# D.5 Geology, Soils, and Paleontology

Section D.5.1 provides a summary of existing geological, soil, and paleontological conditions present along the alignment of SDG&E's proposed Miguel-Mission 230 kV #2 Project and associated geologic and seismic hazards. Applicable regulations, plans, and standards are listed in Section D.5.2. Potential impacts and mitigation measures for the Proposed Project are presented in Section D.5.3; and alternatives are described and discussed in Sections D.5.4 and D.5.5. Mitigation monitoring, compliance, and reporting are discussed in Section D.5.6.

## D.5.1 Environmental Setting for the Proposed Project

This section presents a discussion of the regional topography, geology, seismicity, soils, and mineral and paleontological resources in the project area. Baseline geologic information was collected from published and unpublished geologic, seismic, and geotechnical literature covering the Proposed Project alignment and the surrounding area. The literature review was supplemented by a field reconnaissance of the proposed alignments. The literature review and field reconnaissance focused on the identification of specific geologic hazards and paleontologic resources.

The project alignment is located in the southern part of the Peninsular Ranges Geomorphic Province of southern California. This province extends from south of the U.S.–Mexico border northward to the southern mountain front of the Transverse Ranges (just north of Los Angeles) (Norris and Webb, 1990). The province is bounded on the east by the Colorado Desert province. The landscape in the eastern part of the project area is defined by fault-block mountains separated by alluvium-filled valleys. Wide, sand- and boulder-filled river washes cut through the mountains and across the valleys in this part of the project area. The western part of the project area has a landscape of low hills and mesas developed on ancient, uplifted erosional terraces.

### Topography

The project alignment traverses diverse topography ranging from flat and sandy washes of the San Diego River to the moderate to steep slopes on San Miguel Mountain and the granite mountains south and east of El Cajon. Elevations along the proposed alignment range from about 100 feet where the alignment crosses Mission Valley, to 1,450 feet in the granite mountains north of Forment are presented in Table D.5-1. Elevations were determined using USGS 7½-minute quadrangles from TOPO software (TOPO, 2002).

**Table D.5-1. Elevations Along the Miguel-Mission 230 kV #2 Project (feet above mean sea level)**

| Location | Elevation |
|---|---|
| Miguel Substation | Approx 500 |
| San Miguel Mountain | 1,280 |
| Jamacha Valley | 350 |
| Forester Creek | 980 |
| Interstate 8 crossing | 610 |
| Los Coches Substation near Lake Jennings | 480 |
| San Diego River crossing | 435 |
| Moreno Valley | 422 |
| Eucalyptus Hills | Less than 1,000 |
| Sycamore Canyon | 400 |
| Fanita Junction | 700 |
| Mission Valley | 100 |
| Mission Substation | 300 |

Source: National Geographic Holdings software program TOPO (2002).

### Geology

The Peninsular Ranges region is underlain primarily by Cretaceous age plutonic (i.e., granitic) rocks that formed from the cooling of molten magmas deep within the earth's crust. Intense heat associated with these cooling plutonic magmas metamorphosed the ancient sedimentary and volcanic rocks into which the plutons intruded. These metamorphic rocks are now preserved in the Peninsular Ranges region as slates, schists, and metavolcanic rocks. In the western half of the project area, younger (Tertiary-age), mostly flat-lying sedimentary rocks overlie the granite or metamorphic rocks on mesas and ridges.

Geologic conditions anticipated to be encountered during construction of the Proposed Project are summarized in Table D.5-2. This table lists each geologic formation, a description of the formation's general rock type or lithology, the slope stability, excavation characteristics, where the formation occurs along the project alignment, and age of each formation along the Proposed Project route.

**Table D.5-2. General Descriptions and Characteristics of the Geologic Formations**

| Formation Name | Lithologic Description | Slope Stability | Excavation Characteristics | Occurrence Along Alignment | Age |
|---|---|---|---|---|---|
| Alluvium, Colluvium, and Riverwash | Unconsolidated silt, clay, sand, and gravel. Riverwash consists of loose sand, gravel, cobbles, and silt. | Unstable on slopes and subject to erosion. | Easy | In the Jamacha Valley, Los Coches Canyon (Interstate 8 crossing), and the San Diego River Valley. | Quaternary |
| Marine Terrace Formations | Marine deposits and marine terrace deposits of semi-consolidated claystone, siltstone, and sandstone. | Contains many land-slides. Semi-stable to unstable on slopes, subject to erosion. | Moderate to easy | Capping some of the ridges and mesas be-tween Fanita Junction and Mission Substation. | Pleistocene |
| Otay Formation | Poorly indurated massive light-colored sandstone, siltstone and claystone. The claystone is interbedded with bentonite layers and lenses. | Contains many land-slides. Semi-stable to unstable on slopes, subject to erosion. | Difficult | Only at Miguel Substation. | Oligocene-Pliocene (Tertiary) |
| Poway Group (includes the Pomerado conglomerate, Mission Valley Formation, and Stadium conglomerate.) | Light brown sandy cobble conglomerate and conglom-eratic sandstone with thin interbeds and lenses of sand and shale. Contains distinctive "Poway" clasts: well rounded, very hard, metamorphosed siliceous volcanic rocks and quartzite. | Contains many land-slides. Semi-stable to unstable on slopes, subject to erosion. | Difficult due to well-cemented cobble con-glomerate beds. | Along northern portion of alignment starting just west of Euca-lyptus Hills and con-tinuing (with minor interruptions) to Mission Substation. | Eocene |
| Friars Formation | Sandstone and claystone. Sandstone is massive, yellow-gray, poorly indurated and arkosic. Claystone contains mixed clays and is highly expansive. Unit contains thin lenses of conglomerate. | Contains many land-slides. Semi-stable to unstable on slopes, subject to erosion. | Easy to moder-ate, conglom-erate lenses and caliche layers present | Similar extent as Poway Group, and occurs beneath the Poway Group in northwestern portion of the study area. | Lower Eocene |
| Granitic Rocks | Undifferentiated plutonic rocks of the southern California batholith include: tonalite, granodiorite, granite, quartz diorite, pegmatite, alaskite, aplite, quartz norite, gabbroic rocks and minor amounts of rock types listed for the Santiago Peak Volcanics. | Stable on slopes but steep slopes are subject to raveling, erosion, rock fall, and debris flow. | Easy near weathered surface, becomes more difficult with depth. | From about a mile south of Steele Can-yon to just south of Lake Jennings Res-ervoir. From west side of Moreno Valley to just west of Euca-lyptus Hills, and for about a mile where alignment crosses Fortuna Mountain. | Cretaceous |

**Table D.5-2. General Descriptions and Characteristics of the Geologic Formations**

| Formation Name | Lithologic Description | Slope Stability | Excavation Characteristics | Occurrence Along Alignment | Age |
|---|---|---|---|---|---|
| Santiago Peak Volcanics | Mildly metamorphosed volcanic, volcaniclastic, and sedimentary rocks. Volcanic rocks range from basalt to rhyolite, but are predominantly andesite and dacite. | Stable to semi-stable on slopes, but due to severe jointing and steep slopes, it is subject to raveling, erosion, rock fall, and debris flow. | Difficult | San Miguel and Mother Miguel Mountains, along hilly part of the southern portion of alignment. | Jurassic to Cretaceous |
| Metavolcanic and other metamorphic rocks | Slate, metavolcanics, and various metasedimentary rocks as narrow bodies (1-2 miles wide) between granitic plutons. | Stable to semi-stable on slopes, but due to severe jointing and steep slopes, it is subject to raveling, erosion, rock fall, and debris flow. | Moderate to difficult | East of El Cajon on Dehesa Mountain, at Los Coches Substation, and north to San Diego River in narrow (1/2 to 1 mile) swaths within granitic rocks. | Triassic to Jurassic |

Source: Southern part of study area: S.S. Tan (1992); eastern part of study area: CDMG (1962); *Kuper, H.T. (1977); northern part of study area CDMG (1975).

## Soils

A variety of soil types occur in the large, diverse area of central San Diego County. The following issues were discussed in the 1973 Soil Survey: soil type, erodibility, and shrink-swell capacity. The soil types associated with granitic rock in the project area are highly susceptible to erosion due to the large, loose grains generated by the weathering of crystalline granite. Erodible soils generally correspond to those on the hillsides and mountains where granitic bedrock is close to or at the surface (SCS, 1973). Soils with shrink-swell or expansion potential are found developed on the sedimentary rocks in the western portions of the project area. These soil terms are further described in the following paragraphs. Detailed information associated with the soils along the Proposed Project route is presented in Table D.5-3.

**Soil Erodibility.** Soil erosion affects stormwater quality and can damage surface structures such as roads. Therefore, the erodibility of soils should be considered when planning and designing access and maintenance roads. Soil erodibility ratings are as follows: slight, moderate, and severe. A rating of slight is given when the surface layer texture is clay that holds together, is thicker than 40 inches, and occurs on slopes less than 15 percent. A rating of moderate is given when the surface layer texture is clay loam, loam, or sandy loam that holds together moderately well, is between 20 and 40 inches thick, and occurs on slopes between 15 and 30 percent. A rating of severe is given to soils when the surface layer texture is sand or loamy sand that is weakly held together, is less than 20 inches thick, and lies on slopes of greater than 30 percent. Ratings of moderate and severe indicate that protective and corrective measures must be implemented during construction and maintenance of a project (SCS, 1973).

