.3 considers cumulative effects on paleontological resources, and 5.8.4 presents Applicant-proposed mitigation measures. Section 5.8.5 discusses applicable laws, ordinances, regulations, and standards (LORS). Section 5.8.6 lists involved agencies, Section 5.8.7 lists permits, and Section 5.8.8 provides the references consulted.

This section of the Application for Certification (AFC) meets all siting regulations of the California Energy Commission (CEC) (2000, 2007) and conforms with the recommendations of the Society of Vertebrate Paleontology (SVP, n.d.) that address the assessment of and mitigating impacts on paleontological resources resulting from earth-moving activities. 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 on 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 central California, including in Contra Costa County where the project is located.

5.8.1 Affected Environment

5.8.1.1 Physiographic Setting

The proposed site of CCGS is in the northwestern-most and lowest portion of the San Joaquin Valley about 0.6 mile south of the San Joaquin River, on the southwestern margin of the San Joaquin-Sacramento River Delta. As such, the project site lies along the boundary between the Coast Ranges (here recognized as the Diablo Range) to the west and south, and the Great Valley (Central Valley) physiographic province to the east and north. The Los Medanos Hills, which are the piedmont of the Diablo Range here, lie about 1.7 miles southwest. The project area occupies land between the Los Medanos Hills and the low, flat historic floodplain of the San Joaquin River to the north. This area is typified by relict sand dunes and an associated sand sheet, which in some areas is incised by postglacial erosion to a depth of 30 to 40 feet (Graymer et al., 2002). To the south, and in terraces within major drainages, alluvium from the Los Medanos Hills comprises the near-surface sedimentary blanket.

This region is known as the Coast Ranges–Sierran Block boundary zone and is delineated by a series of low hills and complex thrust/reverse faults. The Great Valley and the adjacent Sierra Nevada form a relatively stable crustal block (Sierran block) composed of Mesozoic crystalline basement that dips gently to the west. The western edge of the Sierra Nevada block is buried beneath the sediments of the Great Valley, and its terminus at great depth is generally thought to be coincident with the western margin of the Great Valley (Wahrhaftig and Birman, 1965).

The Great Valley physiographic province separates the Coast Ranges to the west from the Sierra Nevada to the east (Fenneman, 1931). This province is comprised of two elongated northwest- to southeast-trending basins: the Sacramento basin to the northwest and the San Joaquin basin to the southeast. This province is approximately 435 miles long and 44 to 56 miles wide, and characterized by a thick, relatively undeformed sequence of alluvium and volcanic deposits. The present-day basin evolved from a late Jurassic to middle Tertiary (40–150 million years ago [Ma]) marine fore-arc basin. During the Jurassic and Cretaceous, much of the area was a deep abyssal plain, in the range of 10,000 feet below sea level (Dickinson and Rich, 1972).

In the mid-Tertiary (25–30 Ma), a change in the relative motion between the Pacific and North American plates resulted in the gradual uplift of the Coast Ranges and the eventual isolation of the Central Valley basin from the ocean. More recent Miocene through Pleistocene sediments were derived from the bounding Coast Ranges and the Sierra Nevada. By the late Pliocene (2–3 Ma), subaerial depositional conditions prevailed and Sierra Nevada–derived sediments dominated basin deposition (Wahrhaftig and Birman, 1965).

The Coast Ranges are a north-northwest- to northwest-trending series of mountains and intervening valleys extending for almost a thousand miles from Washington state south to the Santa Ynez River near Santa Barbara. The Los Medanos Hills, which represent the closest Coast Range outcrops, about a mile southwest of the project area, are composed of the Plio-Pleistocene Tulare Formation, and then shallow marine rocks of the Miocene Neroly Formation (Graymer et al., 1997) stratigraphically above those. The Tulare Formation comprises the youngest deformed sedimentary unit in the Diablo Range sequence, and can be correlated with older Quaternary deposits along the west margin San Joaquin Valley for some distance to the south (Wahrhaftig and Birman, 1965). The transmission line extends farther south onto the incised alluvial fan extending toward the river from the Los Medanos Hills (see Figure 5.4-1 in Section 5.4, Geological Hazards and Resources).

