

3.8 GEOLOGY, MINERALS, AND SOILS

This section addresses the effects on geology, minerals, and soils that would be caused by the proposed Tule Wind Project. The following discussion describes the existing environmental setting in the surrounding area, analyses the impacts of the proposed project, and recommends mitigation measures to avoid or reduce impacts of the proposed project. The following studies were used for this geological analysis:

Draft Tule Wind Project Geological Hazards Assessment, January 2010, HDR Engineering, Inc. (Appendix K).

Draft Tule Wind Project Desktop Study, November 2009, Barr Engineering (Appendix L).

Data Gap

An approved Preliminary Grading Plan for the proposed project is being prepared for the County portion of the project area and a Final Grading Plan will be prepared after final design and prior to construction for the entire project. To date, a grading plan has not been incorporated into this environmental document. Upon approval and incorporation of the Grading Plan, some project conditions or analyses may change.

3.8.1 Affected Environment/Environmental Setting

Regional and Site Geology

The proposed project site is located in eastern San Diego County, north of Interstate 8 (I-8). The project area is west of Anza-Borrego Desert State Park within the McCain Valley in the In-Ko-Pah Mountains. The area is east of Cleveland National Forest and the Laguna Mountains, and south of the Sawtooth Mountains. The terrain includes moderate to steep slopes with the most southern area of the project at the lower elevations of 3,600 feet above mean sea level (AMSL) in the McCain Valley. The project continues north through the valley and extends east into the eastern In-Ko-Pah Mountains and reaches elevations of 5,600 feet AMSL, as shown in **Figure 3.8-1**, Area Topography. The project is situated in two physiographic provinces, the Basin and Range province and the Lower Californian province. The closest named fault line is the Coyote Mountain section of the Elsinore Fault Zone, located approximately 7.1 miles northeast on the eastern portion of the In-Ko-Pah Mountains. There are several unnamed northwest trending faults, which are estimated to be Quaternary in age and potentially active, in addition to two small east-west faults with no age attribution transecting the northern portion of the project area.

Soil Conditions

The project site has surficial soils of detrital, colluvial and alluvial origin, consisting primarily of sand, silty sand, and gravel. The following soils are found within the project site area and are illustrated in **Figure 3.8-2**, Project Area Soils:

Calpine coarse sandy loam, 2 to 5 percent slopes (CaB), 5 to 9 percent slopes (CaC): The Calpine soil series consists of well-drained soils. These soils have a very low to low surface runoff and a moderately

quick permeability. Calpine soils can range from 0 to 15 percent slopes, although slopes of 2 to 9 percent are found on the project site. These soils are formed in alluvium from granitic rocks and are found on alluvial fans and remnants and stream terraces.

Holland fine sandy loam, 5 to 15 percent slopes (HmD), 5 to 30 percent slopes (HnE), 30 to 60 percent slopes (HnG): The Holland series is of deep, well drained soils from granitic rock, either quartz diorite or granodiorite. Holland series soils can be found to have slopes of 2 to 75 percent although on the project site, slopes of 5 to 60 percent are found. The Holland soils are moderately permeable and have a slow to very rapid runoff rate.

Kitchen Creek loamy coarse sand, 5 to 9 percent slopes (KcC), 9 to 15 percent slopes, eroded (KcD2): The Kitchen Creek soils series is formed in residuum from granitic and other acid igneous rocks and are generally well drained. The soils have a medium runoff rate with a moderately rapid permeability.

La Posta loamy coarse sand, 5 to 30 percent slopes, eroded (LaE2), 5 to 30 percent slopes, severely eroded (LcE3), 5 to 30 percent slopes, eroded (LcE2): The La Posta soil series are generally moderately sloping to very steep, and on the project site are found at slopes of 5 to 30 percent. These soils are formed in residuum from granitic rocks and are generally extremely drained with a medium to rapid runoff rate and a rapid permeability.

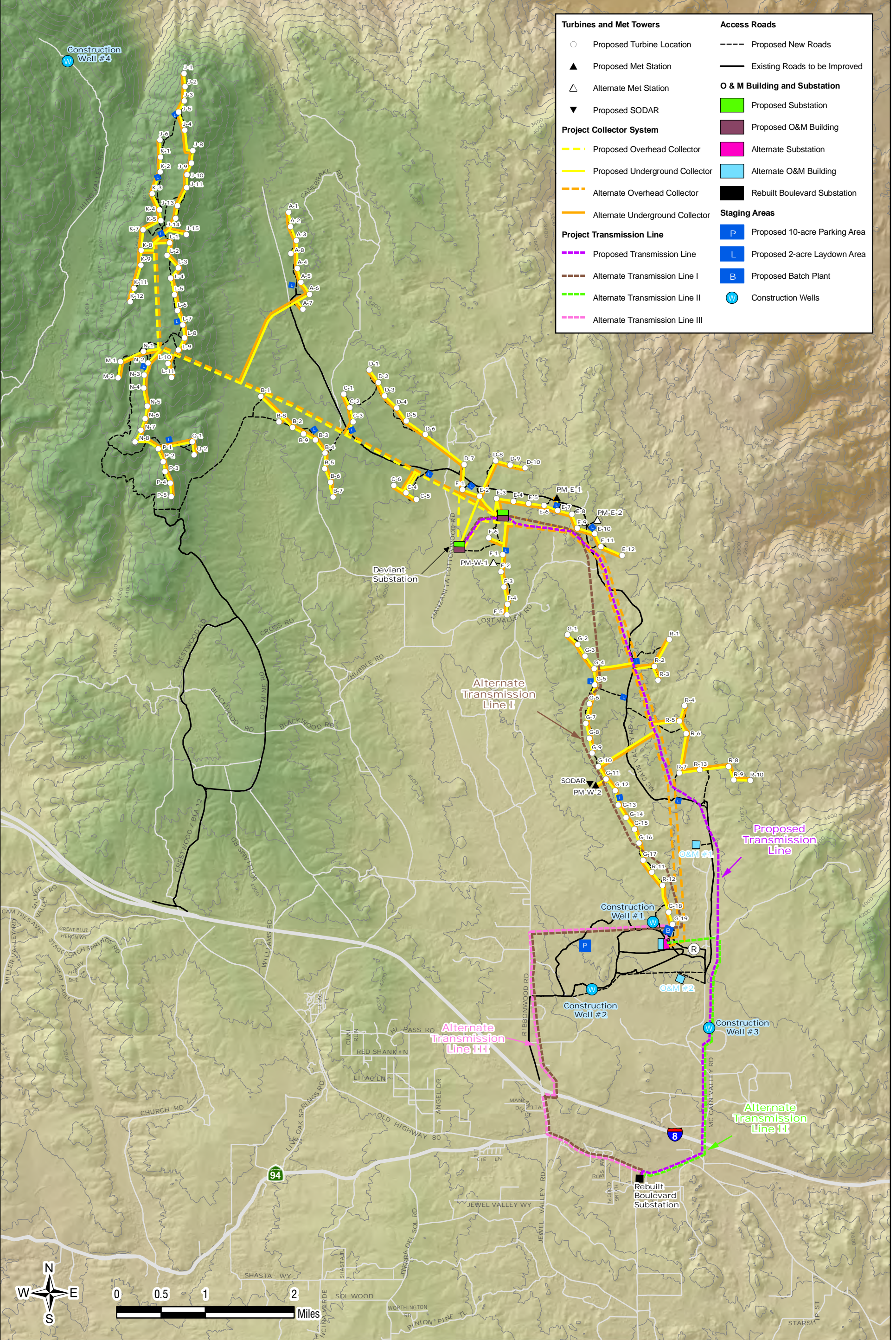
La Posta-Sheephead complex, 9 to 30 percent slopes (LdE), 30 to 65 percent slopes (LdG): A combination of La Posta-Sheephead soils are also found onsite, at slopes from 9 to 65 percent.

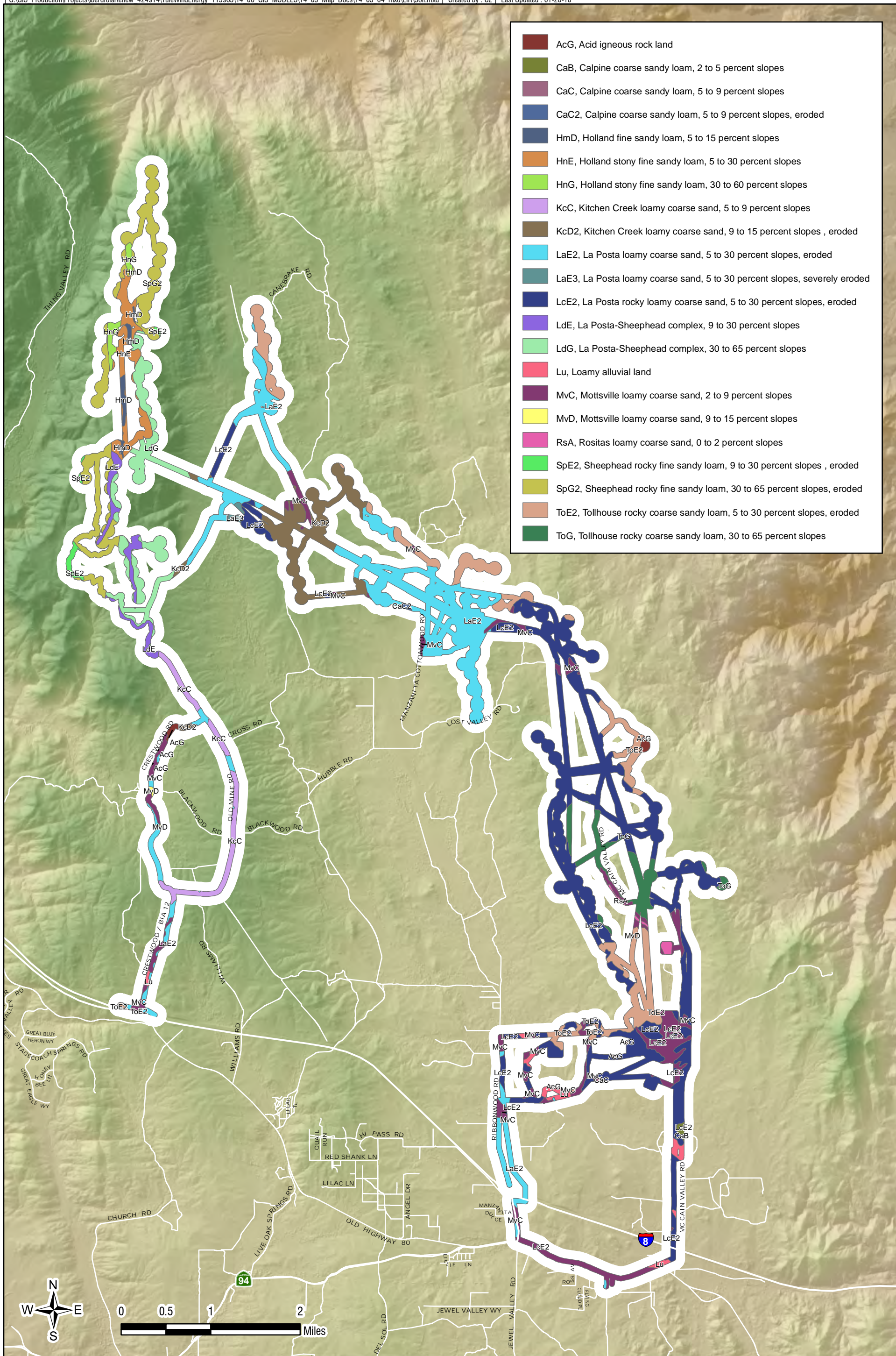
Mottsville loamy coarse sand, 2 to 9 percent slopes (MvC), 9 to 15 percent slopes (MvD): The Mottsville series soils are formed in alluvium from granitic rocks and are found on alluvial fans, fan aprons and fan remnants. Mottsville soils can be found on slopes of 0 to 15 percent, and this range of slopes is found on the project site. These soils are excessively drained and have a low surface runoff rate with a rapid rate of permeability.