**Shrink-Swell Criteria.** Shrink-swell is the potential for volume change resulting from change in moisture content. The shrink-swell potential of San Diego County soils in the project area ranges from low to high. Moderate to high shrink-swell potential can cause damage to buildings, roads, and underground structures such as cables and pipelines through repeated and progressive heaving of the soils as they expand when wet and shrink when dry. Soils with a high potential for shrink-swell generally correspond to the areas where the younger flat-lying sediments occur where weathering of the parent rock material creates clay, such as in areas of metavolcanic rocks. Soils with high potential for shrink-swell

**Table D.5-3. Soils Along the Miguel-Mission 230 kV #2 Project Alignment**

| Alignment Section | Soil Type | Description | Soil Erodibility | Shrink-Swell |
|---|---|---|---|---|
| Miguel Substation to south of Steele Canyon | Diablo, San Miguel-Exchequer | Clay, eroded clay near substation; rocky silty loam across mountains | Clay is moderately to slightly erodible, rocky silty loam is severely erodible. | Mostly high |
| South of, and within Steele Canyon | Cieneba, Vista, Visalia and Ramona | Very rocky coarse sandy loam, rocky coarse sandy loam, sandy loam | Severely erodible. | Low to moderate |
| Northeast to Jamacha Valley | Cieneba, Vista | Very rocky coarse sandy loam, coarse sandy loam | Severely erodible | Low |
| Jamacha Valley | Visalia, Tujunga, Riverwash | Sandy loam, sand | Severely erodible | Low |
| Northeast along Jamacha Valley | Cieneba, Vista, Visalia | Very rocky coarse sandy loam, coarse sandy loam, coarse sandy loam - eroded, sandy loam | Severely erodible | Low |
| Between Jamacha Valley and Interstate 8 | Vista and Cieneba soils with minor Ramona, Greenfield and Friant | Rocky sandy loam, sandy loam occurring on moderate to steep slopes | Slopes steeper than 30% are severely erodible | Mostly low with some moderate |
| Bottom of valley with Interstate 8 | Visalia, Escondido | Sandy loam and very fine sandy loam | Severely erodible | Low |
| Between Interstate 8 and San Diego River wash | Huerhuero, Las Posas, Escondido, Friant with minor Bosanko | Loam, fine sandy loam, sandy loam, rocky fine sandy loam; Bosanko is stony clay | Mostly severely erodible | High; sandier soils are low |
| San Diego River wash | Tujunga, Riverwash | Sand | Severely erodible | Low |
| North of San Diego River to Los Coches Substation | Cienega, Cienega-Fallbrook, Visalia | Ranges from igneous rock to very rocky coarse sandy loam, to rocky sand loam to sandy loam. Steeper slopes are rockier. | Severely erodible | Low |
| Los Coches Substation to Vicente Creek (Moreno Valley) | Vista, Visalia, Riverwash | Coarse sandy loam, sandy loam, and sand | The coarse sandy loam is on 15-30% slopes and is moderately erodible, the rest is on lower slopes and is severely erodible | Low |
| Between Moreno Valley and west side of Eucalyptus Hills | Placentia, Fallbrook-Vista, Vista, Visalia | Rocky coarse sandy loam, coarse sandy loam, sandy loam | The coarse sandy loam is on 15-30% slopes and is moderately erodible, the rest is on either steeper or less-steep slopes and is severely erodible | Varies from low to high (low in sandier soils, high in clayey soils) |
| Granite Hills west of Eucalyptus Hills | Cieneba, Cieneba-Fallbrook | Very rocky coarse sandy loam, sandy loam, | Severely erodible | Low |
| Ridges and mesas topped with sedimentary rocks west to Fanita Junction | Greenfield, Redding, Visalia | Cobbly loam, cobbly loam – dissected, sandy loam, gravelly sandy loam, and stony land | Severely erodible | Low to high |
| Between Fanita Junction and Oak Canyon | Redding | Cobbly loam – dissected, stony land in the wash (boulders) | Severely erodible | High |
| Between Oak Canyon and Mission Valley | Friant, Cieneba, Diablo-Olivenhain, Olivenhain, Redding, Huerhuero | Rocky fine sandy loam, rocky coarse sandy loam – eroded, clay and cobbly loam, cobbly loam, gravelly loam, loam – eroded, terrace escarpment | Mostly severely erodible (except for the clay in the Diablo-Olivenhain | Ranges from low to high |
| Mission Valley | Salinas, Tujunga | Clay loam, sand, terrace escarpment | Severely to moderately erodible | Moderate to low |
| Between Mission Valley and Mission Substation | Olivenhain, Altamont, made land and gravel pit | Cobbly loam, clay, disturbed land | Severely erodible, except for the clay which is slightly erodible | Clay is high, cobbly clay is low |

Source: USDA (1973).

occur where young sedimentary rocks exist along the western portion of the proposed alignment. Soils with moderate potential for shrink-swell occur where the project alignment crosses metamorphic rocks in the eastern and southern part of the project area. The areas with sandy soils over granitic rocks in the northeastern portion of the alignment have low shrink-swell potential.

## Faulting and Seismic Hazards

The Proposed Project alignment does not cross any faults designated as Alquist-Priolo Special Earthquake Hazard Zones (active faults), although some of the facilities may be subjected to moderate ground shaking, especially in the western ends of the project alignment. Major faults in the region include the San Andreas Fault (80 miles NE), the San Jacinto Fault (50 miles NE), the Elsinore Fault (30 miles NE), and the Coronado Bank fault zone (20 miles SW, offshore). Figure D.5-1 shows the faults in the vicinity of the project area. The active fault closest to the project alignment is the north-south trending Rose Canyon Fault, located approximately 2 miles west of Mission Substation. The La Nacion Fault is a north-south trending fault, potentially active complex that lies about 5 miles west of the Miguel Substation and terminates before reaching the northern portion of the Proposed Project alignment. Two traces that may be associated with the La Nacion Fault are shown on the State fault map just east of the Mission Substation (CDMG, 1994). The east-west trending Mission Canyon Fault is not identified on the State map and is not considered active.

The intensity of earthquake induced ground motions can be described using peak ground accelerations, represented as a fraction of the acceleration of gravity (g). As identified in Figure D.5-2, the California Geological Survey (CGS) determined that probable peak ground acceleration in the project area would range from 0.2 to 0.3 g in an earthquake event with a 10 percent probability of occurring in the next 50 years (CGS, 2003).

## Geologic Hazards

Geologic hazards related to liquefaction, landslides, and land subsidence occur locally in the project area.

**Liquefaction** occurs when seismic shaking of loose, cohesionless, saturated sand deposits temporarily lose strength and behave as a liquid. Liquefaction generally occurs in areas of high groundwater (depths of 50 feet or less). Such conditions occur in the project area along the San Diego River and along the Jamacha Valley. None of the project substations are located in an area of potential liquefaction. The normal method of construction of the poles involves placing them on deep, drilled piers. If the piers bottom in bedrock, neither liquefaction, landslides nor subsidence would negatively affect the towers. All of the existing towers are on rock or over very thin soil with the exception of a few towers in valleys such as the Jamacha Valley and the San Diego River Valley.

**Landslides** occur on the steep slopes at the edges of mesas and ridges where the rock type at the surface consists of Tertiary-aged sediments. These conditions exist in the western portion of the project area. These conditions exist in the western portion of the project area. Most of the landslides that have occurred in the project area were small and shallow, although such a slide could disturb a tower foundation.

**Land subsidence** due to mechanisms such as removal of groundwater, oil or gas, compaction of unconsolidated sediments, or tectonic lowering, is not documented as occurring anywhere along the project alignment.

## Mineral Resources

**Table D.5-4. Mineral Resources Along the Project Alignment**

| Location | Mineral Resource |
|---|---|
| Steele Canyon overcrossing | Decomposed granite quarry (inactive) |
| Jamacha Valley overcrossing | Sand and gravel (active) |
| Near where alignment turns north on north side of Jamacha Valley | Decomposed granite quarry (status unknown) |
| Hills just south of Forester Creek | Dimension stone quarry (status unknown) |
| Interstate 8 overcrossing | Sand and gravel (status unknown) |
| San Diego Riverwash | Sand and gravel (active) |
| East of Eucalyptus Hills | Dimension stone quarry (status unknown) |
| Near Mission Substation | Sand and gravel (active) |

Source: Weber, 1963, and Bergen, et al.,1997

While gold and gem mining was active in San Diego County in the late 1800s, it did not occur along the Proposed Project alignment. The mining of sand and gravel does occur along the alignment in several places where the alignment crosses major washes (e.g., Towers 600, 1120, between 1150 and 1160). Decomposed granite is quarried from several small localities near the alignment. In addition, bentonite, a clay used in drilling operations, is mined in places in the Otay Formation in the southern part of the project area. Geothermal resources are recognized in the area, but the alignment is not near any mapped occurrence of thermal springs (Bergen et al., 1997). Table D.5-4 relates the types of mining activities that occur at locations along the project alignment.

## Paleontology

Determination of the "significance" of a fossil can only occur after a fossil has been found and identified by a qualified paleontologist. Until then, the actual significance is unknown. The most useful designation for paleontological resources in an EIR document is the "sensitivity" of a particular geologic unit. Sensitivity refers to the likelihood of finding significant fossils within a geologic unit. In California, fossils of land-dwelling vertebrates are considered significant. Such fossils are found in fluvial and coastal plain deposits such as those of the Otay Formation, Friars Formation, and Poway conglomerate group.