5.8.1.2 Resource Inventory Methods

Published and available unpublished geological and paleontological literature was reviewed 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. Sources included geological maps, satellite photography, technical and scientific reports, and electronic databases. An updated paleontological resources record review was conducted for the project using the online database maintained by the University of California Museum of Paleontology at Berkeley (UCMP). Additionally, Dr. Spaulding has served as project paleontological resources specialist for two phases of constructed-related excavations related to Pacific Gas and Electric Company's (PG&E) Gateway Generation Station 0.75 mile to the northwest, and supervised excavation monitoring of that site as well as linear facilities that extend to the municipal water treatment facility station, only several hundred feet northwest of the current project site.

Field survey of the proposed plant area and reconnaissance of the right-of-way (ROW) for the transmission line was conducted by the project paleontological resources specialist on April 22, 2009. Freshly tilled earth within the vineyards of the plant site allowed thorough survey of that area. Field reconnaissance rather than formal survey was made of the transmission line corridor because most of the area of potential effect along the ROW is

obscured by vegetation, fill, or development. No fossiliferous sediments could be observed within the boundary of the plant site or along the ROW.

5.8.1.3 Resource Inventory Results

5.8.1.3.1 Geological Units in the Vicinity

The disturbed agricultural soils within the boundary of the plant site are a fine to medium, brown sand that represents a Late Pleistocene to early Holocene age eolian deposit, part of the geographically extensive sand sheets and relict sand-dune systems in the Sacramento-San Joaquin Delta area (Atwater, 1982; Helley and Graymer, 1997) that apparently formed under an effectively drier climate. At the plant site, this surface undulates to the extent that there are two topographic highs near the northern and northeastern margin of the site, and a depression to the southwest that is linear and oriented southeast-northwest. The low likely represents a filled drainage while the topographic highs, presenting a total relief of approximately 15 feet, likely represent two adjacent sand-dune crests. Alternatively, they may be erosional remnants; the result of widespread fluvial erosion of a thick but unconsolidated sand sheet deposited immediately south of the floodplain of the San Joaquin River. During the survey no fossils, fossil fragments, carbonate pseudomorphs, or carbonate nodules were noted. The homogeneity of this sand is consistent with its eolian nature, but lack of evidence of carbonate accumulation suggests that the unit actually is not as old as Late Pleistocene in age. Carbonates indicate substantive soil development and therefore appreciable age.

The historical floodplain of the San Joaquin River lies less than 0.5 mile to the north of the project site and represents local base level. The plant site and the transmission line corridor all lie upon what has been mapped as Quaternary (Late Pleistocene and Holocene) dune sand by Helley and Graymer (1997), except for the approximately 0.4-mile stretch immediately east of the PG&E substation. This material is mapped as Holocene alluvial fan (fine-grained alluvium), with limited exposures of Pleistocene alluvium near the bed of the arroyo that lies about 0.5 mile east of the substation (Helley and Graymer, 1997). Other than the alluvium and dune sand, there are no other geological units mapped within 0.5 mile of the project site or the transmission line ROW. The closest outcrops of the Tulare Formation and the Neroly Sandstone lie between 0.5 and 0.8 mile south of the east-west segment of the transmission line ROW (Graymer et al., 1994). In-field review of the project area confirms that there are no outcrops closer to the project area.

5.8.1.3.2 Results of the Records Search

A search of the UCMP database on March 16, 2009, queried Quaternary fossil site records within Contra Costa County. The results can be used as a general guide to the paleontological potential (the likelihood of yielding scientifically significant fossils) of the sediments in the vicinity of the project, with allowance for the nature of the data. In this area there have been a number of microfossil studies (e.g., pollen, radiolaria, diatoms, foraminifera), and these microfossil localities are also listed in the UCMP database. Many sediments that yield microfossils or isolated invertebrate remains are largely devoid of plant or vertebrate megafossils. Additionally, many invertebrate and microfossil localities in the UCMP database have no associated catalogued specimens (UCMP, n.d.). Invertebrate localities include sites where a molluscan fauna can yield important data, but also sites where only sponge spicules or echinoderm plates were noted. When microfossil and invertebrate localities are excluded, the resultant number of vertebrate fossil sites is smaller

(there are no plant megafossil localities listed for Quaternary sediments in Contra Costa County), and more reflective of the paleontological potential of the sedimentary unit. The total number of Quaternary-age (Pleistocene and Holocene) fossil localities recorded by the UCMP for Contra Costa County is 160, with 61 fossil vertebrate localities. Of these, 13 localities are from the east and northeast side of the Diablo Range

There are no known fossil localities within 1 mile of the project site or its transmission line. Because there are no known paleontological localities within 1 mile of the project area, no map of paleontological localities accompanies this assessment.