Rositas loamy coarse sand, 0 to 2 percent slopes (RsA): Rositas soils are formed in sandy eolian material and are found on dunes and sand sheets. Slopes of these soils can range from 0 to 30 percent, although Rositas soils are found on the project site in a 0 to 2 percent slope range. These soils are excessively drained, have a low runoff rate, and a rapid rate of permeability.

Sheephead rocky fine sandy loam, 9 to 30 percent slopes, eroded (SpE2), 30 to 65 percent slopes, eroded (SpG2): The Sheephead soil series is of shallow soils formed from weathered mica, schist, gneiss, or granite material. Sheephead soils are found on slopes of 9 to 75 percent, although on the project site, Sheephead soils are found at slopes of 9 to 65 percent. These soils are excessively drained with a moderate to rapid runoff rate and a moderately rapid rate of permeability.

Tollhouse rocky coarse sandy loam, 5 to 30 percent slopes, eroded (ToE2), 30 to 65 percent slopes (ToG): The Tollhouse soils are shallow, well drained soils which were formed from material weathered from granitic rocks. They can have very steep slopes, although the Tollhouse soils on the project site are found at slopes of 5 to 65 percent. Tollhouse soils have a rapid rate of runoff and a moderate to rapid rate of permeability. Additionally, acid igneous rock land (AcG) and Lomay alluvial (LU) are found on the project site.





Geologic Bedrock

Approximately 90 percent of the project area is underlain by the La Posta Tonalite unit of early and late Cretaceous age, as shown in **Figure 3.8-3, Faults**. These crystalline plutonic rocks include primarily hornblende-biotite trondhjemite, which is locally foliated. This rock body is largely undeformed and inclusion-free.

In the westernmost 10 percent of the project area, a body of metamorphic rocks of Triassic and Jurassic ages is exposed, which include semi-pelitic, pelitic, and quartzitic schists, calc-silicate bearing feldspathic metaquartzite, and minor small pebble metaconglomerate. These rocks also contain layers of sandstone, quartz pebble conglomerate, mudstone, and amphibolite, and are thought to represent metamorphosed submarine fan deposits interlayered with volcanic rocks. These rocks are locally intruded by leucocratic dikes comprising leucogranite, granophyre, alaskite, pegmatite, and aplite, which range in age from late Jurassic to early Cretaceous. A small body of middle to late Jurassic age Harper Creek gneiss is present at the westernmost edge of the project area.

Surficial Units

Local areas of younger alluvium are present in the project area. These materials are generally composed of sand, silt, and gravel, and occur along modern intermittent drainage courses. Colluvium occurs on east-facing slopes in the western portion of the project area. Colluvium includes sand and gravel as slope wash deposits and debris flows. Some talus (broken rock piles) is also present at the base of local steeper slopes in the western portion of the project area.

Faulting and Seismicity

According to the Geologic Hazards Assessment (HDR 2010) conducted for the project, there are several northwest-trending faults, having lengths from a few hundred feet up to 4,000 feet, mapped within the project area. These faults are generally identified as being of pre-Quaternary age shown in **Figure 3.8-3, Faults**. There are many similar faults in the areas surrounding the proposed project (Todd 2004), only a few of which are shown on the California Division of Mines and Geology (CDMG) 1994 fault activity map. Those shown on the CDMG map are said to be of pre-Quaternary age, except for two of the northwest-trending faults mentioned above, which are said to be of undivided Quaternary age (i.e., between 1.6 million and 200 years old), and which must be considered potentially active. Two faults trending nearly east-west are present transecting the northern portion of the project area. These faults have lengths of 2,000 and 1,500 feet, respectively. No age attribution has been published for these small faults.

Several proposed turbines are located close to mapped fault lines. These include a fault line east of proposed turbines J-6, K-1, K-2 and K-3, and west of J-13, L-1 and L-2. Another fault line is located south of A-4 and north of A-5 and A-6. Another fault is located east of P-5. The closest named fault line is the Coyote Mountain section of the Elsinore Fault Zone located approximately 7.1 miles northeast of the proposed project site. The project site is also located west of the Borrego Mountain section and Superstition Hills section of the San Jacinto fault zone, the Imperial fault, and an unnamed fault of the Brawley seismic zone.

While there are unnamed fault/folds located in the area of the project site, the area is located relatively close to a historic seismic active area. Five earthquakes have occurred in the El Centro and Imperial

Valley area between 1915 and 2003, located approximately 35 to 45 miles east of the project area, with a magnitude of 6.3 and higher, as presented in **Table 3.8-1**, Historic Area Earthquakes.

Table 3.8-1. Historic Area Earthquakes

Name or Location	Earthquake Magnitude	Distance to Project Area	Date	Comments
Calexico-El Centro, CA	Two 6.3	40 miles east	June 23, 1915	Damage property of 900,000 and six fatalities, felt in Los Angeles, east to Yuma Arizona, and south to Ensenada, Mexico.
Imperial Valley, CA	7.1 and 5.5	45 miles east	May 19, 1940	Claimed nine lives and property damage of 6 million. Main earthquake was felt over Southern California, southwest Arizona, and northern Baja California.
Superstition Hills, CA	6.5 and 6.7	35 miles east	November 24, 1987	Caused two fatalities and estimated 3 million in property damage. Felt over most of southern California and western Arizona and southern Nevada.
Imperial Valley, CA	6.5	45 miles east	October 15, 1979	Injured 91 people and caused 30 million dollars in damage, felt in southern California, southern Nevada, western Arizona, and parts of Mexico.
Brawley, CA	4.2	41 miles east	May 24, 2003	Damage not identified.

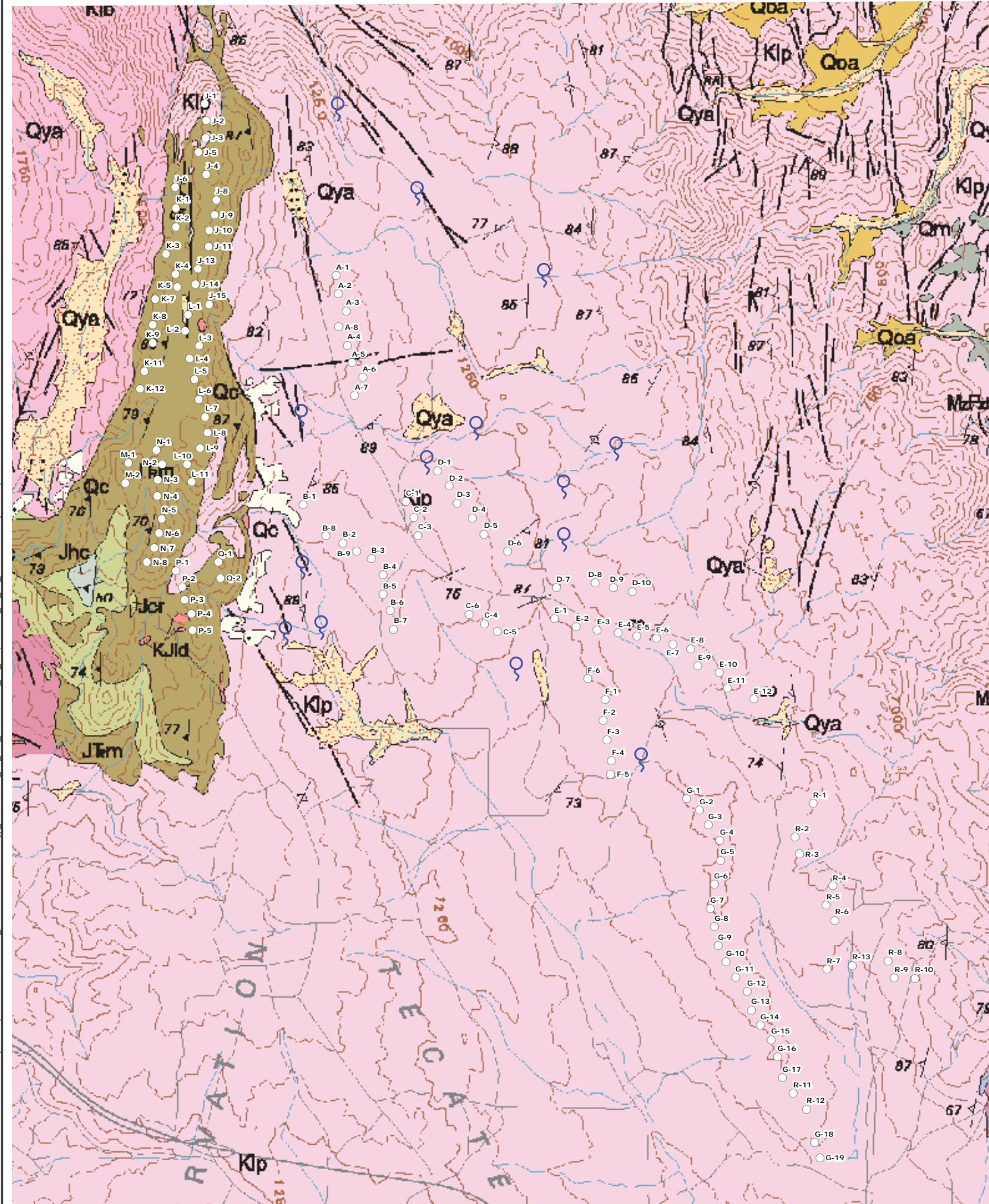
Source: http://earthquake.usgs.gov/earthquakes/states/historical_state.php

Ground Shaking

According to the Geological Hazards Assessment (HDR 2010), all of San Diego County is located within Seismic Zone 4, which indicates that the site is subject to moderate to severe ground shaking. For the project area, this is attributable to the presence of the Elsinore Fault Zone, approximately 7.1 miles east-northeast of the project site at its nearest point. The Maximum Credible Earthquake for the Temecula segment of the Elsinore Fault Zone is a moment magnitude 6.8 event (Cao 2003).