The following levels of sensitivity recognize the important relationship between fossils and the geologic formations within which they are preserved.

- **High Sensitivity.** High sensitivity is assigned to geologic formations known to contain paleontological localities with rare, well-preserved, and/or critical fossil materials for stratigraphic or paleoenvironmental interpretation, and fossils providing important information about the paleobiology and evolutionary history (phylogeny) of animal and plant groups. Generally speaking, highly sensitive formations are known to produce or have the potential to produce vertebrate fossil remains.
- **Moderate Sensitivity.** Moderate sensitivity is assigned to geologic formations known to contain paleontological localities with moderately preserved, common elsewhere, or stratigraphically long-ranging fossil material. The moderate sensitivity category is also applied to geologic formations that are judged to have a strong, but unproven potential for producing important fossil remains (e.g., Pre-Holocene sedimentary rock units representing low to moderate energy, of marine to non-marine depositional settings).
- **Low Sensitivity.** Low sensitivity is assigned to geologic formations that, based on their relative youthful age and/or high-energy depositional history, are judged unlikely to produce important fossil remains. Typically, low sensitivity formations may produce invertebrate fossil remains in low abundance.

Figure D.5-1. Faults in the Vicinity of the Project Area

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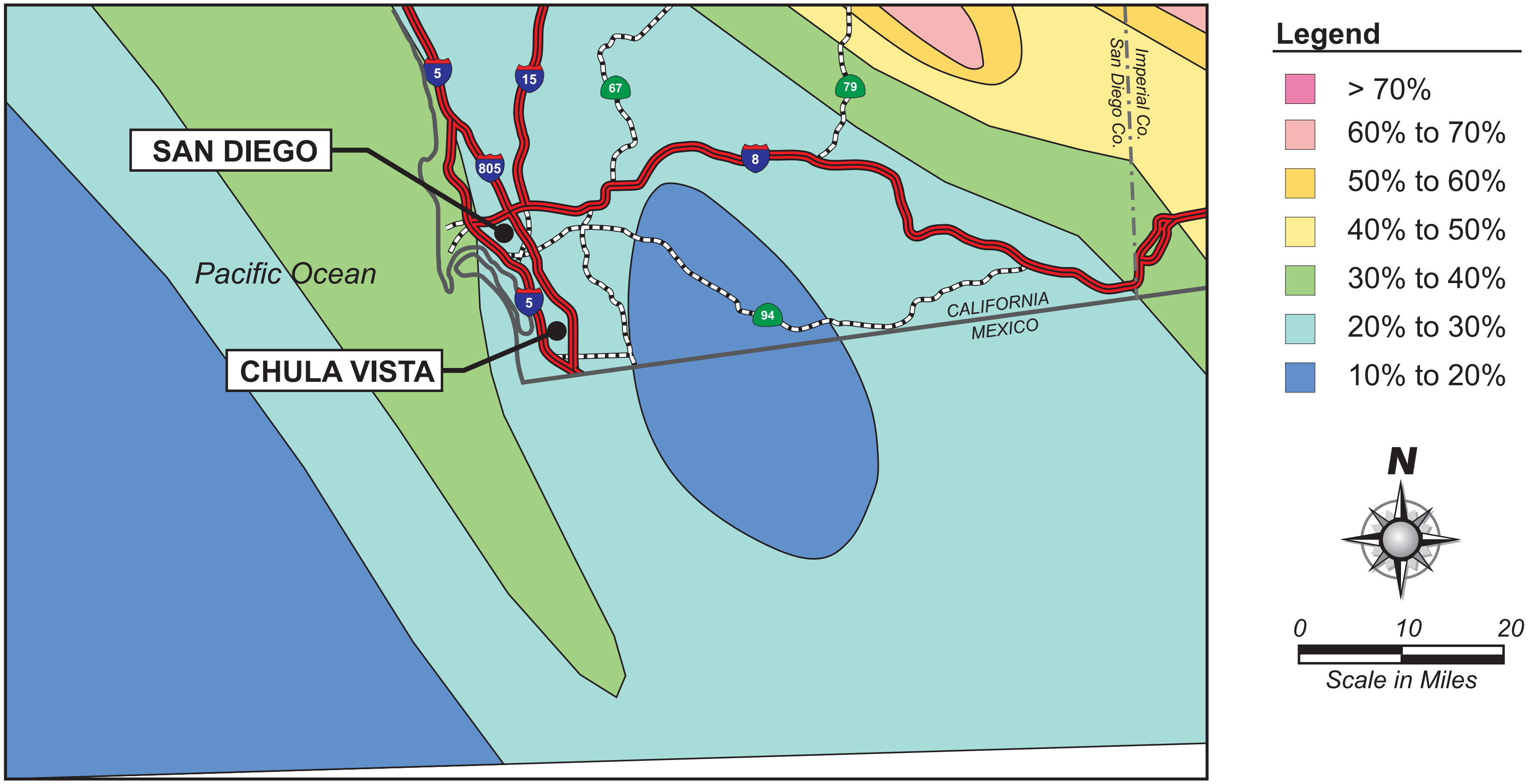
Peak Ground Acceleration Atlas

Probabilistic Seismic Hazards
San Diego 1x 2 Degree Sheet




The information shown on this map is not intended to be used for site specific seismic hazards analyses, but for the illustration of regional patterns of shaking hazard.

**Miguel-Mission 230 kV #2 Project**

Figure D.5-2

**Peak Ground Acceleration Map**

Aspen Environmental Group

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- **Marginal Sensitivity.** Marginal sensitivity is assigned to geologic formations that are composed either of pyroclastic volcanic rocks or metasedimentary rocks, but which nevertheless have a limited probability for producing fossil remains from certain sedimentary lithologies at localized outcrops.
- **Zero Sensitivity.** Zero sensitivity is assigned to geologic formations that are entirely plutonic (volcanic rocks formed beneath the earth's surface) in origin and therefore have no potential for producing fossil remains.

Fossils are known to occur in the Tertiary sediments in the project area. Highly to moderately sensitive units may include the Friars Formation, members of the Poway conglomerate group in the northern portion of the project area, and Otay Formation in the southern portion. Significant California fossils are typically vertebrate fossils of Tertiary age. The age of the geologic units, their terrestrial origin, and the discovery of numerous vertebrates in Tertiary-aged units in the region indicates that there is a likelihood that significant fossils may be found during excavation for new pole footings in locations along the project route. The most likely locations would be where towers are placed on ridge tops and mesas capped by sandstone, siltstone, or conglomerate (Lillegraven, 1973). Locations where metamorphic or crystalline rocks occur have no potential for paleontological resources.

## D.5.2 Applicable Regulations, Plans, and Standards

Geologic resources and geotechnical hazards are governed primarily by local jurisdictions. The conservation elements and seismic safety elements of city and county general plans contain policies for the protection of geologic features and avoidance of hazards, but do not specifically address transmission line construction projects. For the segment that may be placed underground, local grading ordinances establish detailed procedures for underground utility construction, including trench backfill, compaction, and testing.

The two major environmental statutes that guide the design and construction of new transmission lines are the National Environmental Policy Act (NEPA), and the California Environmental Quality Act (CEQA). These statutes set forth a specific process of environmental impact analysis and public review. In addition, the project proponent must comply with several additional federal, State and local applicable statutes, regulations, and policies. Relevant and potentially relevant statutes, regulations, and policies are discussed below.

### Federal Statutes

NEPA requires an assessment of any federal action that may impact the environment. NEPA applies to restoration actions undertaken by federal trustees, except where a categorical exclusion or other exception to NEPA applies. Pursuant to Presidential Executive Order, federal agencies are obligated to comply with the NEPA regulations adopted by the Council on Environmental Quality (CEQ).

**Protection of Paleontological Resources:** National Environmental Policy Act (NEPA), as amended, 42 U.S.C. 4321, et seq., 40 C.F.R. Parts 1500-1508.

### State Statutes

**California Environmental Quality Act (CEQA) (Pub. Resource Code sections 21000-21177.1).** CEQA was adopted in 1970 and applies to most public agency decisions to carry out, authorize, or approve projects that may have adverse environmental impacts. CEQA requires that agencies inform themselves about the environmental effects of their proposed actions, consider all relevant information, provide the public an opportunity to comment on the environmental issues, and avoid or reduce potential environmental harm whenever feasible. Relevant CEQA sections include those for protection of geological and mineral resources, protection of soil from erosion, and for the protection of paleontological resources (certain fossils found in sedimentary rocks).

The **Alquist-Priolo Earthquake Fault Zoning Act** of 1972 (formerly the Special Studies Zoning Act) regulates development and construction of buildings intended for human occupancy to avoid the hazard of surface fault rupture. While the Act does not specifically regulate overhead transmission lines, it does help define areas where fault rupture is most likely to occur. The Act groups faults into categories of active, potentially active, and inactive. Historic and Holocene age faults are considered active, Late Quaternary and Quaternary age faults are considered potentially active, and pre-Quaternary age faults are considered inactive. These classifications are qualified by the conditions that a fault must be shown to be "sufficiently active" and "well defined" by detailed site-specific geologic explorations in order to determine whether building setbacks should be established.