In addition to the record search and literature review, a paleontological resources survey of the project area and linears yielded no fossil material. Finally, approximately 2 years of paleontological resources monitoring associated with development of PG&E's Gateway Generating Station yielded no evidence of fossil material.[1]

5.8.1.3.3 Paleontological Sensitivity of the Project Site

Paleontological sensitivity is the qualitative assessment made by a professional paleontologist taking into account the paleontological potential of the stratigraphic units present, the local geology and geomorphology, and any other local factors that may be germane. According to SVP (n.d.) standard guidelines sensitivity comprises (1) the potential for yielding abundant or significant vertebrate fossils or for yielding a few significant fossils, large or small, vertebrate, invertebrate, or paleobotanical remains, and (2) the importance of recovered evidence for new and significant taxonomic, phylogenetic, paleoecological, or stratigraphic data (Table 5.8-1).

TABLE 5.8-1
Paleontological Sensitivity Ratings Employed

	Definition
High	Assigned to geological formations known to contain paleontological resources that include rare, well-preserved, and/or fossil materials important to on-going paleoclimatic, paleobiological and/or evolutionary 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.
Moderate	Stratigraphic units that have yielded fossils that are but moderately well preserved, are common elsewhere, and/or that are stratigraphically long ranging would be assigned a moderate rating. This evaluation also can be applied to strata that have an unproven but strong potential to yield fossil remains based on the stratigraphy and/or geomorphologic setting.
Low	Sediment that is relatively recent, or that represents 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. This evaluation also can be applied to strata that have been monitored and that have failed to yield scientifically significant fossil remains.
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) also may be assigned a marginal or zero sensitivity rating. Manmade fill is also considered to possess zero (no) paleontological potential.

[1] Monitoring records are maintained by CH2M HILL's senior paleontologist, Dr. W. Geoffrey Spaulding (geof.spaulding@ch2m.com).

As noted above, within 0.5 mile of the project area geological units are limited to Late Pleistocene and Holocene fine-grained alluvium and eolian sand. There are no known paleontological localities within 1 mile of the project site or its laterals, and recent paleontological monitoring of the same geological units nearby have failed to yield scientifically significant fossil remains. A "low" sensitivity rating is therefore applied to Quaternary (Pleistocene and Holocene) sediments (dune sand and alluvium) because they are generally devoid of fossils in this area.

The depth to undisturbed sediment is variable from place to place but, generally extends at least to the bottom of the "plow zone", 3 to 4 feet below the surface. Material above this depth has no potential to yield scientifically important fossils, and therefore possesses no paleontological sensitivity.

5.8.2 Environmental Analysis

The subsurface of the CCGS facility consists of Quaternary dune sand. The project transmission line ROW crosses chiefly Quaternary dune sand and a limited area of Quaternary alluvium. The environmental impacts on paleontological resources from construction and operation of the CCGS are presented in the following sections.

5.8.2.1 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, or (9) a skeletal element different from, or a specimen more complete than, those now available for that species. For example, identifiable land mammal or terrestrial plant fossils are considered scientifically important because of their potential use in determining the age and paleoenvironment of the sediments in which they occur. Moreover, vertebrate and plant remains are comparatively rare in the fossil record. Fossil plants are particularly important in this regard and, as sessile (anchored in place) organisms, are actually more sensitive indicators of their paleoenvironment and, thus, more important than mobile mammals for paleoenvironmental reconstructions.

For marine sediments, invertebrate megafossils (e.g., mollusks, cephalopods) are scientifically important for the same reasons that land mammal and/or land plant fossils are valuable in terrestrial deposits. Marine microfossils such as foraminifera or radiolaria are much more common, and consequently usually not considered for resource protection because of their relative abundance. 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.

Using these criteria and the sensitivity ratings provided above, the significance of potentially adverse impacts of earth moving on the paleontological resources was assessed. Any unmitigated impact on a fossil site, or on a fossil-bearing rock unit of high or moderate sensitivity, would be considered significant.

5.8.2.2 Paleontological Resource Impact Assessment

The significance of 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 project area including the transmission line. All facility components are expected to impact previously disturbed sediments at shallow depth in the plow zone, within 3 to 4 feet of the surface, and Quaternary dune sand. The transmission interconnect will also affect Holocene alluvium and may affect limited exposures of Pleistocene alluvium.