Ground motions (10% probability of being exceeded in 50 years) are expressed as a fraction of the acceleration due to gravity. Three values of acceleration response parameters in multiples of the acceleration of gravity for the mapped maximum credible earthquake are shown, S_s/S_1 for seismic wave periods of 0.2 seconds (S_s) and 1.0 seconds (S_1), 0.2 seconds (S_M) and 1.0 seconds (S_{M1}) adjusted for site conditions, and S_M/S_{M1} values for periods of 0.2 seconds (S_D) and 1.0 seconds (S_{D1}) used to determine the site seismic design category. **Table 3.8-2** contains seismic design parameters derived from the U.S. Geological Survey (USGS) earthquake hazards program (accessed November 11, 2009). Full details of the input parameters used to generate these values are presented in Appendix A of the *Draft Tule Wind Project Geological Hazards Assessment* (Appendix K). Site Class B (rock) was selected for this assessment, which is the appropriate site class for the proposed ridgeline tower locations in the project area.

Source: GeohazardAssessment, 2009 | G:\Projects\IberdrolaRenew_424914\TuleWindEnergy_11596514_00_GIS_MODELS\14_02_Graphics\14_02_01_docs\Faults.all | Last Updated: 01-18-10



EXPLANATION

- Qya** **Young alluvium (Holocene)**—Sand, silt, and gravel in modern streambeds and washes. Includes recent material accumulated on active alluvial fans
- Qc** **Colluvium (Holocene and Pleistocene)**—Sand and gravel of slopewash, debris-flow, and talus deposits. Grades locally into younger alluvium (Qya) and older alluvium (Qoa)
- Qoa** **Older alluvium (Holocene and Pleistocene)**—Sand, silt, and gravel; moderately dissected terraces in stream valleys. Well to poorly bedded, unconsolidated. In places, modern streams incise older alluvium to as much as 15 m. In some areas, older alluvium grades into younger alluvium
- KJld** **Leucocratic dikes (Late Cretaceous and Late Jurassic)**—Leucogranite, granophyre, alaskite, pegmatite, and aplite; found cutting plutonic units in quadrangle. Includes dikes of at least three ages
- Klp** **Tonalite of La Posta (Early and Late Cretaceous)**—Hornblende-biotite trondhjemite in western part, and biotite trondhjemite and granodiorite in eastern part. Unit is leucocratic, homogeneous, largely undeformed, and inclusion-free, but locally, pluton margins are moderately to strongly foliated. Color index from 6 to 15
- Jcr** **Granodiorite of Cuyamaca Reservoir (Late and Middle Jurassic)**—Biotite and hypersthene-biotite granodiorite and tonalite; also contains actinolitic amphibole. Fine to medium grained, strongly foliated, locally mylonitic gneiss. Average color index is 25
- Jrm** **Metasedimentary and metavolcanic rocks (Jurassic and Triassic)**—Interlayered semi-pelitic, pelitic, and quartzitic schists; calcisilicate-bearing feldspathic metaquartzite; and minor small-pebble metaconglomerate. Includes layers of sandstone, quartz-pebble conglomerate, mudstone, and amphibolite. Interpreted to be metamorphosed submarine fan deposits and intercalated volcanic rocks; equivalent to the Julian Schist of Hudson (1922)
- Jhc** **Gneiss of Harper Creek (Late and Middle Jurassic)**—Gneiss to mylonitic biotite granodiorite and tonalite, and lesser monzogranite. Fine- to medium-grained; strongly foliated. Average color index is 22. Contains muscovite, cordierite, sillimanite, and garnet, and abundant inclusions. Isoclinal folded in places

- Contact** —Solid where accuracy of location ranges from well located to approximately located; dashed where very poorly located or inferred. Color change without a contact shown is a scratch boundary
- Fault** —Solid where accurately located, dashed where approximately located, dotted where concealed. Arrow and number indicate direction and amount of dip.
- Quaternary fault - age undifferentiated (CDMG- Fault Activity Map of California and Adjacent Areas (1994))**

- Spring (Approximate)**
- Turbine**

Strike and dip of bedding

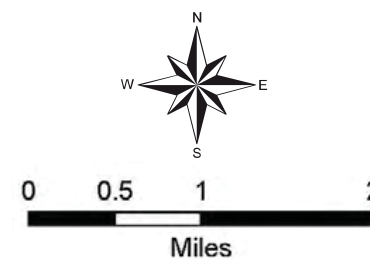
- Horizontal**
- Inclined**

Strike and dip of foliation, primary igneous

- Inclined**
- Vertical**

Strike and dip of foliation, metamorphic

- Inclined**
- Vertical**



Geology from Todd, V.R., 2004, Geologic Map of El Cajon 30'x 60' Quadrangle, Southern California

Table 3.8-2. Site Seismic Acceleration Values

Location	Ss/S1 ¹	SMs/SM1 ²	SDs/SD1 ³
Northern end of project area	1.429/0.519	1.429/0.519	0.953/0.346
Southern end of project area	1.283/0.450	1.283/0.450	0.855/0.300

Source: *Draft Tule Wind Project Geological Hazards Assessment*, HDR Engineering, January 2010.

- Notes:
1. Ss/S1 are the spectral acceleration response parameters in multiples of the acceleration of gravity for the mapped maximum credible earthquake (MCE) for seismic wave periods of 0.2 seconds (Ss) and 1.0 seconds (S1).
 2. SMs/SM1 are the spectral acceleration response parameters in multiples of the acceleration of gravity for the mapped MCE adjusted for site conditions, for seismic wave periods of 0.2 seconds (SMs) and 1.0 seconds (SM1).
 3. SDs/SD1 are the spectral acceleration response parameters in multiples of the acceleration of gravity used to determine the site seismic design category, calculated as 2/3 of the SMs/SM1 values for periods of 0.2 seconds (SDs) and 1.0 seconds (SD1).

Liquefaction

Liquefaction is a potential risk where loose, saturated sandy soils can transition from a solid state to a liquefied state when subjected to seismic energy. The loose sands tend to decrease in volume, which produces an increase in their pore water pressures and consequently a decrease in shear strength; i.e., reduction in effective stress. Liquefaction is more likely to occur in loose to moderately saturated granular soils with poor drainage, such as silty sands or sands and gravels capped or containing seams of impermeable sediments. The County has identified specific soil units that are susceptible to liquefaction risk, including the Mottsville loamy coarse sand (MxA), 0-2 percent slopes. The site contains Mottsville soil (MvC) loamy coarse sand, 2 to 9 percent slopes, and Mottsville loamy coarse sand (MvD), 9 to 15 percent slopes, with a depth to water table more than 80 inches, which is considered a well-drained soil. The general description of loamy coarse sand has a depth of water table more than 80 inches, whereas other soil types are less than 80 inches thick over rock and weathered rock. The geotechnical studies have identified the proposed turbine sites E-11, C-1, C-2, C-3, C-4 are located close to an area containing Mottsville soil.

The Mottsville soil is located through out the project area. According to the United States Department of Agriculture (USDA), Natural Resource Conservation Service (NRCS) metadata, more Mottsville soil is identified in the project area than identified in the Barr Engineering and HDR Engineering geologic studies indicate, as shown in **Figure 3.8-2**, Project Soils. The availability of groundwater in areas with no slope makes this soil a liquefaction hazard. There are seven identified springs located throughout the project area, with turbines D-1 and F-4 located nearest to an identified spring as shown in **Figure 3.8-3**, Faults. While it is possible that saturated soils exist immediately adjacent to these spring locations, the majority of the turbine locations are located on top of hills and soils would have sufficient drainage due to the slope. Additionally, turbine sites appear to be located a sufficient distance from the springs that the risk of liquefaction appears to be low. Further analysis will be required prior to construction to assess the on-site geotechnical conditions.

Landslides

The project site has areas of steep slopes, with some greater than 25 percent. In the western portion of the project area, some bedrock units such as schists, which have foliations and other planes of weakness, could contribute to instability of constructed cut slopes. There may be local talus deposits which could also impact planned grading. There is the potential for landslides primarily in the westernmost portion of the site, where schists are present. Areas underlain by tonalite (approximately 90 percent of the project areas) are considered to be generally free of the potential for landslides.

Expansive Soils

Certain types of clayey soils have a tendency to absorb water and swell and shrink as they dry, leading to cosmetic and structural damage. The County of San Diego has identified specific soil units that are susceptible to expansion (shrink-swell). The project site includes silty sands (SM), not fat clays (CH or MH); thus, the project is not susceptible to expansive soil conditions.

Hydrogeologic Conditions

The project area generally receives 9 to 12 inches of precipitation annually (County of San Diego). Given the thin and well-drained soils, crystalline bedrock, and high steep relief, groundwater should not be an issue for soil saturation and liquefaction hazard. Soil mapping indicates the water table is greater than 80 inches deep.

In the crystalline bedrock groundwater there is no porosity in the rocks, so the groundwater will only be present in open joints, fractures, and local shear zones. Concentrations of groundwater may be present adjacent to mapped faults where more fracturing is present and where fault gouge along fault planes and shear zones may cause retardation of lateral and vertical flow of descending meteoric water and groundwater. Several mapped springs in the project area probably reflect water being conducted along joint and fracture systems where they intersect the ground surface, and may also include areas where faults cause local retention of groundwater. It is not known whether the mapped springs are perennial or intermittent. Recharge of these systems comes through rainfall and snow melt. Small local bodies of silt, sand, and gravel in intermittent stream drainages may also be seasonally saturated through rainfall and snow melt.

As discussed previously, there are seven springs located within one mile of a proposed tower site. The closest that any tower location comes to a spring location is approximately 500 feet from proposed tower D-1, as shown in **Figure 3.8-3, Faults**.

A groundwater well will be drilled for the Operation and Maintenance (O&M) building. Based on an estimated need of 2,500 gallons of water per day (gpd), the well must be capable of supplying water at a rate of approximately 2 gallons per minute (gpm). Typically wells drilled within fractured bedrock yield relatively low production capacities; however, the median well yield from fractured rock wells in San Diego County range from less than 3 gpm to over 100 gpm. There is a moderate to high probability of successfully drilling a well that can yield at least 2 gpm.

Flash Floods and Mud Flows

The general area is subject to heavy rains at time causing flash floods and mud flows. Mudflows are determined by topography, and generally follow existing drainage patterns. There were no alluvial fans identified within the project area. The project facilities will be constructed on high ground and will avoid drainage courses whenever possible.