The **California Building Code** (CBC, 2001) is based on the 1997 Uniform Building Code (UBC), with the addition of more extensive structural seismic provisions. Chapter 16 of the CBC contains definitions of seismic sources and the procedure used to calculate seismic forces on structures. Because the Proposed Project route lies within UBC Seismic Zone 3, provisions for design should follow the requirements of Chapter 16. Chapter 33 of the CBC contains requirements relevant to the construction of underground transmission lines. California Code of Regulations Title 24, Section 3301.2 and 3301.3 *et seq.* contain the provisions requiring protection of adjacent properties during excavations and requires 10 days written notice and access to the excavation be given to the adjacent property owners.

## Local

The safety elements of general plans for the cities and the County along the proposed alignment contain policies for the avoidance of geologic hazards and/or the protection of unique geologic features. A survey of general plans along the proposed alignment indicated that most municipalities require submittal of construction and operational safety plans for proposed construction in areas of identified geologic and seismic hazards for review and approval prior to issuance of permits. County and local grading ordinances establish detailed procedures for excavation and grading required for underground construction. No applicable San Diego County regulations or policies have been identified. Applicable City of San Diego regulations are identified below.

### City of San Diego Municipal Code

The following regulations apply:

- Excavation fees and permits (Ch 6, Art 2, Div 12, Sec 62.1205)
- Grading regulations (Ch 14, Art 2, Div 1 and 4)
- Building regulations (Ch 14, Art 5, Div 2 Sec 145.0203 and 145.0206)

## Compliance with Regulations, Plans, and Standards

SDG&E is a long-term operator in the region. The Proposed Project is a routine type of project with no especially difficult issues relating to geology or paleontology. It is anticipated that SDG&E would likely be able to comply with the applicable regulations, plans, and standards pertaining to this project.

## D.5.3 Environmental Impacts and Mitigation Measures

During the review and field check of the geologic conditions along the project alignment, no evidence was found of especially problematic soil or geologic conditions. Slope stability issues occur in the western part of the study area and are addressed in Impacts G-2 (slope instability) and associated Mitigation Measure G-2a (geotechnical surveys for landslides). Other impacts are also defined.

### D.5.3.1 Definition and Use of Significance Criteria

Geologic and soil conditions, and paleontological resources were evaluated with respect to the impacts the project may have on the local geology, as well as the impact specific geologic hazards may have upon the Miguel-Mission 230 kV #2 Project. The significance of these impacts was determined on the basis of CEQA statues, guidelines and appendices; thresholds of significance developed by local agencies; government codes and ordinances; and requirements stipulated by California Alquist-Priolo statues. Significance criteria and methods of analysis were also based on standards set or expected by agencies for the evaluation of geologic hazards.

Impacts of the project on the geologic environment would be considered significant if:

- Unique geologic features or geologic features of unusual scientific value (including significant fossils) for study or interpretation would be disturbed or otherwise adversely affected by the proposed new transmission line towers and the associated construction activities.
- Known mineral and/or energy resources would be rendered inaccessible by transmission line construction.
- Agricultural soils would be converted to non-agricultural uses.
- Geologic processes, such as landslides or erosion, could be triggered or accelerated by construction or disturbance of landforms.
- Substantial alteration of topography would be required or could occur beyond that which would result from natural erosion and deposition.

Impacts of geologic hazards on the project would also be considered significant if the following conditions existed:

- High potential for earthquake-induced groundshaking to cause liquefaction, settlement, lateral spreading and/or surface cracking along the route and probable attendant damage to the transmission line or other project structures.
- Potential for failure of construction excavations or underground borings due to the presence of loose saturated sand or soft clay.
- Presence of corrosive soils, which would damage the underground portions of the transmission line, the transmission line support structures, or foundations at the substations.

### D.5.3.2 Project Protocols

Table D.5-5 presents the measures proposed in the Proponent's Environmental Assessment to reduce project impacts related to geology, soils, and paleontology.

**Table D.5-5. Project Protocols – Geology, Soils, and Paleontology**

| PP No. | Description |
|---|---|
| 3 | Project construction activities shall be designed and implemented to avoid or minimize new disturbance, erosion on manufactured slopes, and off-site degradation from accelerated sedimentation, and to reduce maintenance and repair costs. Maintenance of cut and fill slopes created by project construction activities would consist primarily of erosion repair. In situations where revegetation would improve the success of erosion control, planting or seeding with native hydroseed mix may be done on slopes. |
| 4 | In areas where recontouring is not required, vegetation would be left in place wherever feasible and original ground contour would be maintained to avoid excessive root damage and allow for resprouting. |
| 5 | In areas where ground disturbance is substantial or where recontouring is required (e.g., marshaling yards, tower sites, spur roads from existing access roads), surface restoration would occur as required by the governmental agency having jurisdiction. The method of restoration normally would consist of returning disturbed areas back to their original contour, reseeding (if required), installing cross drains for erosion control, placing water bars in the road, and filling ditches for erosion control. Erosion would be minimized on access roads and other locations primarily with water bars. The water bars would be constructed using mounds of soil shaped to direct the flow of runoff and prevent erosion. Soil spoils created during ground disturbance or recontouring shall be disposed of only on previously disturbed areas, or used immediately to fill eroded areas. However, material for filling in eroded areas in roads or road ruts should never be obtained from the sides of the road that contain habitat without the approval of the onsite biological resource monitor. Cleared vegetation would be hauled off-site to a permitted disposal location. To limit impact to existing vegetation, appropriately sized equipment (e.g., bulldozers, scrapers, backhoes, bucket-loaders, etc.) would be used during all ground disturbance and recontouring activities. |
| 6 | Potential hydrologic impacts would be minimized through the use of best management practices (BMPs) such as water bars, silt fences, staked straw bales, and mulching and seeding of all disturbed areas. These measures will be designed to minimize ponding, eliminate flood hazards, and avoid erosion and siltation into any creeks, streams, rivers, or bodies of water. |
| 7 | Prior to construction, all SDG&E, contractor, and subcontractor project personnel would receive training regarding the appropriate work practices necessary to effectively implement the Protocols and to comply with the applicable environmental laws and regulations including, without limitation, hazardous materials spill prevention and response measures, erosion control, dust suppression, and appropriate wildlife avoidance, impact minimization procedures, and Stormwater Pollution Prevention Plan (SWPPP) BMPs. To assist in this effort, the training would address: (a) federal, State, local, and tribal laws regarding antiquities, fossils, plants, and wildlife, including collection and removal; (b) the importance of these resources and the purpose and necessity of protecting them; and (c) methods for protecting sensitive cultural, paleontological, and ecological resources. |
| 11 | To the extent feasible, access roads would be built at right angles to the streambeds and washes. Where it is not feasible for access roads to cross at right angles, SDG&E would limit roads constructed parallel to streambeds or washes to a maximum length of 500 feet at any one transmission line crossing location. Such parallel roads would be constructed in a manner that minimizes potential adverse impacts on "waters of the U.S." or "waters of the State." Streambed crossings and roads constructed parallel to streambeds would require review and approval of necessary permits from the U.S. Army Corps of Engineers (USACOE), CDFG, and RWQCB. Culverts would be installed where needed for right angle crossings, but rock crossings would be utilized across most right angle drainage crossings. All construction and maintenance activities would be conducted in a manner that would minimize disturbance to vegetation, drainage channels, and streambanks (e.g., towers would not be located within a stream channel; construction activities would avoid sensitive features). Prior to construction in streambeds and washes, SDG&E would perform three pre-activity surveys to determine the presence or absence of endangered riparian species. Endangered riparian species for which surveys would be performed include the least Bell's vireo, arroyo southwestern toad, and San Diego fairy shrimp. However, these site surveys would not replace the need for SDG&E to perform detailed on-the-ground surveys as required by Protocols 20, 21, 42, 43, and 44. In addition, road construction would include dust-control measures (e.g., watering of construction areas to suppress dust) during construction in sensitive areas, as required. Erosion control during construction in the form of intermittent check dams and culverts should also be considered to prevent alteration to natural drainage patterns and prevent siltation. |
| 12 | In the construction and operation of the project, SDG&E would comply with all applicable environmental laws and regulations including, without limitation, those regulating and protecting air quality, water quality, wildlife and its habitat, and cultural resources. |
| 15 | If paleontological resources were encountered, appropriate field mitigation efforts would be implemented to protect the resources. For example, if significant resources were discovered, such as vertebrate fossils, construction would be stopped in this area while SDG&E and its designated paleontologist determine the appropriate method and schedule to recover or protect the resource. When it is not feasible to avoid paleontological sites, SDG&E would consult with the appropriate federal, State, and resource agencies and specialists to either develop alternative construction techniques to avoid paleontological resources or develop appropriate mitigation measures. Appropriate mitigation field measures may include actions such as protection-in-place by covering with earthen fill, removal and cataloging, and/or removal and relocation. |