Previously Disturbed Sediment – Construction-related excavations within the plow zone will not result in any adverse impacts on paleontological resources. Reworked and disturbed fossil material can be present in previously disturbed sediment or fill, but lack of stratigraphic context and likely mechanical damage would compromise all scientific values. This would apply to all excavations within 3 feet of current ground surface and operations such as grading and surface preparation for roads and parking areas. Therefore, no impacts on paleontological resources will occur from excavations within 3 feet of the surface or grading in previously disturbed sediment.

Quaternary Dune Sand and Alluvium – Excavations including drilling and trenching extending to depths below 3 feet within the current plant compound, as well as for tower footings along the transmission line, will affect Quaternary-age dune sand and alluvium. Quaternary sediments here possess low paleontological sensitivity because they have failed to yield significant fossil resources nearby, and are not of a sediment type expected to frequently yield fossils. As noted above, subaerially deposited sediment such as alluvium and eolian sand does not normally provide a suitable environment for fossil preservation. Excavation is therefore not expected to affect fossil resources in these sediments because none are anticipated to be present at depth in these units (Quaternary dune sand, and Holocene and Pleistocene alluvial units).

Because no excavations in paleontologically sensitive sediments are anticipated from either the operation or the maintenance of the project, no impacts on paleontological resources are expected from the operation and maintenance of the CCGS.

5.8.3 Cumulative Effects

Widespread development in the San Francisco Bay area and in the Central Valley has resulted in proportionately extensive impacts on paleontological resources, and this is anticipated to continue, albeit not at the rate that existed prior to the current economic recession, and not at the rate that existed before implementation of the California Environmental Quality Act (CEQA). The extensive nature of these cumulative impacts is due to this extensive development combined with the widespread presence of numerous fossiliferous sedimentary units in the region, if not in this project area. However, measures typically implemented pursuant to state statutes (see Section 5.8.6) serve to mitigate these impacts through the recovery of the scientific and educational potential of the affected paleontological resources. Although not all projects are subject to CEQA review, and only a proportion of those incorporate paleontological protection measures, application of paleontological monitoring and mitigation measures is common and therefore mitigates the cumulative and direct impacts of continued development.

The potential of this project to contribute to cumulative impacts on paleontological resources is low, given the low paleontological sensitivity of the sediments to be disturbed. Thus, with the mitigation described below, the contribution of CCGS to cumulative negative impacts on paleontological resources would be negligible.

5.8.4 Mitigation Measures

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 negative based on the data and considerations provided above.

Because construction of CCGS has no appreciable potential to result in adverse impacts on significant paleontological resources, the mitigation measures described below are limited. The mitigation measures proposed below in compliance with CEC environmental guidelines (CEC, 2000; 2007) and with SVP standard guidelines for mitigating adverse construction-related impacts on paleontological resources (SVP, n.d.). Implementation of these mitigation measures would assure that the potential impacts from project-related ground disturbance on paleontological resources would be maintained at an insignificant level.

5.8.4.1 Project Paleontological Resources Specialist

No less than 60 days prior to the start of construction, the project proponent will submit the name and resume of a qualified paleontological resources specialist (PRS) to the CEC for review and approval. This individual will prepare the paleontological resources module of the worker education program and be available during the course of ground-disturbing construction in case there is an unanticipated paleontological discovery. The name and contact information of the PRS will be provided to all construction management personnel, the compliance manager, and the cultural resource monitors (if any).

5.8.4.2 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. This training ideally would be provided as a module in the 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 the PRS. Subsequent training may be conducted via video presentation and hard-copy training materials.

5.8.5 Laws, Ordinances, Regulations, and Standards

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 environmental regulations (CEQA, Section 15064.5). Professional standards for assessment

and mitigation of adverse impacts on paleontological resources have been established by the SVP (n.d.). Design, construction, and operation of CCGS will be conducted in accordance with all LORS applicable to paleontological resources. Federal, state, and local LORS applicable to paleontological resources are summarized in Table 5.8-2 and discussed briefly below, along with professional standards for paleontological resources assessment and impact mitigation.