Minerals and Mines

Currently there are at least 48 abandoned or inactive mine openings in the project vicinity. The majority of these sites are located in the vicinity of Julian and McCain Valley. Several informational brochures regarding abandoned mines have been produced. These publications emphasize the safety hazards associated with abandoned and inactive mines, and the precautions that should be utilized around these

sites. Abandoned mine hazards include, but are not limited to, open shafts and adits, open pits and quarries, high and steep walls of pits and trenches, potential for the presence of explosives, the presence of contaminated air or gas in underground workings and the presence of unstable buildings or structures.

The primary mineral commodities of San Diego County are gravel and crushed stone, although there are still some mineral mines located in the area. According to the USGS, there are two mines located in the western portion of the project area that are currently active and producing Tungsten ore. Two mines named Metal Mountain Mines are located adjacent to turbines N-6, N-7 and N-8. Area mines are with status, and longitude and latitudes is presented in **Table 3.8-3**, and shown in **Figure 3.8-6**. There is also one active mine in the regional vicinity, Packrat Mines. Packrat Mines operates approximately 3.5 miles southeast of the project site and mines gemstones. Deposits of the following minerals have been found in the vicinity of the project site: manganese, gemstones, semi-precious gemstones, beryllium, tungsten, strontium, feldspar, and silica.

Development of mineral resources from public lands managed by the Bureau of Land Management (BLM) is regulated under the General Mining Law of 1872, which allows citizens the right to enter public lands for the purpose of exploration and development of minerals. Resources are listed in three categories:

- **Locatable Mineral Deposits.** Includes metallic minerals such as asbestos, barite, gypsum, and mica; and uncommon varieties of stone;
- **Leasable Minerals.** Include fluid energy mineral deposits such as oil, gas, coal bed methane, carbon dioxide, and geothermal resources. Solid energy and/or industrial mineral such as coal, sodium and potash, are also disposed of from public land by BLM lease;
- **Salable Minerals.** Includes construction materials such as sand, gravel, cinders decorative rock, and building stone.

According to the Environmental Impact Statement prepared for the Eastern San Diego County Resource Management Plan (RMP), most minerals of interest in the planning area are localized within a series of granitic intrusive rocks ranging in age from Precambrian (600 million years ago) to Cretaceous (65 million years ago). Composition varies from granite to gabbro. Localized within the plutonic rocks are zones and veins of pegmatite rocks. Plutonic rocks comprise and dominate the Sawtooth Mountains. There are three areas of historic mineral development: the Julian District, the Metal Mountain District (located northwest of McCain Valley), and the Sacatone District located in the Sacatone Spring/Tule Mountain area southeast of McCain Valley), none of which are located within the project area.

The project area is identified as having moderate potential for construction materials, nonmetallic/ industrial, and locatable (metallic) minerals. There is currently no commercial activity due to poor access and lack of a consistent market in the area. A high potential for construction materials (sand and gravel) exists in the McCain Valley. Access to the area is limited due to private holdings surrounding the area. In addition, the presence of off-highway vehicle (OHV) activities in the Lark Canyon area of McCain Valley impedes establishing a safe site for a rock quarry. **Figure 3.8-4** identifies the metallic minerals and **Figure 3.8-5** identifies the non-metallic and industrial mineral potential as identified by BLM in the general vicinity of the project area.

Table 3.8-3. BLM Identified Area Mines

Mine Name	Site ID	Type	Longitude	Latitude	Township and Range
Metal Mountains	2624	Abandoned	32.774721	-116.365895	N/A
Metal Mountain	0060730459	Underground	32.782778	-116.370278	CA 27 T16SR6E
Buckthorn Deposit	0060730407	Surface-Underground (abandoned)	32.773808	-116.36701	CA 27T16S6E
Blackstone	0060730447	Unknown	32.771389	-116.376944	N/A
Winatoma and Morning Glory	0060730408	Mine	32.775278	-116.373056	N/A
Unknown Name	2622	Quarry	32.773557	-116.3365896	N/A
Crestline & Gem Spar	0060730409	Unknown	32.76666	-116.365833	N/A

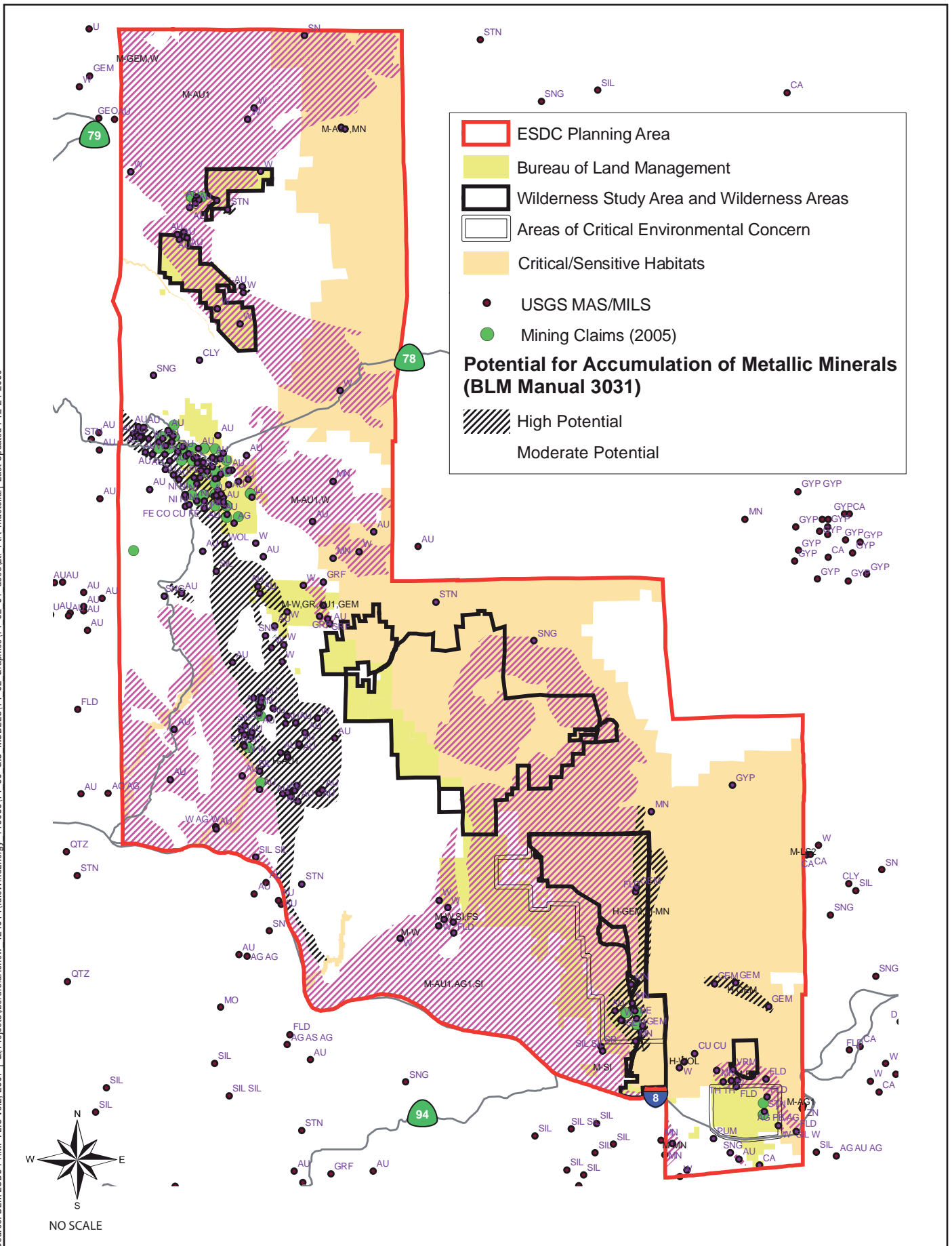
Source: BLM Geocommunicator, <http://www.geocommunicator.gov/blmMap/Map.jsp?MAP=SITEMAPPER>

Turbine Foundation Types

Feasible foundation types for the project are in part selected based upon a combination of critical geotechnical, climatological, and mechanical factors which drive design selection. The following foundation types are feasible based on the combination of critical geotechnical, climatological, and mechanical factors identified:

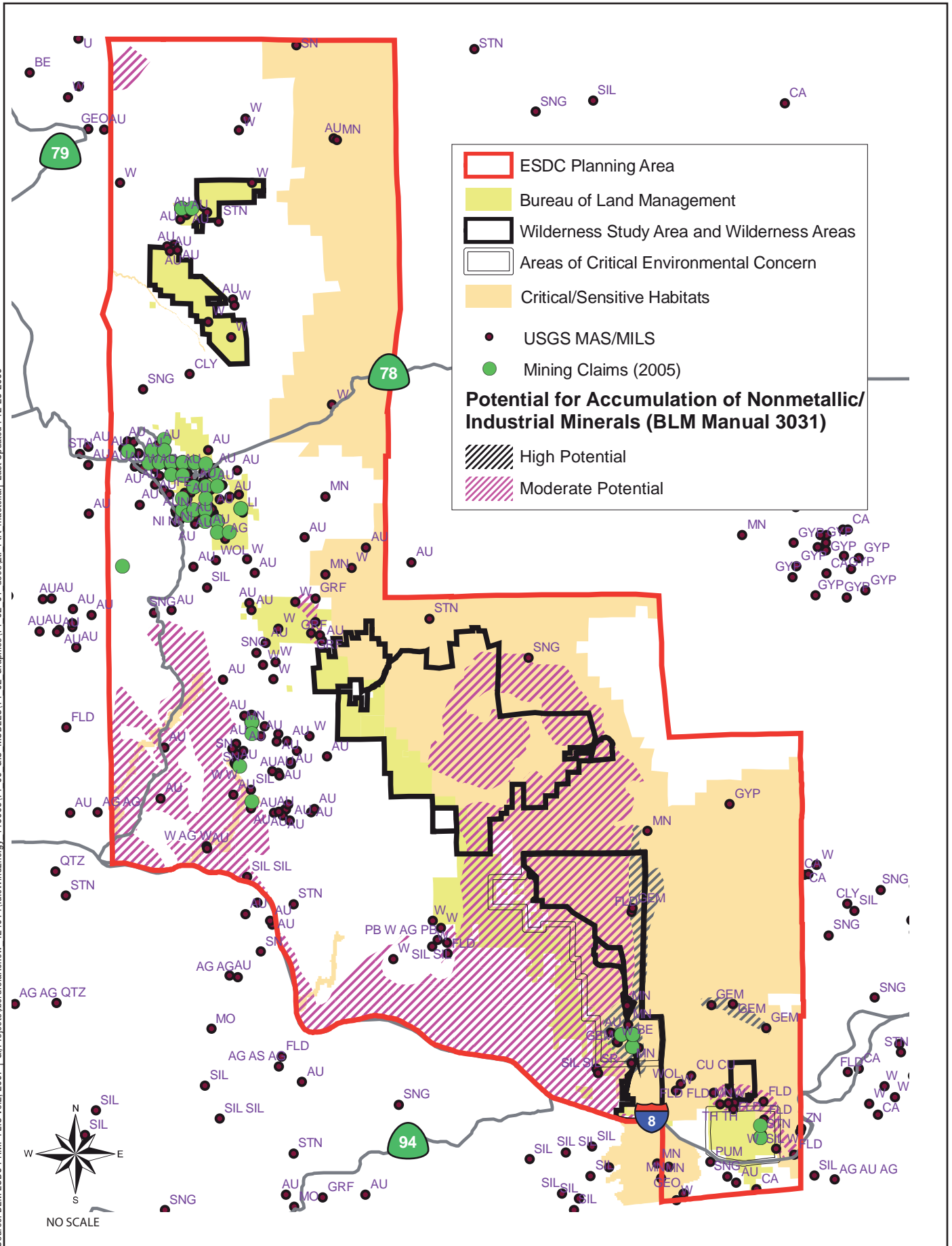
- **Spread Footing.** The soil deposits and bedrock are typically suitable for support of a spread footing. A level foundation subgrade is difficult to achieve in bedrock, and the use of lean concrete and engineered fill is often needed to level the bedrock subgrade.
- **Rock Socket Foundation.** At sites where bedrock is encountered at very shallow depths; i.e., within 1-3 feet of the ground surface, a rock socket foundation may be appropriate. This foundation type may be feasible at some locations. This type of foundation is constructed by blasting an excavation approximately 20' x 20' x 20' into the bedrock, placing an anchor bolt cage and reinforcing in the excavation, and filling the excavation with concrete. The success of this foundation type is highly dependent on the rock strength, rock conditions, and blasting techniques. Each site needs to be evaluated accordingly. There is more uncertainty associated with a rock socket foundation than with a conventional spread footing.
- **Rock Anchor Foundation.** At sites where strong, massive bedrock is encountered at very shallow depths; i.e., within 1-3 feet of the ground surface, a rock anchor foundation may be appropriate. This foundation type may be feasible at some locations. This type of foundation is constructed by blasting an excavation approximately 25-35 feet in diameter by 7-9 feet into the bedrock, drilling anchors to an approximate depth of 20-50 feet, placing an anchor bolt cage and reinforcing in the excavation, and pouring a concrete cap. This type of foundation is also dependent on the rock strength and condition. There is also more uncertainty associated with a rock anchor foundation than with a conventional spread footing.