**Table D.5-5. Project Protocols – Geology, Soils, and Paleontology**

| PP No. | Description |
|---|---|
| 16 | Hazardous materials would not be disposed of or released onto the ground, the underlying groundwater, or any surface water. Totally enclosed containment would be provided for all trash. All construction waste, including trash and litter, garbage, other solid waste, petroleum products and other potentially hazardous materials, would be removed to a hazardous waste facility permitted or otherwise authorized to treat, store, or dispose of such materials. |
| 35 | To minimize ground disturbance impacts to streams in steep canyon areas, access roads in these areas would avoid streambed crossings to the extent feasible. Where it is not feasible for access roads to avoid streambed crossings in steep canyons, such crossings would be built at right angles to the streambeds. Where such crossings cannot be made at right angles, SDG&E would limit roads constructed parallel to streambeds to a maximum length of 500 feet at any one transmission line crossing location. Such parallel roads would be constructed in a manner that minimizes potential adverse impacts on "waters of the U.S." Streambed crossings or roads constructed parallel to streambeds would require review and approval of necessary permits from the USACOE, CDFG, and RWQCB. |
| 37 | All new access roads constructed as part of the project that are not required as permanent access for future project maintenance and operation would be permanently closed. Where required, roads would be permanently closed using the most effective feasible and least environmentally damaging methods appropriate to that area with the concurrence of the underlying landowner and the governmental agency having jurisdiction (e.g., stock piling and replacing topsoil or rock replacement). This would limit new or improved accessibility into the area. Mowing of vegetation can be an effective method for protecting the vegetative understory while at the same time creating access to the work area. Mowing should be used when permanent access is not required since, with time, total revegetation is expected. If mowing is in response to a permanent access need, but the alternative of grading is undesirable because of downstream siltation potential, it should be recognized that periodic mowing would be necessary to maintain permanent access. The project biological construction monitor shall conduct checks on mowing procedures to ensure that mowing for temporary or permanent access roads is limited to a 12-foot-wide area on straight portions of the road (slightly wider on turns) and that the mowing height is no less than 4 inches from finished grade. |
| 38 | Secure any required General Permit for Storm Water Discharges Associated With Construction Activity (NPDES permit) authorization from the SWRCB and/or the RWQCB to conduct construction-related activities to build the project and establish and implement a SWPPP erosion control measures during construction to minimize hydrologic impacts in areas sensitive from flooding or siltation into waterbodies. |
| 39 | To the extent feasible, where the construction of access roads would disturb sensitive features, the route of the access road would be adjusted to avoid such impacts. Examples of sensitive features include, without limitation, cultural sites, identified habitats of endangered species, and streambeds. As another alternative, construction and maintenance traffic would use existing roads or cross-country access routes (including the right-of-way), which avoid impacts to the sensitive feature. To minimize ground disturbance, construction traffic routes must be clearly marked with temporary markers such as easily visible flagging. Construction routes, or other means of avoidance, must be approved by the authorized officer or landowner before use. When it is not feasible to avoid constructing access roads in sensitive habitats, SDG&E would perform three site pre-activity surveys to determine the presence or absence of endangered or threatened species, or species of special concern, in those sensitive habitats. SDG&E would submit results of those surveys to the USFWS and CDFG in accordance with its NCCP and consult on reasonable and feasible mitigation measures for potential impacts prior to access road construction. However, these pre-activity surveys would not replace the need for SDG&E to perform detailed on-the-ground surveys as required by Protocols 20, 21 42, 43, and 44. Where it is not feasible for access roads to avoid streambed crossings in steep canyons, such crossings would be built at right angles to the streambeds. Where such crossings cannot be made at right angles, SDG&E would limit roads constructed parallel to streambeds, to a maximum length of 500 feet at any one transmission line crossing location. Such parallel roads would be constructed in a manner that minimizes potential adverse impacts on "waters of the U.S." Streambed crossings or roads constructed parallel to streambeds would require review and approval of necessary permits from the USACOE, CDFG, and RWQCB. When it is not feasible to avoid cultural sites, SDG&E would consult with the appropriate federal and State SHPO and local (indigenous Native American tribes) cultural resource agencies and specialists to either develop alternative construction techniques to avoid cultural resources or develop appropriate mitigation measures. Appropriate mitigation measures may include actions such as removal and cataloging and/or removal and relocation. |
| 40 | To minimize ground disturbance and/or reduce scarring (visual contrast) of the landscape, the alignment of any new access roads (i.e., bladed road) or cross-country route (i.e., unbladed route) would follow the landform contours in designated areas to the extent feasible, providing that such alignment does not additionally impact sensitive features (e.g., riparian area, habitat of sensitive species, cultural site). To the extent feasible, new access roads would be designed to be placed in previously disturbed areas and areas that require the least amount of grading in sensitive areas. Whenever feasible, in areas where there are existing access roads, preference shall be given to the use of new spur roads rather than linking facilities tangentially with new, continuous roads. Where it is infeasible to locate roads along contours, or in previously disturbed areas, or use spur roads to limit grading, the revegetation/seeding plans for the project would incorporate plant species in areas adjacent to access roads that are capable of screening the visual impacts of the roads. |

**Table D.5-5. Project Protocols – Geology, Soils, and Paleontology**

| PP No. | Description |
|---|---|
| 55 | An *Erosion Control and Sediment Transport Control Plan* would be included with the project grading plans submitted to San Diego County for review and comment. The sediment transport control plan would be prepared in accordance with the standards provided in the *Manual of Erosion and Sedimentation Control Measures* and consistent with practices recommended by the Resource Conservation District of San Diego County. Implementation of the plan would help stabilize soil in graded areas and waterways and reduce erosion and sedimentation. The plan would designate BMPs that would be implemented during construction activities. Erosion control efforts, such as hay bales, water bars, covers, sediment fences, sensitive area access restrictions (e.g., flagging), vehicle mats in wet areas, and retention/settlement ponds, would be installed before extensive soil clearing and grading begins. Mulching, seeding, or other suitable stabilization measures would be used to protect exposed areas during construction activities. Revegetation plans, the design and location of retention ponds and grading plans would be submitted to the CDFG and USACOE for review in the event of construction near waterways. |
| 64 | During construction, SDG&E would remove boulders uphill of structures that pose potentially high risk of landslide damage to those structures and would position structures to span over potential landslide areas to the greatest extent feasible. |
| 65 | In disturbed areas where construction equipment has caused compaction of soils (e.g., staging areas, structure sites, temporary spur roads), soils would be decompacted as necessary prior to seeding and reclamation would occur to enhance revegetation and reduce potential for erosion. |

Source: SDG&E, 2002b

## D.5.3.3 Proposed Miguel-Mission 230 kV #2 Project

## Geology

### Impact G-1: Seismically Induced Ground Failures Including Liquefaction, Lateral Spreading, and Seismic Slope Instability

The Proposed Project does not cross any mapped Alquist-Priolo Earthquake Hazard Zones, nor does it cross any mapped faults of Quaternary age that may be deemed active or potentially active. Therefore, it is anticipated that there would be no impacts associated with fault ruptures.

Due to the distance from active faults (both onshore and offshore) that would be a source of seismic shaking, only moderate to low ground shaking is predicted for central and southern San Diego County. In the Proposed Project area, peak ground acceleration could range from 0.2 to 0.3 g in an earthquake event with a 10 percent probability of occurring in the next 50 years. It is anticipated that impacts associated with strong seismic ground shaking would result in less than significant impacts.

Earthquake-generated ground failure, including liquefaction, lateral spreading, and differential settlement could impact the Proposed Project where tower or pole structures are located within the alluvial deposits along the San Diego and Sweetwater rivers, Moreno Valley (San Vicente Creek), and Sycamore Canyon due to the anticipated presence of unconsolidated, sandy soil and, at certain times of the year, elevated groundwater levels. Because of the potential for ground failure along the project alignment, Mitigation Measure G-1a (see below) is recommended to reduce potentially significant impacts to less than significant levels (Class II).

Shallow landslides could be triggered by an exceptional seismic event or even project-related excavation anywhere along the alignment. The most likely areas susceptible to seismic instability occur at Towers #1290 and above, where tower footings are placed on ridges and slopes on sedimentary rock.

#### *Mitigation Measure for Impact G-1, Ground Failure, Liquefaction*

**G-1a Geotechnical evaluations of ground stability.** Geotechnical evaluations of the liquefaction potential and general ground stability shall be undertaken wherever new tower footings or other subsurface structures are placed in areas that do not have hard bedrock at the surface. Results of the geotechnical evaluations shall be incorporated into the placement strategy for the new poles or other structures and the foundation design of the structures. Excavations in soft or loose soil shall require special construction methods or shoring as appropriate.

### Impact G-2: Slope Instability Including Landslides, Earth Flows, and Debris Flows May Impact Stability of New Pole Foundations

Small landslides have occurred in all areas of the Proposed Project where Tertiary-age, flat-lying sediments overlie granitic or metamorphic bedrock. In addition, numerous small landslides and evidence of past earth and debris flows were observed in the poorly consolidated sediments (Poway conglomerate and Friars Formation in the northern portion of the project area, and Otay Formation in the southern portion) during a recent field survey. A landslide, earthflow, or debris flow could destabilize or completely destroy a tower or pole. A landslide initiated by construction of a pole foundation could impact the public. For example, where a pole is placed above a steep slope with a road at the base, such as at the Steele Canyon crossing, a failed pole could impact passing motorists. Placement of towers on mesas, ridges, and spurs should be evaluated by a geologist to determine the stability of the site and adjacent slopes. In addition to PP-64 (see Table D.5-5), Mitigation Measure G-2a is recommended to reduce potentially significant impacts associated with slope instability to less than significant levels (Class II).

#### *Mitigation Measure for Impact G-2, Landslides, Earth Flows, and Debris Flows*

**G-2a Geotechnical evaluations of ground stability and foundation design.** Placement of towers on mesas, ridges, and spurs shall be evaluated by a geologist to determine the stability of the site and adjacent slopes. The study shall consider alternatives for foundation type and depth and provide recommendations for placement of facilities, types of foundations, and remediation of unsuitable ground.