TABLE 5.8-2
Laws, Ordinances, Regulations, and Standards Applicable to Paleontological Resources

LORS	Applicability	AFC Reference	Project Conformity
Omnibus Public Land Management Act of 2009 (H.R. 146), Title 6, Subtitle D	Not applicable – Applies only to federal land managed by the Secretaries of the Interior and Agriculture	—	—
Antiquities Act of 1906	Not applicable – No federal land involved, or federal entitlement required	—	—
National Environmental Policy Act of 1969	Not applicable – No federal land involved, or federal entitlement required	—	—
CEQA, Appendix G	Applicable – Requires assessment of the potential to affect paleontological resources during earth-moving activities	Sections 5.8.2, 5.8.3, and 5.8.5	Yes
Public Resources Code, Sections 5097.5/5097.9	Not applicable – Applies to state-owned land	—	—
Contra Costa County General Plan 2005-2025	Applicable – Paleontological resources are not addressed per se.	-	-
City of Oakley General Plan	Applicable - Requires assessment of the potential to affect paleontological resources during development planning	Sections 5.8.2, 5.8.3, and 5.8.5	Yes

5.8.5.1 Federal LORS

Federal protection for significant paleontological resources would apply to CCGS only if any construction or other related project impacts occur on federally owned or managed lands, or if a federal entitlement or other permit were required. On March 31, 2009, President Obama signed into law the Omnibus Public Land Management Act of 2009 (H.R. 146; OPLMA). Implementing regulations for this law have yet to be developed by the affected agencies. Title 6, Subtitle D of the OPLMA, Paleontological Resources Preservation, requires the secretaries of the Department of the Interior (exclusive of Indian trust lands) and the Department of Agriculture (insofar as U.S. Forest System lands are concerned) to "…manage and protect paleontological resources on Federal land using scientific principals and expertise… (and) develop appropriate plans for inventory, monitoring, and the scientific and educational use of paleontological resources…". The OPLMA further excludes casual collection from restrictions under the law, and then describes the requirements for permitting collection on federal lands, stipulations regarding their use in education, continued federal ownership of recovered paleontological resources, and standards for

acceptable repositories of collected specimens and associated data (OPLMA, Sections 6303-6305). The OPLMA also provides for criminal and civil penalties for unauthorized removal of paleontological resources from federal land, and rewards for reporting the theft of fossils (Sections 6306-6309).

Additional 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. Because no federally owned or managed lands will be affected by this project, and no federal entitlement or other permit is required, these statutes do not extend to paleontological resources (see Table 5.8-2).

5.8.5.2 State LORS

The CEC environmental review process under the Warren-Alquist Act is considered functionally equivalent to that of CEQA (Public Resources Code Sections 21000 et seq.). CEQA requires that public agencies and private interests identify the environmental consequences 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]). The CEQA Guidelines (Public Resources Code Sections 15000 et seq.) define 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:

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

The CEQA lead agency having jurisdiction over a project is responsible for ensuring 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 CCGS 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.

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. However, for this project the answer to these questions is "unlikely" if not "no," and therefore a mitigation and monitoring plan is not warranted for this project at this time.

Other state requirements for paleontological resource management are in California Public Resources Code Chapter 1.7, Section 5097.5/5097.9 (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. Public Resources Code, Sections 5097.5/5097.9 does not apply to CCGS because construction or other related project impacts will not occur on state owned or managed lands and no state agency is intended to obtain ownership of project lands during the term of the project license (Table 5.8-2).

5.8.5.3 Local LORS

The Contra Costa County General Plan 2005-2025 (Contra Costa County, 2005) places emphasis on the preservation of historic and cultural resources, but does not address paleontological resources per se. Nevertheless, county approval of projects includes review for CEQA compliance, and the CEQA Environmental Checklist employed does include the Appendix G, Section V, part c question regarding paleontological resources (see Section 5.8.6.2).

The City of Oakley 2020 General Plan (City of Oakley, 2002) Open Space and Conservation Element "expresses community goals to protect environmental resources…Specifically… Cultural resources in terms of known and potential archaeological and paleontological resources." It further states that there "have been few archeological or paleontological finds in the City of Oakley. However, given the rich history of the Plan Area and region, the City will continue to require site evaluation prior to development of undeveloped areas, as well as required procedures if artifacts are unearthed during construction." Toward that end, the City of Oakley Plan Goal 6.4 is to "Encourage preservation of cultural resources within the

Plan Area." And Policy 6.4.1 implementing that goal is to "Preserve areas that have identifiable and important archaeological or paleontological significance" (City of Oakley, 2002).

5.8.5.4 Professional Standards

The SVP, an international organization of professional paleontologists, has established standard guidelines (SVP, n.d.) 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.

5.8.6 Agencies and Agency Contacts

There are no agencies having blanket jurisdiction over paleontological resources. The CEC has jurisdiction over paleontological resources for this project. The Contra Costa County General Plan 2005-2025 (Contra Costa County, 2005) places emphasis on the preservation of historic and cultural resources, but does not address paleontological resources. The City of Oakley does require consideration of potential impacts on paleontological resources prior to site development (City of Oakley, 2002). If encountered, scientifically significant fossil specimens and associated site records will be submitted to the UCMP (Table 5.8-3).