Source: BLM ESDC PRMP FEIS Vol2, 2007 | G:\Projects\berdrola\Renew_424914\TuleWindEnergy_11596514_00_GIS_MODELS\14_02_Graphics\14_02_01_docs\Ltr_Pirtt_masterairal_Last Updated - 12-24-2009

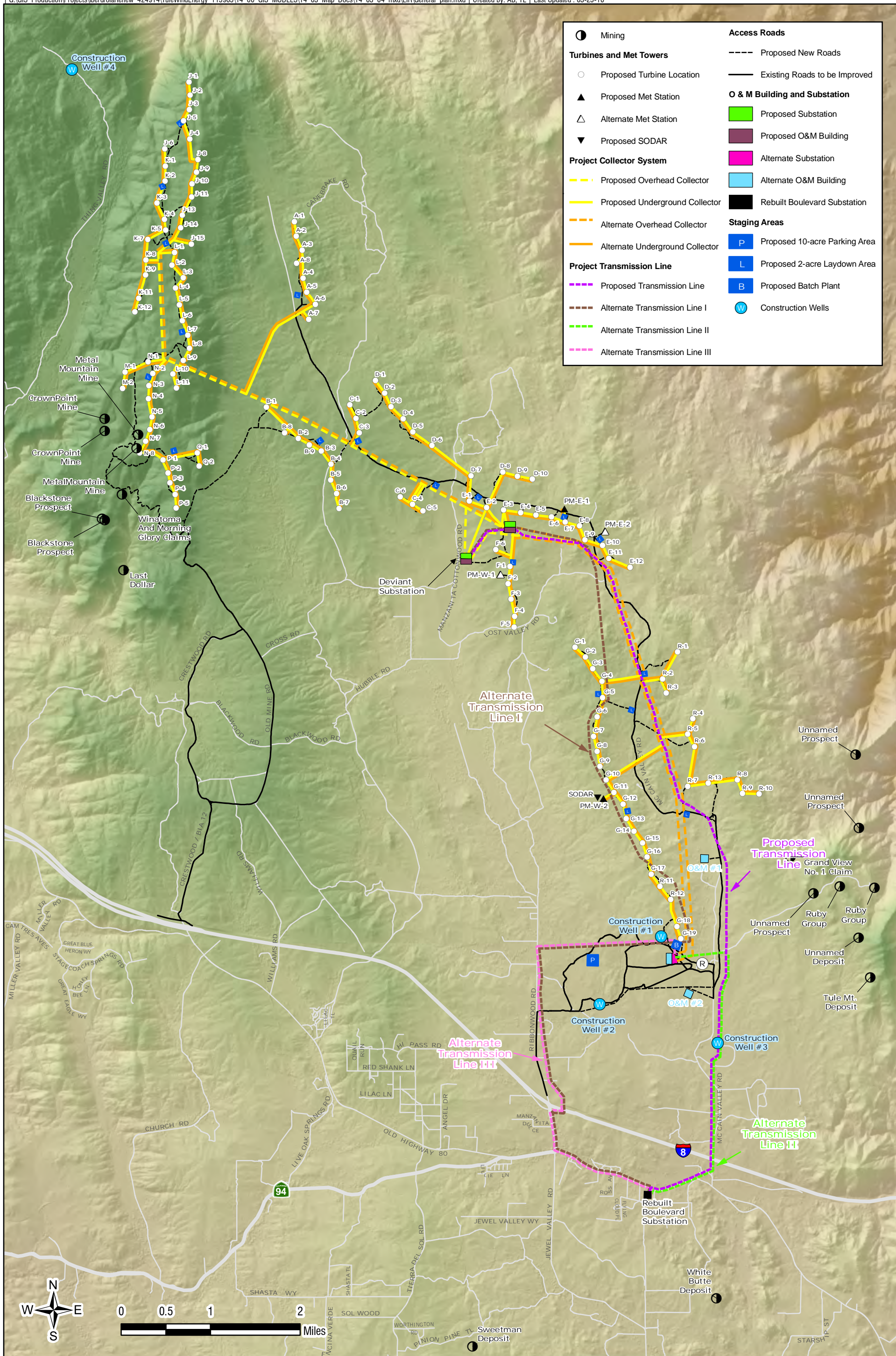


Potential For Locatable (Metallic) Minerals
FIGURE 3.8-4

Source: BLM ESDC PRMP FEIS Vol2, 2007 | G:\Projects\berdrola\Renew_424914\TuleWindEnergy_11596514_00_GIS\Models\14_02_Graphics\14_02_01_docs\lrr_Pirtt_master\lrr_12-23-2009



Non-Metallic/Industrial Mineral Potential
FIGURE 3.8-5



- Patrick and Henderson (P&H) Style Foundation.** P&H-style caissons have been constructed in similar soil and rock conditions found at the project site. The P&H-style foundation is known to occasionally have issues with foundation movement and stiffness, but is feasible to construct at this project.

It is unlikely that all of the foundations presented will be feasible or cost-effective; therefore, site-specific based design will assist in areas where additional engineering is required.

Soil Electrical Resistivity

The soil, bedrock, and groundwater conditions of the project area indicate generally high resistivity subsurface conditions. The predominant factor affecting the electrical resistivity of the soil throughout the Tule Wind Project area appears to be the presence of thin, silty sand soils overlying shallow igneous (granite) and metamorphic (schist and gneiss) bedrock.

The general range of electrical resistivities for alluvium and sands is from 1,000 to 80,000 ohmcentimeters (Ωcm). Values can range from 100 to 10,000 Ωcm for clays. The general range of electrical resistivities for schist, gneiss, and granite are from 2,000 to 1E6 Ωcm , 6.8E6 to 3E8 Ωcm , and 4.5E5 to 1.3E8 Ωcm , respectively (Telford 1976). The soil survey from San Diego County indicates the soils consist of mostly silty sand, and thus are likely to have soil resistivities $>10,000 \Omega\text{cm}$. Shallow bedrock will likely have resistivity $>10,000 \Omega\text{cm}$. **Table 3.8-4** presents the soil type and assumed electrical resistivity.

Table 3.8-4. Soil Type and Assumed Electrical Resistivity

Soil Series Name	Soil Symbol	Taxonomic Description	USCS	Clay Content %	Site Coverage %	Assumed Electrical Resistivity Ωcm
La Posta	LcE2	Entic haploxerolls, sandy, mixed, mesic	SM	7.5	23.1	$>10,000$
Sheephead	SpG2	Entic ultic haploxerolls, loam, mixed, mesic	SM	10.0	17.4	$>10,000$
La Posta	LaE2	Entic haploxerolls, sandy, mixed, mesic	SM	7.5	15.1	$>10,000$
La Posta	LdG	Entic haploxerolls, sandy, mixed, mesic	SM	7.5	11.9	$>10,000$
Tollhouse	ToE2	Entic haploxerolls, loamy, mixed, mesic, shallow	SM	11.5	11.2	$>10,000$
Kitchen Creek	KcD2	Ultic argixerolls, coarse-loam, mixed, mesic	SM	7.5	9.3	$>10,000$
Holland	HnE	Ultic haploxerolls, fine-loam, mixed, mesic	SM	11.0	4.1	$>10,000$
La Posta	LdE	Entic haploxerolls, sandy, mixed, mesic	SM	7.5	2.6	$>10,000$
Tollhouse	ToG	Entic haploxerolls, loamy, mixed, mesic, shallow	SM	11.5	2.1	$>10,000$
Holland	HnG	Ultic haploxerolls, fine-loam, mixed, mesic	SM	11.0	1.9	$>10,000$

Source: *Draft Tule Wind Project Geological Hazards Assessment*, HDR, January 2010.

Note: Soils comprising $<1\%$ of the project area were not included in this table.

The American Petroleum Institute (API) provides guidance for the potential corrosivity of materials based upon resistivity measurements (API-651, *Cathodic Protection of Aboveground Petroleum Storage Tanks* 1996). **Table 3.8-5** lists the General Classification of Resistivity.