### Impact G-3: Increased Soil Erosion Caused by Construction and Use of Maintenance Roads May Impact Tower Stability

Soils blanketing the hills and mountains in the vicinity of the project area are thin and prone to erosion. Nearly all the soils mapped in the project area are described as “highly erodible” (SCS, 1973). The numerous access roads required to maintain the transmission line tend to funnel surface runoff along the uphill side of the road after rains. During a field visit of the project area in the Spring of 2003, occasional washouts were observed in the San Miguel Mountains where runoff had moved across the road to drain to lower elevations creating small, steep gullies across or through the road. The existing access roads focus overland flow and as such contribute to erosion of the soil. To reduce potentially significant erosion impacts associated with construction and use of maintenance access roads to less than significant levels (Class (II), Mitigation Measure G-3a is recommended.

#### *Mitigation Measure for Impact G-3, Erodible Soils*

**G-3a** **Soil erosion along maintenance roads.** Soil erosion along the maintenance roads shall be minimized through construction of water bars, grading road surfaces to direct flow away from natural slopes, and through the consistent maintenance of roads and culverts to maintain appropriate flow paths. Silt fences and straw bales shall be installed as appropriate prior to construction, but shall be removed to restore natural drainage during the cleanup and restoration phase of the project.

### Impact G-4: Overuse or Abandonment of Maintenance Roads May Result in Substantial Soil Erosion and Loss of Topsoil

Unauthorized public use of the project maintenance and access roads would contribute to degradation of the road surface and water bars, leading to an increase in soil erosion and excess sedimentation in the landscape. The Applicant has proposed PP-3, PP-4, PP-5, PP-6, PP-7, PP-11, PP-35, PP-38, PP-39, PP-40, PP-49, PP-55, and PP-65 to address soil erosion (see Table D.5-5). In addition, PP-37 — closing unused access roads — would also help in reducing the area of land covered by roads that tend to concentrate runoff and perhaps allow unauthorized access. However, Mitigation Measure G-4a (see below) is recommended to strengthen the intent of PP-37. Through the implementation of these Project Protocols and Mitigation Measure G-4a, project impacts would be less than significant (Class II).

#### *Mitigation Measure for Impact G-4, Erodible Soils*

**G-4a** **Restrict access to maintenance roads.** To prevent erosion caused by unauthorized use of the maintenance roads by the general public, access to maintenance roads shall be restricted with devices that effectively bar access by unauthorized vehicles. Abandoned maintenance roads shall be checked periodically (annually) to ensure no additional erosion occurs.

### Impact G-5: Construction on Unstable and Erodible Deposits on Ridges and Steep Slopes, and in Areas near Active Washes May Result in Landslides or Undermining of Pole Foundations

Some of the proposed route is located on mesas or ridges in the northern and western portion of the project area where numerous small landslides have been observed. A landslide could destabilize or damage a tower or pole. PP-11, PP-35, and PP-64 address only some of the issues of unstable soils. PP-64 provides for the removal of boulders upslope of the project alignment and avoiding pole placement in an area of potential landslide. The Applicant's proposed PP-11 and PP-35 discuss construction within streambeds and washes. PP-11 and PP-35 indicate no towers would be placed in streambed crossings; however existing Tower #1380 is currently situated within an active wash. Scouring and erosion associated with periodic flooding could undermine the tower footings if they were not designed to withstand flood erosion. With the implementation of the Project Protocols and the mitigation measures listed below, project impacts should be less than significant.

#### *Mitigation Measure for Impact G-5, Unstable or Erodible Soils*

**G-5a** **Foundations in unstable slopes or erodible soils.** A geologist and geotechnical engineer should evaluate the placement of towers on mesas, ridges, slopes, spurs, and in or near active streambeds. Their analyses shall describe the geologic stability and make recommendations for the best foundation type and depth for the local conditions.

### Impact G-6: Expansive (Shrink-Swell) Soils Could Damage Substations Over Time

The presence of expansive soil is documented in the portions of the project area underlain by Tertiary-age sedimentary deposits. Expansive soil is identified at the Miguel Substation, in small patches north of Interstate 8, and along most of the alignment west the Eucalyptus Hills area, except on the granitic outcrops. The impact from expansive soil on new transmission poles is not expected to be significant because the poles would be founded on deep-drilled piers that are not affected by shrink-swell soil cycles. Both terminal substations are located on soil units classified as expansive (SCS, 1973). Expansive soil is not discussed in the Project Protocols. With the implementation of Mitigation Measure G-6a below, project impacts associated with shrink swell soils would be less than significant (Class II).

#### *Mitigation Measure for Impact G-6, Expansive Soils*

**G-6a** **Geotechnical evaluations of expansive soils.** Geotechnical investigations that include an analysis of expansive soil shall be performed for any new or modified foundations for facilities at the Miguel and Mission Substations. Standard foundation design for expansive soil shall be employed if expansive soils are found at either of the sites.

## Mineral Resources

The Proposed Project would occupy an established right-of-way in which quarrying operations presently occur. Future development of sand, gravel, or rock quarries would be compatible with the Proposed Project. It is anticipated that the project would have no impact on mineral resource availability.

## Paleontologic Resources

### Impact G-7: Construction Activities May Destroy Paleontologic Resources

Fossils are known to occur in the Tertiary sediments in the project area. The potentially sensitive units include the Poway conglomerate group and the Friars Formation in the northern portion of the project area, and Otay Formation in the southern portion. Significant California fossils are typically vertebrate fossils of Tertiary age. The age of the geologic units, and the fact that they are primarily terrestrial deposits indicates that there is a likelihood that significant fossils would be found during excavation for new tower footings in several locations along the project route.

There is a notable likelihood of encountering paleontologic resources during excavation or grading in the sedimentary units encountered in the northern and western parts of the project, generally west of the Eucalyptus Hills, and also near the Miguel Substation. As identified in Table D-5.5, the Applicant has proposed various Project Protocols (PP-7, PP-12, PP-15, PP-39, PP-40, and PP-49) that include elements that would protect paleontologic resources. However the intent of these protocols could be improved by requiring the presence of a qualified paleontologist in the project area before earthmoving begins to help identify potentially fossiliferous areas where either avoidance or monitoring and salvage work can be conducted. PP-7 provides worker environmental training about practices necessary to implement applicable environmental laws and regulations, and PP-12 requires compliance with applicable environmental laws and regulations, but the Project Protocols do not specially mention laws regarding the protection of paleontological resources. PP-15 requires a paleontologist to be part of the project only after a vertebrate fossil is found.

In addition to the Project Protocols discussed above, Mitigation Measures G-7a and G-7b are recommended to allow preconstruction review by a paleontologist, to increase construction worker awareness of paleontological concerns, and to require paleontological monitoring in sensitive geologic units. Implementation of Mitigation Measures G-7a and G-7b would reduce potentially significant impacts associated with paleontological resources lost during construction to less than significant levels (Class II).

***Mitigation Measure for Impact G-7, Paleontologic Resources***

**G-7a** **Review of construction plans by paleontologist.** A qualified paleontologist shall review the project and provide an opinion of which geologic units are classified as sensitive in terms of paleontologic sensitivity. The findings of the paleontologist shall be used to organize paleontologic monitoring in sensitive units (pursuant to Mitigation Measure G-7b) as well as to identify potential areas of avoidance for new access road construction and construction laydown areas.

**G-7b** **Paleontological training and monitoring.** A qualified paleontologist shall be employed to help implement the paleontological portion of the environmental training program for construction workers. All employees involved with earthmoving shall receive this training and shall be instructed as to the laws regarding the protection of paleontologic resources. The paleontologist shall also monitor excavations and drilling for new footings or foundations in sensitive geologic units at the Miguel Substation and along the route west of Eucalyptus Hills (Valle Vista Road). Where fossil finds have been disturbed due to excavation or road grading, the fossils should be collected (salvaged) and prepared for curation with a public museum that has a paleontologic collection. The paleontologist should sample the excavation spoils pile for both mega fossils (can be seen by the naked eye) and microfossils (very tiny fossils that must be retrieved through wet or dry screening of fine-grained samples). The Society of Vertebrate Paleontology guidelines (1995) for monitoring, sampling, and salvaging fossils shall be followed. The results of the paleontologic monitoring shall be presented in a final paleontologic report that will be held confidential. A copy of the confidential report and all paleontologic finds from the project shall be donated to a curating museum.

### D.5.3.4 Future 230 kV Circuit within Miguel-Mission ROW

The future 230 kV circuit within Miguel-Mission ROW would consist of a second bundled 230 kV circuit in a vacant position on towers that would be in place at the time of construction. If installation of the future circuit occurs at the same time as the Proposed Project, impacts similar to those identified above for the Proposed Project would occur, and the impact would be similarly addressed by the Project Protocols and mitigation measures described in Section D.5.3.3.

Installation of the future circuit after completion of the Proposed Project would have the potential to cause increased soil erosion due to additional activity on construction access roads (Impacts G-3 and G-4), but as with the Proposed Project, Mitigation Measures G-3a and G-4a would reduce these impacts to less than significant levels (Class II). Other impacts related to geology, soils, and paleontology would be similar to those of the Proposed Project.