TABLE 5.8-3
Agency Contacts for Paleontological Resources

Issue	Agency	Contact
Contra Costa County Historical Resources	Contra Costa County Department of Conservation and Development	Pat Roche Contra Costa County Department of Conservation and Development 651 Pine Street Martinez, CA 94553 (925) 335-1290
City of Oakley Paleontological Resources Impact Assessment	City of Oakley Community Development Department	Kenneth Stelo or Joshua McMurray Community Development Department City of Oakley 3639 Main Street Oakley, CA 94561 (925) 625-7036 or (925) 625-7004
Paleontological Resources Documentation and Specimen Repository	UCMP	Dr. Patricia Holroyd Curator of Vertebrate Paleontology 1101 Valley Life Sciences Building Berkeley, CA 94720-4780 (510) 642-3733

5.8.7 Permits 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.

5.8.8 References

Atwater, B.F. 1982. *Geologic maps of the Sacramento-San Joaquin Delta.* USGS Miscellaneous Field Studies Map MF-1401. U.S. Geological Survey, Denver, CO.

California Energy Commission (CEC). 2000. Paleontological Resources: *in* Regulations Pertaining to the Rules of Practice and Procedure & Power Plant Site Certification.

California Energy Commission (CEC). 2007. Paleontologic Resources: *in* Complete Text of the Energy Commission's Proposed Amendments to the Power Plant Siting Regulations.

California Office of Historic Preservation. 1983. Summary of State/Federal Laws Protecting Cultural Resources.

City of Oakley. 2002. 2020 General Plan. Oakley, California.

Contra Costa County. 2005. Contra Costa County General Plan 2005-2025. Contra Costa County Department of Conservation and Development. Martinez, California. http://www.co.contra-costa.ca.us/documentcenterii.asp.

Dickinson, W.R., and E. I. Rich. 1972. Petrologic intervals and petrofacies in the Great Valley sequence, Sacramento Valley, California. *Geological Society of America Bulletin* 83: 3007-3024.

Fenneman, N. M. 1931. Physiography of Western United States. McGraw-Hill Book Company, New York, NY.

Fisk, L. H., and L. A. Spencer. 1994. Highway Construction Projects Have Legal Mandates Requiring Protection of Paleontological Resources (fossils). p. 213-225, *in* Scott F. Burns (editor), *Proceedings of the 45th Highway Geology Symposium, Portland, Oregon*.

Graymer, R.W., D.L. Jones, and E.E. Brabb. 2002. Geologic map and map database of northeastern San Francisco Bay region, California -- most of Solano County and parts of Napa, Marin, Contra Costa, San Joaquin, Sacramento, Yolo, and Sonoma Counties: U.S. Geological Survey, Miscellaneous Field Studies Map MF-2403, scale 1:100,000. Denver, CO.

Graymer, R.W, D.L. Jones, and E.E. Brabb. 1994. Preliminary geologic map emphasizing bedrock formations in Contra Costa County, California: A digital database. U.S. Geological Survey Open-file Report OFR94-622. Denver, CO.

Helley, E.J., and R.W. Graymer. 1997. Quaternary Geology of Contra Costa County, and Surrounding Parts of Alameda, Marin, Sonoma, Solano, Sacramento, And San Joaquin Counties, California: A Digital Database. U.S. Geological Survey Open-file Report OFR97-98. Denver, CO.

Marshall, L. G. 1976. Paleontological Salvage and Federal Legislation. *Journal of Paleontology*. vol. 50, p. 346-348.

Society of Vertebrate Paleontology (SVP). n.d. Assessment and Mitigation of Adverse Impacts to Nonrenewable Paleontologic Resources: Standard Guidelines. Web site: http://vertpaleo.org/ society/polstatconformimpactmigig.cfm.

University of California, Berkeley, Museum of Paleontology (UCMP), n.d. About the UCMP collections catalog. Web site: http://ucmpdb.berkeley.edu/about.shtml

Wahrhaftig, Clyde, and J. H. Birman. 1965. The Quaternary of the Pacific mountain system in California. In *The Quaternary of the United States*, edited by H. E. Wright, Jr., and D. G. Frey, pp. 299-340. Princeton University Press, New Jersey.