Table 3.8-5. Classification of Resistivity

Resistivity Range, Ωcm	Resistivity Range, Ωm	Resistivity Range, Ωfeet	Potential Corrosion Activity
<500	<5	<16	Very Corrosive
500-1,000	5-10	16-33	Corrosive
1,000-2,000	10-20	33-66	Moderately Corrosive
2,000-10,000	20-100	66-330	Mildly Corrosive
>10,000	>100	>330	Progressively Less Corrosive

Source: *Draft Tule Wind Project Geological Hazards Assessment*, HDR Engineering, January 2010. Adapted from API 651, Chapter 5.3.1.2, Table 1.

Based on the above-reference, the soils and bedrock for the project area appear to have a potential for soil corrosivity, although testing is recommended for site specific soil type and topographic setting. The soil descriptions which indicate most site soils near the proposed turbine locations are mildly corrosive to steel and concrete. More corrosive soil conditions might be encountered where there are localized increases in clay content and increased moisture conditions. More corrosive bedrock conditions might be encountered where there are localized increases in weathering, fracturing, and/or moisture content.

High soil resistivity and thin soil cover can affect the design of the wind turbine ground grid. The National Electrical Code requires a burial depth of 36 inches for direct buried circuits. The burial depth can be reduced to 24 inches when the circuits are installed in rigid non-metallic conduit, or 6 inches when installed in intermediate metallic conduit or rigid steel conduit. San Diego County may also require “wrapping” of metallic conduit for corrosion resistance. If thinner soil conditions are encountered, cutting channels in the rock or surface mounted conduit may be options.

Ability of Soil to Support Wastewater Disposal

The proposed O&M facility will require the use of septic in an area that contains La Posta loamy coarse sand, 5 to 30 percent slopes eroded (LaE2) soil, which has a rating of Severe 1 for sewage disposal. As described below, this rating indicates greater limitations and will require compensating measures. The limitations of each soil for sewage effluent disposal are rated as:

- *Slight* – Means that soil properties are generally favorable, with limitations as minor and easily overcome. Soil can support a filter field of appropriate size that is properly installed and maintained;
- *Moderate* – Indicates greater limitations and the need for compensating measures;
- *Severe* – Indicates progressively greater limitations and the need for compensating measures.

Table 3.8-6 presents the soil rating for sewage disposal and **Table 3.8-7** lists the project area soil types for shrink-swell and septic tank effluent disposal.

Soil properties or qualities are affected by slope, surface layer texture, depth to a layer which restricts permeability, and the structure in the surface layer. **Table 3.8-8** presents the soil erodibility for soils located within the project construction footprint including the acreage and percentages.

Table 3.8-6. Criteria for Rating Soils for Sewage Disposal

Factors Affecting Limitation	Limitation		
	Slight	Moderate	Severe
Permeability (in./hr.)	More than 1 inch	1 to 0.63 inch	Less than 0.65 inch
Depth to seasonal water table	More than 6 feet	6 to 4 feet	Less than 4 feet
Drainage class	Excessive, somewhat excessive, or good ¹	Moderately good or somewhat poor	Poor or very poor
Depth to impervious bedrock or hardpan or pavement water table	More than 6 feet	6 to 4 feet	Less than 4 feet
Slope	Less than 5 percent	5 to 9 percent	More than 9 percent
Overflow hazard	None	Less than once in 10 years	Once or more in 10 years
Overflow Duration	None	48 hours or less	More than 48 hours

Source: U.S. Department of Agriculture, Soil Survey, San Diego Area, California, December 1973.

¹Contamination of the water supply is a hazard in coarse-textured soils.

Table 3.8-7. Soil Types Shrink-Swell and Septic Tank Rating

Map Symbol	Soil Name	Shrink-Swell Behavior	Septic Tank Effluent Disposal*
AcG	Acid Igneous, rock land	Low	Severe 9
CaB	Calpine coarse sandy loam, 5 to 9 percent slopes	Low	Slight
CaC	Calpine coarse sandy loam, 5 to 9 percent slopes	Low	Moderate 1
HmD	Holland fine sandy loam, 5 to 15 percent slopes	Moderate	Severe 1
HnE	Holland stony fine sandy loam, 5 to 30 percent slopes	Moderate	Severe 1
HnG	Holland stony fine sandy loam, 30 to 60 percent slopes	Moderate	Severe 1
KcC	Kitchen Creek loamy coarse sand, 5 to 9 percent slopes	Low	Moderate 1
KcD2	Kitchen Creek loamy coarse sand, 9 to 15 percent slopes, eroded	Low	Severe 1
LaE2	La Posta loamy coarse sand, 5 to 30 percent slopes, severely eroded	Low	Severe 1
LaE3	La Posta loamy coarse sand, 5 to 30 percent slopes, eroded	Low	Severe 1
LcE2	La Posta rocky loamy coarse sand, 5 to 230 percent slopes, eroded	Low	Severe 1
LdE	La Posta-Sheephead complex, 9 to 30 percent slopes, eroded	Low	Severe 1
LdG	La Posta-Sheephead complex, 30 to 65 percent slopes	Low	Severe 1
Lu	Loamy alluvial land	Low	Severe 5
MvC	Mottsville loamy coarse sand, 2 to 9 percent slopes	Low	Moderate 1
MvD	Mottsville loamy coarse sand, 9 to 15 percent slopes	Low	Severe 1
RsA	Rositas loamy coarse sand, 0 to 2 percent slopes	Low	Slight
SpE2	Sheephead rocky fine sandy loam, 9 to 30 percent slopes, eroded	Low	Severe 1
SpG2	Sheephead rocky fine sandy loam, 30 to 65 percent slopes, eroded	Low	Severe 1
ToE2	Tollhouse rocky coarse sandy loam, 30 to 65 percent slopes	Low	Severe 1
ToG	Tollhouse rocky coarse sandy loam, 30 to 65 percent slopes	Low	Severe 1

Source: U.S. Department of Agriculture, Soil Survey, San Diego Area, California, December 1973.

*Numerals indicate soil properties or qualities that adversely affect suitability for disposal of sewage effluents. Numeral 1 refers to slope; 4 to flooding, ponding, or overflow; 5 to natural drainage; 7 to permeability rate; and 9 to depth to hard rock, or hardpan, or any layer that restricts permeability.

Table 3.8-8. Soil Erodibility Rating

Map Symbol	Soil Name	Erodibility*	Percentage of Soil Located within Construction Footprint	Acreage
AcG	Acid Igneous, rock land	Severe 1	0.17	1.19
CaB	Calpine coarse sandy loam, 5 to 9 percent slopes	Moderate 2	0.07	0.48
CaC	Calpine coarse sandy loam, 5 to 9 percent slopes	Moderate 2	0.03	0.20
HmD	Holland fine sandy loam, 5 to 15 percent slopes	Severe 16	0.61	4.32
HnE	Holland stony fine sandy loam, 5 to 30 percent slopes	Severe 16	4.69	33.41
HnG	Holland stony fine sandy loam, 30 to 60 percent slopes	Severe 1	1.73	12.29
KcC	Kitchen Creek loamy coarse sand, 5 to 9 percent slopes	Severe 16	0.67	4.79
KcD2	Kitchen Creek loamy coarse sand, 9 to 15 percent slopes, eroded	Severe 2	8.02	59.13
LaE2	La Posta loamy coarse sand, 5 to 30 percent slopes, severely eroded	Severe 2	14.42	102.71
LaE3	La Posta loamy coarse sand, 5 to 30 percent slopes, eroded	Severe 2	0.10	0.69
LcE2	La Posta rocky loamy coarse sand, 5 to 230 percent slopes, eroded	Severe 2	28.53	203.25
LdE	La Posta-Sheephead complex, 9 to 30 percent slopes, eroded	Severe 2	3.55	25.29
LdG	La Posta-Sheephead complex, 30 to 65 percent slopes	Severe 1	8.55	60.91
Lu	Loamy alluvial land	Severe 16	0.43	3.08
MvC	Mottsville loamy coarse sand, 2 to 9 percent slopes	Severe 2	3.23	23.03
MvD	Mottsville loamy coarse sand, 9 to 15 percent slopes	Severe 2	0.03	0.18
RsA	Rositas loamy coarse sand, 0 to 2 percent slopes	Severe 2	0.01	0.07
SpE2	Sheephead rocky fine sandy loam, 9 to 30 percent slopes, eroded	Severe 16	0.22	1.58
SpG2	Sheephead rocky fine sandy loam, 30 to 65 percent slopes, eroded	Severe 1	12.71	90.51
ToE2	Tollhouse rocky coarse sandy loam, 30 to 65 percent slopes	Severe 9	10.06	71.69
ToG	Tollhouse rocky coarse sandy loam, 30 to 65 percent slopes	Severe 1	2.19	15.58

Source: U.S. Department of Agriculture, Soil Conservation Service Soil Survey, San Diego Area, December 1973.

* Numeral indicates soil properties or qualities that affect erodibility. Numeral 1 refers to slope; 2 to surface layer texture; 9 to depth to hard rock, or a hardpan, or any layer that restricts permeability; 16 to grade of structure in the surface layer. Absence of rating means no valid interpretations can be made.

3.8.2 Regulatory Setting

Numerous federal, state, and local regulations have been enacted to prevent or mitigate damage to public health and safety and the environment from geologic hazard. Although not a complete list of potentially applicable regulations, the regulations below are relevant to the topic of geologic hazards.

Federal

Institute of Electrical and Electronics Engineers 693 “Recommended Practices for Seismic Design of Substations”

Institute of Electrical and Electronics Engineers (IEEE) 693 “Recommended Practices for Seismic Design of Substations” was established by the Substations Committee of the IEEE Power Engineering Society to set standard methods of providing seismic withstand capabilities of equipment used for electrical substations. Test and analysis methods are provided for each major piece of equipment used or component in electrical substations. IEEE 693 provides design recommendations for substations and equipment to provide for seismic hazards. The recommendations include criteria, qualification methods, and levels, structural capacities, performance requirements for operation, and installation methods.

U.S. Environmental Protection Agency Clean Water Act

The Clean Water Act (CWA), established by the U.S. Environmental Protection Agency (EPA), regulates the quality and amount of stormwater runoff. Construction sites in particular can have adverse affects on water quality as stormwater can easily accumulate pollutants. The CWA requires construction site operators to follow the National Pollutant Discharge Elimination System (NPDES) stormwater program and thus to develop and implement A Stormwater Pollution Prevention Plan (SWPPP). The SWPPP must include a site description, identify onsite stormwater discharge areas, anticipated drainage patterns, places where major measures would be, any onsite surface waters, or points of discharge to surface waters.

Uniform Building Code

The Uniform Building Code (UBC) covers the regulations regarding the major aspects of building design and construction in relation to fire and structural safety. The code covers field inspection and fire and life-safety provisions, structural design provisions, and testing and installation standards.

State

Alquist-Priolo Earthquake Fault Zoning Act

The Alquist-Priolo Earthquake Fault Zoning Act works to avoid the hazard of surface fault rupture by regulating the development and construction of buildings intended for human occupancy. The act helps to define areas where fault rupture is likely to occur.