# D.5.4 Project Alternatives

## D.5.4.1 Jamacha Valley 138 kV/69 kV Underground Alternative

### Environmental Setting

This 3.5-mile underground alternative would follow Willow Glen Drive from where the existing ROW crosses Willow Glen Drive to a point along the ROW located northwest of Singing Hills Memorial Park. In general, this route is located south and downhill from the proposed alignment. The topography along this alternative alignment is very gentle compared to the applicable portion of the proposed alignment because Willow Glen Drive is located at the margin of Jamacha Valley.

The geology along this alternative is also different than the Proposed Project. Trenching beneath the existing road would likely encounter artificial fill and alluvium. Groundwater may occur locally in the alluvium beneath Willow Glen Drive. Granitic bedrock and a thin soil cover will be encountered along the segment northwest of Dehesa Road. The alluvium and granitic bedrock in this area has little or no potential for encountering paleontologic resources.

### Environmental Impacts and Mitigation Measures

Soft or loose soil and alluvium may affect excavation stability (Impact G-1) and may require special construction methods or shoring, but construction would still be technically feasible assuming implementation of the requirements of Mitigation Measure G-1a. Mitigation Measure G-1a would provide pre-construction identification of soil conditions, presence of groundwater, and excavation characteristics and construction methods to reduce this potential impact to less than significant (Class II). Erodible soil in the segment would require proper site restoration and implementation of Mitigation Measure G-3a to reduce soil erosion impacts to less than significant (Class II). As with the Proposed Project, access to maintenance roads would be restricted (Mitigation Measure G-4a). Impacts to paleontological resources (Impact G-7) would be mitigated to less than significant levels (Class II) with implementation of Mitigation Measures G-7a and G-7b.

### Comparison to Proposed Project

The Jamacha Valley 138 kV/69 kV Underground Alternative within Willow Glen Drive is entirely underground along gentle terrain with readily achieved erosion control by reconstructing the road over the cable trench. This underground construction would allow additional opportunity for excavation instability, but would be less disruptive to erodible soil and potential slope instability than constructing several new towers in bedrock along sloping terrain.

### Comparison to Proposed Project with Future Circuit

Potential environmental impacts generated by installing a future circuit on existing towers consists of soil disturbance during construction and during more frequent use of access roads for maintenance of the additional conductor. This impact would be similar for the Jamacha Valley 138 kV/69 kV Underground Alternative and the Proposed Project.

## D.5.4.2 Jamacha Valley Overhead A Alternative

### Environmental Setting

This alternative would move the 138 kV and 69 kV circuits on new steel poles on the east side of the ROW. Like the Proposed Project, this alternative route would be on the northeast side of Jamacha Valley, a generally wide river valley formed by the Sweetwater River. This route would be placed in an area where large amounts of sediment have been deposited during high-flow events. There is little or no potential for paleontologic resources in this area.

### Environmental Impacts and Mitigation Measures

Construction of new pole foundations would occur in areas that may be prone to ground failure such as liquefaction and slope instability, erodible soil and potentially unstable earth materials (Impacts G-1, G-2, and G-3). Mitigation Measures G-1a, G-2a, and G-3a would provide pre-design identification of geologic and soil conditions to evaluate each pole site to select appropriate foundation designs and would reduce these impacts to less than significant levels (Class II). Erodible soil would require proper site restoration and implementation of Mitigation Measures G-3a and G-5a to reduce soil erosion impacts to less than significant (Class II). As with the Proposed Project, access to maintenance roads would be restricted (Mitigation Measure G-4a). Impacts to paleontological resources (Impact G-7) would be mitigated to less than significant levels (Class II) with implementation of Mitigation Measures G-7a and G-7b.

### Comparison to Proposed Project

This alternative would have a slightly greater area of disturbance during construction of additional pole sites and the access roads to transition the circuit to the east side of the ROW when compared to the Proposed Project, which would thereby increase the potential for unstable soil conditions to occur as well as the potential to damage paleontological resources. The implementation of the Project Protocols and mitigation measures for the alternative would reduce the effects of the alternative to less than significant levels.

### Comparison to Proposed Project with Future Circuit

Potential environmental impacts generated by installing a future circuit on existing towers consist of soil disturbance during construction and during more frequent use of access roads for maintenance of the additional conductor. This impact would be similar for the Jamacha Valley Overhead A Alternative and the Proposed Project.

## D.5.4.3 Jamacha Valley Overhead B Alternative

### Environmental Setting

This alternative includes the construction of new poles at the center of the existing ROW in the Jamacha Valley and the removal of the existing 138 kV/69 kV steel lattice towers made obsolete by the new steel mono-poles for the 230 kV circuit. The environmental setting and the geologic and topographic conditions of this alternative are identical to the applicable portion of the Proposed Project and the Jamacha Valley Overhead A Alternative. There is little or no potential for paleontologic resources in this area.

### Environmental Impacts and Mitigation Measures

Like the Proposed Project, construction of new pole foundations would occur in areas that may be prone to ground failure such as liquefaction and slope instability, erodible soil and potentially unstable earth materials (Impacts G-1, G-2, and G-3). Mitigation Measures G-1a, G-2a, and G-3a would provide pre-design identification of geologic and soil conditions to evaluate each pole site to select appropriate foundation designs and would reduce these impacts to less than significant levels (Class II). In addition, approximately 7 to 12 existing lattice towers would be removed in areas with erodible soil. Erodible soil would require proper site restoration and implementation of Mitigation Measures G-3a and G-5a to reduce soil erosion impacts to less than significant (Class II). As with the Proposed Project, access to maintenance roads would be restricted (Mitigation Measure G-4a). Impacts to paleontological resources (Impact G-7) would be mitigated to less than significant levels (Class II) with implementation of Mitigation Measures G-7a and G-7b.

### Comparison to Proposed Project

The Jamacha Valley Overhead B Alternative would require construction of a greater number of new poles than the Proposed Project, and it would remove 7 to 12 existing tower structures. The impact of this alternative on the environment would be slightly greater than that of the Proposed Project due to increased ground disturbance necessary to install the additional poles and remove the existing towers; however, the disturbance would be temporary.

### Comparison to Proposed Project with Future Circuit

Potential environmental impacts generated by installing a future circuit on existing towers consist of soil disturbance during conductor installation. This impact would be similar for the Jamacha Valley Overhead B Alternative and the Proposed Project.

## D.5.4.4 City of Santee 138 kV/69 kV Underground Alternative

### Environmental Setting

This alternative includes a 1.35-mile underground cable that follows a paved access road from the existing ROW then crosses southwest to Princess Joann Road, goes west along Princess Joann Road through a residential neighborhood, and then crosses undeveloped land back to the ROW. The eastern segment of this alternative traverses moderate slopes until reaching gentle terrain in the residential development.

The geology along this alternative is similar to the Proposed Project. Trench excavation beneath the existing roads would encounter artificial fill, thin soil, and weathered granite in the hillside areas, and alluvium in the residential development. This alternative may encounter sensitive sedimentary units likely to contain paleontologic resources.

### Environmental Impacts and Mitigation Measures

Soft or loose soil and alluvium may affect excavation stability (Impact G-1) and may require special construction methods. Mitigation Measure G-1a would also provide pre-construction identification of soil conditions, and excavation characteristics that would reduce this potential impact to less than significant Class II). Erodible soil in the segment would require proper site restoration and implementation of Mitigation Measure G-3a to reduce soil erosion impacts to less than significant (Class II) along the 800 feet to the northwest of Princess Joann Road to the Miguel-Mission ROW. As with the Proposed Project, access to maintenance roads would be restricted (Mitigation Measure G-4a). Impacts to paleontological resources

(Impact G-7) would be mitigated to less than significant levels (Class II) with implementation of Mitigation Measures G-7a and G-7b.

### Comparison to Proposed Project

The City of Santee 138 kV/69 kV Underground Alternative would be predominantly within paved roads, which would reduce the potential for erosion of loose soil. However, approximately 800 feet of trenching at the west end of the alternative through undeveloped land would be particularly susceptible to erosion and would require proper site restoration. Because this alternative would require trenching in erosion-susceptible soils, the potential for soil disturbance with this alternative would be slightly greater than with the Proposed Project. All impacts would be mitigated to less than significant levels.

### Comparison to Proposed Project with Future Circuit

Potential environmental impacts generated by installing a future circuit on existing towers consists of soil disturbance during conductor installation. This impact would be similar for the City of Santee 138 kV/69 kV Underground Alternative and the Proposed Project.

## D.5.4.5 City of Santee 230 kV Overhead Northern ROW Boundary Alternative

### Environmental Setting

The setting of this alternative is similar to the Proposed Project because it would also be within or adjacent to the existing ROW. This alternative would be located approximately two miles north of the San Diego River across the head of a small southerly trending valley and its flanking hills. The topography along this alternative route is relatively gentle along the valley floor, but becomes steeper and more rugged in the hills to the east. This alternative may encounter sensitive sedimentary units likely to contain paleontologic resources.

### Environmental Impacts and Mitigation Measures

This alternative would require construction of two more mono-poles than the Proposed Project, allowing cross-over of the 230 kV line to the northern side of the ROW. Construction of new pole foundations would occur in areas that may be prone to ground failure such as liquefaction and slope instability, erodible soil and potentially unstable earth materials (Impacts G-1, G-2, and G-3). Mitigation Measures G-1a, G-2a, and G-3a would provide pre-design identification of geologic and soil conditions to evaluate each pole site to select appropriate foundation designs and would reduce these impacts to less than significant levels (Class II). Erodible soil would require proper site restoration and implementation of Mitigation Measures G-3a and G-5a to reduce soil erosion impacts to less than significant (Class II). As with the Proposed Project, access to maintenance roads would be restricted (Mitigation Measure G-4a). Impacts to paleontological resources (Impact G-7) would be mitigated to less than significant levels (Class II) with implementation of Mitigation Measures G-7a and G-7b.

### Comparison to Proposed Project

This alternative would have a greater area of disturbance during construction of the two additional mono-poles in comparison to the Proposed Project, which would thereby increase the potential for unstable soil conditions to occur as well as the potential to damage paleontological resources.

### Comparison to Proposed Project with Future Circuit

Potential environmental impacts generated by installing a future circuit on existing towers consists of soil disturbance during conductor installation. This impact would be similar for the City of Santee 230 kV Overhead Northern ROW Boundary Alternative and the Proposed Project.

## D.5.5 Environmental Impacts of the No Project Alternative

Implementation of the No Project Alternative assumes the future installation of new power plants in the San Diego area. Although new power plants may be necessary, their location and schedule for development cannot be predicted. Potential new generation facilities would require analysis of geologic and seismic impacts, requiring consideration of appropriate soil conditions and foundation requirements, and specific facility design to minimize damage during earthquakes that cause strong groundshaking.

## D.5.6 Mitigation Monitoring, Compliance, and Reporting Table

Table D.5-6 shows the mitigation monitoring, compliance, and reporting program for Geology, Soils, and Paleontology.

**Table D.5-6. Mitigation Monitoring Program – Geology, Soils, and Paleontology**

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| **IMPACT G-1** | **Ground Failure, Liquefaction (Class II)** |
| **MITIGATION MEASURE** | **G-1a: Geotechnical evaluations of ground stability.** Geotechnical evaluations of the liquefaction potential and general ground stability shall be undertaken wherever new tower footings or other subsurface structures are placed in areas that do not have hard bedrock at the surface. Results of the geotechnical evaluations shall be incorporated into the placement strategy for the new poles or other structures and the foundation design of the structures. Excavations in soft or loose soil shall require special construction methods or shoring as appropriate. |
| **Location** | Jamacha Valley and San Diego River Valley |
| **Monitoring / Reporting Action** | Provide copies of the geotechnical evaluations to regulating agency. |
| **Effectiveness Criteria** | Plan/remediation reduces impacts caused by liquefaction to the extent feasible |
| **Responsible Agency** | CPUC and local planning agencies |
| **Timing** | Prior to construction of new tower foundations. |
| **IMPACT G-2** | **Landslides, Earth Flows and Debris Flows (Class II)** |
| **MITIGATION MEASURE** | **G-2a: Geotechnical evaluations of ground stability and foundation design.** Placement of towers on mesas, ridges, and spurs shall be evaluated by a geologist to determine the stability of the site and adjacent slopes. The study shall consider alternatives for foundation type and depth and provide recommendations for placement of facilities, types of foundations, and remediation of unsuitable ground. |
| **Location** | Western portions of the project area where project is located on sedimentary deposits. |
| **Monitoring / Reporting Action** | Provide copies of the geotechnical evaluations to regulating agency. |
| **Effectiveness Criteria** | Plan/remediation prevents tower or offsite damage due to failure of unstable slopes. |
| **Responsible Agency** | CPUC and local planning agencies |
| **Timing** | Prior to construction of new tower or substation foundations. |
| **IMPACT G-3** | **Erodible Soils (Class II)** |
| **MITIGATION MEASURE** | **G-3a: Soil erosion along maintenance roads.** Soil erosion along the maintenance roads shall be minimized through construction of water bars, grading road surfaces to direct flow away from natural slopes, and through the consistent maintenance of roads and culverts to maintain appropriate flow paths. Silt fences and straw bales shall be installed as appropriate prior to construction, but shall be removed to restore natural drainage during the cleanup and restoration phase of the project. |
| **Location** | All access and maintenance roads. |
| **Monitoring / Reporting Action** | Mitigation measure implementation reports with monthly compliance report |
| **Effectiveness Criteria** | Plan/remediation prevents erosion and excessive sedimentation along access and maintenance roads. |
| **Responsible Agency** | CPUC and local planning agencies |
| **Timing** | Ongoing during construction and post-construction remediation. |

**Table D.5-6. Mitigation Monitoring Program – Geology, Soils, and Paleontology**

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| **IMPACT G-4** | **Erodible Soils (Class II)** |
| **MITIGATION MEASURE** | **G-4a: Restrict access to maintenance roads.** To prevent erosion caused by unauthorized use of the maintenance roads by the general public, access to maintenance roads shall be restricted with devices that effectively bar access by unauthorized vehicles. Abandoned maintenance roads shall be checked periodically (annually) to ensure no additional erosion occurs. |
| **Location** | All sites of abandoned access and maintenance roads. |
| **Monitoring / Reporting Action** | Mitigation measure implementation reports with monthly compliance report |
| **Effectiveness Criteria** | Plan/remediation prevents erosion and excessive sedimentation along abandoned roads. |
| **Responsible Agency** | CPUC and local planning agencies |
| **Timing** | During post-construction remediation and annually following project completion. |
| **IMPACT G-5** | **Unstable or Erodible Soils (Class II)** |
| **MITIGATION MEASURE** | **G-5a: Foundations in unstable slopes or erodible soils.** A geologist and geotechnical engineer should evaluate the placement of towers on mesas, ridges, slopes, spurs, and in or near active streambeds. Their analyses shall describe the geologic stability and make recommendations for the best foundation type and depth for the local conditions. |
| **Location** | All locations along the project alignment that traverse potentially unstable or erodible soils, e.g., potential landslide areas and areas prone to debris flow or flash flood. |
| **Monitoring / Reporting Action** | Provide copies of the geological and engineering analysis to regulating agency for review and comment. |
| **Effectiveness Criteria** | Geotechnical recommendations prevent failure of unstable slopes and on erodible soils. |
| **Responsible Agency** | CPUC and local planning agencies |
| **Timing** | Prior to construction of new tower or substation foundations. |
| **IMPACT G-6** | **Expansive Soils (Class II)** |
| **MITIGATION MEASURE** | **G-6a: Geotechnical evaluations of expansive soils.** Geotechnical investigations that include an analysis of expansive soil shall be performed for any new or modified foundations for facilities at the Miguel and Mission Substations. Standard foundation design for expansive soil shall be employed if expansive soils are found at either of the sites. |
| **Location** | Miguel, Los Coches, and Mission Substations. |
| **Monitoring / Reporting Action** | Provide copies of the geological and engineering analysis to regulating agency for review. |
| **Effectiveness Criteria** | Geotechnical recommendations prevent failed foundations at substations. |
| **Responsible Agency** | CPUC and local planning agencies |
| **Timing** | Prior to construction of new substation foundations. |
| **IMPACT G-7** | **Paleontologic Resources (Class II)** |
| **MITIGATION MEASURE** | **G-7a: Review of construction plans by paleontologist.** A qualified paleontologist shall review the project and provide an opinion of which geologic units are classified as sensitive in terms of paleontologic sensitivity. The findings of the paleontologist shall be used to organize paleontologic monitoring in sensitive units (pursuant to Mitigation Measure G-7b) as well as to identify potential areas of avoidance for new access road construction and construction laydown areas. |
| **Location** | All parts of the project area where there is a possibility or certainty of encountering potentially fossil-bearing strata (mainly in the western part of the project area). |
| **Monitoring / Reporting Action** | Provide preliminary paleontologic report to regulating agency for review and comment. |
| **Effectiveness Criteria** | Recommendations prevent destruction of non-renewable paleontologic resources. |
| **Responsible Agency** | CPUC and local planning agencies |
| **Timing** | Prior to construction. |

**Table D.5-6. Mitigation Monitoring Program – Geology, Soils, and Paleontology**

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|---|---|
| **MITIGATION MEASURE** | **G-7b: Paleontological training and monitoring.** A qualified paleontologist shall be employed to help implement the paleontological portion of the environmental training program for construction workers. All employees involved with earthmoving shall receive this training and shall be instructed as to the laws regarding the protection of paleontologic resources. The paleontologist shall also monitor excavations and drilling for new footings or foundations in sensitive geologic units at the Miguel Substation and along the route west of Eucalyptus Hills (Valle Vista Road). Where fossil finds have been disturbed due to excavation or road grading, the fossils should be collected (salvaged) and prepared for curation with a public museum that has a paleontologic collection. The paleontologist should sample the excavation spoils pile for both mega fossils (can be seen by the naked eye) and microfossils (very tiny fossils that must be retrieved through wet or dry screening of fine-grained samples). The Society of Vertebrate Paleontology guidelines (1995) for monitoring, sampling, and salvaging fossils shall be followed. The results of the paleontologic monitoring shall be presented in a final paleontologic report that will be held confidential. A copy of the confidential report and all paleontologic finds from the project shall be donated to a curating museum. |
| **Location** | All parts of the project area where there is a possibility or certainty of encountering potentially fossil-bearing strata (mainly in the western part of the project area). |
| **Monitoring / Reporting Action** | Provide monthly paleontologic monitoring reports to regulating agency for review. |
| **Effectiveness Criteria** | Recommendations prevent destruction of non-renewable paleontologic resources. |
| **Responsible Agency** | CPUC and local planning agencies |
| **Timing** | Prior to construction. |

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