Seismic Hazards Mapping Act

The Seismic Hazards Mapping Act aims to reduce the threat of seismic hazard to public health and safety by identifying and mitigating seismic hazards. Through the act, the California Department of Conservation, Division of Mines and Geology, is directed to delineate seismic hazard zones. State, county, and city agencies are directed to utilize such maps in land use and permitting processes. The act also requires geotechnical investigations particular to the site be conducted before permitting occurs on sites within seismic hazard zones.

California Building Code

The California Building Code (CBC) has its base in the UBC although the CBC includes more extensive provisions relating to seismic hazards. The code also defines procedures to calculate seismic forces on structures.

Local

San Diego County

The San Diego County General Plan ensures compliance with the San Diego County Codes and Ordinances, and defines the zoning ordinances and grading ordinances. The San Diego County Grading Ordinance would apply to the private parcels of the project as would all regulations related to excavation, clearing, and grading as outlined in the San Diego County Code of Regulatory Ordinances, Title 8 and Division 7.

3.8.3 Environmental Consequences/Impact Analysis

California Environmental Quality Act Significance Criteria

To satisfy California Environmental Quality Act (CEQA) requirements, conclusions are made regarding the significance of each identified impact that would result from the proposed project and alternatives. Appropriate criteria have been identified and utilized to make these significance conclusions. The following significance criteria for geology, soils, and minerals were derived from previous environmental impact assessments and from the *CEQA Guidelines* (Appendix G, Environmental Checklist Form, Section IX). An impact would be considered significant and require additional mitigation if project construction or if maintenance of project facilities during project operation would result in any of the following criteria being met:

- Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:
 - i. Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo; Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault;
 - ii. Strong seismic ground shaking;
 - iii. Seismic-related ground failure, including liquefaction;
 - iv. Landslides.
- Result in substantial soil erosion or the loss of topsoil;
- Be located on a geologic unit or soil that is unstable or that would become unstable as a result of the project and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse;
- Be located on expansive soil, as defined in Table 18-1B of the UBC (1994), creating substantial risks to life or property;
- Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater;

- Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state;
- Result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan.

Significance conclusions for individual impacts are not required for compliance with National Environmental Policy Act (NEPA). Therefore, conclusions presented in the following analysis regarding the significance of identified impacts are provided for the purposes of CEQA only.

The following section addresses impacts due to the construction, operation and maintenance, and decommissioning activities that may occur as a result of the proposed project.

Earthquake Faults and Ground Shaking

Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving, fault, ground shaking, liquefaction, and landslides

Construction

All of San Diego County is located within Seismic Zone 4, which is classified as the highest seismic zone and is subject to ground shaking. The closest named fault line is the Coyote Mountain section of the Elsinore Fault Zone located approximately 7.1 miles north east of the In-Ko-Pah Mountains. One unnamed well constrained Quarternary fault/fold is located approximately two miles northeast, and one moderately constrained Quarternary fault/fold located within the project boundaries (USGS). The faults/folds located in the project boundary are located east of proposed turbines J-6, K-1, K-2 and K-3, and west of J-13, L-1 and L-2; south of A-4 and north of A-5 and A-6; and east of P-5 as shown in **Figure 3.8-3, Area Faults**. The general area of these turbines are located on remote tribal lands with no surrounding structures or people. No turbines are located within 50 feet of the trace Alquist-Priolo fault or a San Diego County special study fault. This general area where the unnamed faults/folds are located does contain existing residences or structures near the proposed turbine. This identified area will require sufficient turbine foundation engineering to accommodate the possibility of impacts related to earthquakes and seismic ground shaking. It is anticipated that the seismicity would not supersede the turbine design loads, although turbine foundations will need to be site-specific. Impacts due to earthquakes and ground shaking regarding turbines are less than significant.

Operation and Maintenance

The only project structure that proposes human occupancy is the O&M building. The O&M and Substation facility (proposed and deviant) is not located in an area adjacent to any identified fault. The possibility of ground shaking at the project site is similar relative to most sites within Southern California, and the standard geotechnical recommendations identified in the UBC and CBC, in addition to compliance with the regulations of the San Diego County General Plan. As at any point within California, minor cracking of the near-surface soils from distant shaking events is possible. As the project would follow the UBC and CBC standards and grading specifications to establish building foundations appropriate for building in the seismically active area of Southern California, impacts related to a rupture of an earthquake fault and seismic ground shaking would be reduced to less than significant levels. Impacts to exposing people or structures to earthquake faults or ground shaking from the operation and maintenance of the project are less than significant.

Decommissioning

The decommissioning phase would be similar to construction. The dismantling of the turbine components would not subject the public or structures to impacts due to earthquake faults and ground shaking. Impacts to exposing people or structures to earthquake faults or ground shaking from the decommissioning of the project is less than significant.

Liquefaction

Construction, Operation and Maintenance, and Decommissioning

The County of San Diego has identified Mottsville loamy coarse sand (MvA), 0-2 percent slopes, as a soil subject to liquefaction risk. The slope for this soil is nearly level and is infrequently flooded during prolonged winter storms. Runoff is very slow, and the erosion hazard is slight. The project area contains Mottsville soil type but at greater slopes; Mottsville soil unit (MvC) loamy coarse sand, 2 to 9 percent slopes, with a depth to water table more than 80 inches, which is considered well drained soil. The turbines are not located adjacent to this soil with this slope, although the proposed transmission line adjacent to Old Highway 80 is located in an area which also possesses the Mottsville soil type.

According to NRCS, there is more Mottsville soil identified than the geological studies prepared for the proposed project indicate. The Mottsville loamy coarse sand, 2 to 9 percent slopes (MvC), and 9 to 15 percent slopes (MvD) as shown in **Figure 3.8-2**, but not the Mottsville loamy coarse sand 0 to 2 percent (MvA). The hazard with this soil on level ground is the availability of water, of which there are seven springs located within the project area. The closest turbines to a spring are turbines D-1 and F-4, as shown in **Figure 3.8-3**, Faults. The soil does not appear to be saturated, so overall risk from liquefaction appears to be low. While it is possible that Mottsville soils exist in areas adjacent to the spring locations, the tower sites are to be located on slopes which would sufficiently drain, thus reducing the potential risk of liquefaction. This level of analysis is not site-specific; therefore, further investigation will be required prior to construction of the turbine locations of D-1 and F-4.

Areas which are located on level land containing this soil type could have the potential for liquefaction. At this level of detail, it cannot be determined if the MvA soil exists in more level areas where the transmission line construction will occur. Further geologic investigation will be required prior to transmission line construction. Impacts are significant for the areas identified.

Landslides

Construction and Decommissioning

The project area contains steep slopes, with some greater than 25 percent; therefore, the potential for landslides occurring does exist during the construction and decommissioning phases of the project.

Some bedrock units such as schists have foliations and other planes of weakness that could contribute to instability of constructed cut slopes. There may be local talus deposits which could also impact planned grading. The potential for the presence of existing landslides exists primarily in the westernmost portion of the site, where schists are present. Areas underlain by tonalite (approximately 90% of the project areas) are considered to be generally free of the potential for landslides. These rock types will require assessment in the design of cut slopes and other excavations. The risk of landslides will be reduced by the general grading standards of the UBC and CBC building standards and the County of San Diego General

Plan regulations concerning grading, excavation. Subsequent geotechnical investigation will be required prior to construction and the final grading plan; in addition, the county regulations, UBC grading standards, and CBC building standards will be incorporated to reduce the level of significance to less than significant.

Operation and Maintenance

The areas identified for the location of the O&M/Substation facility is located on a generally flat level area, and would not be subject to landslides; therefore, impacts are less than significant.

Result in substantial soil erosion or the loss of topsoil

Construction and Decommissioning

Most of the soils (99 percent) present on the project site exhibit a severe rating for erosion by the USDA Soil Conservation Service Soil Survey. The majority of the soils have properties or qualities that affect erodibility, of which the majority of soils located within the project area are subject to slope and the surface layer texture properties. The remaining one percent contains Calpine soil series which has a moderate potential for erosion. Erosion of the project site would have the potential to decrease the stability of structures on the project site and to decrease the water quality of nearby waterways. During construction, soil erosion shall be controlled through the implementation of a project-specific SWPPP and will include construction Best Management Practices (BMPs). In addition, the project will utilize the California Department of Fish and Game (CDFG) guidelines for culverts to minimize long term maintenance and meet a 10-year rain event to minimize the trapping of sediment. Impacts to soil erosion or the loss of topsoil are less than significant.

Operation and Maintenance

The operation and maintenance activities would not subject the area to soil erosion or the loss of topsoil. No impacts are identified.

Be located on a geologic unit or soil that is unstable or that would become unstable as a result of the project and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse

Construction, Operation and Maintenance, and Decommissioning

The project area geology is underlain by approximately ninety percent La Posta Tonalite unit (early and late Cretaceous age), as shown in **Figure 3.8-3**. These crystalline plutonic rocks include are largely undeformed and inclusion-free. Areas underlain by tonalite are considered to be generally free of the potential for landslides. The western portion of the project area contains granodiorite of Cuyamaca Reservoir (Late and Middle Jurassic), which is medium grained, and strongly foliated. This area contains Gneiss which can be subject to instability and landslides.

Some bedrock units such as schists have foliations and other planes of weakness that could contribute to instability of constructed cut slopes. The western portion of the project area is identified as having bedrock geology that may become unstable and experience landslides, lateral spreading, subsidence, liquefaction or collapse if not properly excavated and graded, and treated with appropriate BMPs. The proposed project will reduce the potential of unstable soils by conducting site-specific geotechnical

investigations prior to earth disturbance activities and by preparing a project-specific grading plan that will account for any unstable soil conditions. Impacts are less than significant.

As described previously, the County of San Diego has identified Mottsville loamy coarse sand (MxA) 0-2 percent slopes as a soil subject to liquefaction risk. The turbines are not located adjacent to this soil with this slope, although the proposed transmission line adjacent to Old Highway 80 is located in an area that possesses this soil. However, additional geotechnical studies, a grading plan, and a SWPPP will be completed prior to construction that will identify and address any potential impacts from landslides, lateral spreading, subsidence, liquefaction, or collapse, thus impacts are less than significant.

Be located on expansive soil, as defined in Table 18-1B of the Uniform Building Code (1994), creating substantial risks to life or property

Construction, Operation and Maintenance, and Decommissioning

The project area contains surficial soils of colluvial and alluvial origin, consisting primarily of silty sand, and gravel and does not contain types of clayey soils that have a tendency to absorb water and swell and then shrink as they dry. The soils are primarily composed of granodiorite and maintain the granodiorite as bedrock. The bedrock is fairly stable and thus exhibits a low potential for expansion. As the project will follow all UCB and CBC requirements, the potential for expansion is lowered; therefore, impacts are less than significant.

Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater

Construction and Decommissioning

There is no need for a septic or alternative wastewater disposal system for the construction and decommissioning phases of the project; therefore, no impacts are identified.

Operation and Maintenance

The O&M facility is proposed to have a septic system for the operation of the wind project. The O&M facility is located in an area that possesses La Posta loamy coarse sand, 5 to 30 percent slopes eroded (LaE2), which has a rating of Severe 1 for sewage disposal, according to the Department of Agriculture San Diego Soil Survey. The following limitations are expected for the identified soils:

- Less than 0.63 inches permeability inch per hour;
- Less than 4 feet depth to seasonal water table;
- Poor or very poor drainage class;
- Less than 4 feet depth to impervious bedrock, hardpan, or permanent water table;
- More than 9 percent slope;
- Once or more in 10 years for overflow hazard;
- More than 48 hours overflow duration.

The proposed O&M facility is proposed to be located in an area that possesses soils which have limitation regarding septic. The operation and maintenance of the project is proposed to employ up to 12 permanent full-time employees who will utilize the O&M facility; consequently, the generation of wastewater will be minimal. This rating indicates progressively greater limitations and the need for compensating

measures. The type of septic system will need to be confirmed prior to construction when the exact location of the O&M facility is known. Impacts and limitations of soils for septic tanks and wastewater capability will require further analysis upon the completion of the groundwater study and site specific percolation tests prior to construction.

Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state

Construction, Operation and Maintenance, and Decommissioning

According to the USGS, there are two mines that are currently active and producing Tungsten ore located in the western portion of the project area. The two Metal Mountain Mines are located adjacent to turbines N-8 N-7, and N-6. Area mines are presented in **Table 3.8-3** with exact locations and shown in **Figure 3.8-6**, Mines. Additionally, there are at least 48 abandoned or inactive mine openings in the project vicinity. The project would not interfere with the active mines or cause a loss in availability of mineral resources; therefore, impacts to mineral resources are less than significant.

Result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan

Construction, Operation and Maintenance, and Decommissioning

Although the Eastern San Diego County RMP has identified the area as having a high potential for construction materials, the area does not possess accessibility or a safe site area for a rock quarry. The County of San Diego has not identified the area as having locally important mineral resources. No impacts are identified for the loss of locally important mineral resources.

3.8.4 Cumulative Impacts

Potential impacts related to geologic, seismic, and soils hazards are all site-specific. All cumulative development would be subject to similar requirements to those imposed and implemented on the proposed project site and would be required to adhere to applicable regulations, standards, and procedures. The following projects have been identified in **Table 2.0-8**, as possessing impacts to geology, soils and minerals:

- *Miller Creek Reclamation* – MUP 04-004 and 04-053. MUP for extraction of and resources in Campo on 58.2 acres. Draft EIR currently in process, project is inactive due to lack of funds.
- *Ketchum Ranch* – RZ 06-019, MUP 5524, GPA 06-014, SP 06-003. Mixed use project in Jacumba for residential, reclamation plant, elementary school, and park. Potential significant impact to geologic issues. Inactivity notification given with extension until 2010.
- *Boulevard Cingular* – MUP 90-019. Potential significant geologic issue identified. Mixed Use Permit (MUP) for permitting for eight antennas and a base transceiver station with equipment enclosure. Approved April 2008.
- *East San Diego County Substation (ECO)*. A rebuild of the Boulevard Substation (to which the Tule project will connect) and the upgrade to the East County Substation to facilitate area wind projects. Currently under environmental review, although geologic impacts are identified.

- *Energia Sierra Juárez (ESJ)*. Wind Turbine projects along the Sierra De Juárez Mountains 70 miles south of eastern San Diego in Mexico. 150 MW to 200 MW of total generating capacity. Environmental documents are not currently available for this project, although impacts to soils and geology are anticipated.

Therefore, the proposed project would not result in significant cumulative impacts in regards to geology and soils.

3.8.5 CEQA Levels of Significance Before Mitigation

Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving fault, ground shaking, liquefaction, and landslides

Earthquake Faults and Ground Shaking

Construction and Decommissioning

The project area is located in the general area of identified fault zones and three unnamed moderately constrained faults are located within the project boundary. Turbines J-6, K-1, K-2 and K-3 are located to the west of a fault, and turbines J-13, L-1 and L-2 are located to the east. Another fault line is located south of A-4 and north of A-5 and A-6. Another fault is located east of P-5. These turbines are located adjacent to said unnamed faults. This area will require sufficient turbine foundation engineering to accommodate the possibility of impacts related to earthquakes and seismic ground shaking. It is anticipated that the seismicity would not supersede the turbine design loads, although turbine foundations design will need to be site specific. Impacts to turbines and associated facilities due to earthquakes and ground shaking are less than significant.

Operation and Maintenance

The O&M facility is not located within or adjacent to an identified fault zone. As the project would follow the UBC and CBC standards and grading specifications to establish building foundations appropriate for building in the seismically active area of Southern California, impacts related to a rupture of an earthquake fault and seismic ground shaking would be reduced to less than significant levels.

Liquefaction

Construction, Operation and Maintenance, and Decommissioning

The County of San Diego has identified Mottsville loamy coarse sand (MxA), 0-2 percent slopes. The project area contains a Mottsville soil unit (MvC), loamy coarse sand, 2 to 9 percent slopes, and 9 to 15 percent slopes (MvD) with a depth to water table more than 80 inches which is considered well-drained soil.

The hazard with this soil will be the availability of water, of which there are seven springs located within the project area. The closest towers to a spring are turbines D-1 and F-4. The soil does not appear to be saturated, so overall the risk of liquefaction appears to be low, although spring locations should be avoided to reduce liquefaction impacts. Further analysis will be required in areas identified with this soil prior to construction. Further analysis will be required prior to construction of turbines D-1 and F-4.

Areas which are located on level land containing this soil type could have the potential for liquefaction. At this level of detail, it cannot be determined if the MvA soil exists in more level areas where the transmission line construction will occur. Further geologic investigation will be required prior to transmission line construction. Impacts are significant for the areas identified.

Landslides

Construction and Decommissioning

The project site has areas of steep slopes with some greater than 25 percent. The majority of the project area contains tonalite, which generally does not have the potential for landslides. Areas containing schists have foliations and weaknesses which may contribute to instability of constructed cut slopes. General grading plan regulations concerning grading, excavation, and UBC grading standards will reduce landslides impacts to less than significant.

Operation and Maintenance

The area identified for the O&M/Substation facility is located on flat level area and would not be subject to landslides. Impacts are considered less than significant.

Result in substantial soil erosion or the loss of topsoil

Construction and Decommissioning

The Department of Agriculture Soil Conservation Service Soil Survey for San Diego identifies 99 percent of the soils present on the project site exhibit a high potential for erosion while the Calpine series (1 percent) has a moderate potential for erosion. Erosion of the project site would have the potential to decrease the stability of structures on the project site and to decrease the water quality of nearby waterways. During construction, soil erosion shall be controlled through the implementation of a project-specific SWPPP, as well as Best Available Technology (BAT) and Best Conventional Pollutant Control Technology; thus, impacts due to soil erosion or the loss of topsoil are less than significant.

Operation and Maintenance

The operation and maintenance activities would not subject the area to soil erosion or the loss of topsoil. No impacts are identified.

Be located on a geologic unit or soil that is unstable or that would become unstable as a result of the project and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse

Construction and Decommissioning

Some bedrock units such as schists have foliations and other planes of weakness that could contribute to instability of constructed cut slopes. This area is identified as having bedrock geology that may become unstable and experience landslides, lateral spreading, subsidence, liquefaction, or collapse if not properly excavated and graded, and treated with appropriate BMPs. The proposed project will reduce the potential of unstable soils by conducting site-specific geotechnical investigations prior to earth disturbance activities and by preparing a project-specific grading plan and SWPPP. Impacts are less than significant.

Operation and Maintenance

Once the project is built there would be no impacts to the operation of the project.

Be located on expansive soil, as defined in Table 18-1B of the Uniform Building Code (1994), creating substantial risks to life or property

Construction, Operation and Maintenance, and Decommissioning

The project area contains silty sand and gravel, and does not contain clayey soils that have expansive soil properties. As the project will follow all UCB and CBC requirements, the potential for expansion is lowered; therefore, impacts are less than significant.

Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater

Construction, Operation and Maintenance, and Decommissioning

There is no need for a septic or alternative wastewater disposal system for the construction and decommissioning phases of the project; therefore, no impacts are identified.

The proposed location of the O&M facility is identified to possess La Posta loamy coarse sand, 5 to 30 percent slopes eroded (LaE2). This soil has a severe rating and is not conducive to the use of septic tanks. Although the generation of wastewater is expected to be minimal, this rating indicates progressively greater limitations and the need for compensating measures. Appropriate measures will be required to accommodate the soil limitations. Impacts and limitations of soils for septic tanks and wastewater capability will require further analysis upon the completion of the groundwater study and site specific percolation tests prior to construction.

Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state

Construction, Operation and Maintenance, and Decommissioning

There are no historic mineral districts located within the project area, although the area is identified as having moderate potential for construction materials, non-metallic/industrial, and locatable (metallic) minerals. Due to poor accessibility, lack of a consistent market in the area, and an area for a safe quarry site, the McCain Valley area would not be available for mineral resource extraction. Therefore, impacts due to mineral resources are less than significant.

Result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan

Construction, Operation and Maintenance, and Decommissioning

The area is identified by the Eastern San Diego County RMP as an area with a high potential for construction materials; the area does not possess accessibility and a safe site area for a rock quarry. Additionally, the County of San Diego has not identified the area to have locally important mineral resources. No impacts are identified for the loss of locally important mineral resources.

3.8.6 Mitigation Measures

- GS-1** Engineering of proper foundations for the location of the proposed turbines J-6, K-1, K-2, K-3, J-13, L-1, L-2, A-4, A-5, A-6, and P-5 for adequate foundation to resist an earthquake and seismic shaking.
- GS-2** Identification of soils and groundwater or springs in areas which contain Mottsville soil.
- GS-3** Further geologic study to determine correct location and compatible soils for the placement of the O&M septic tank.

3.8.7 CEQA Levels of Significance After Mitigation

Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving, fault, ground shaking, liquefaction, and landslides

Faults and Ground Shaking

The foundations of turbines J-6, K-1, K-2, K-3, J-13, L-1, L-2, A-4, A-5, A-6, and P-5 will be engineered to accommodate for the adjacent location of the identified constrained fault. The implementation of mitigation measure GS-1 will give additional engineering that will provide stability for the identified turbines and would reduce impacts to less than significant with mitigation.

Liquefaction

The hazard of Mottsville soil will be the slope and location of available water, of which there are seven springs located within the project area. The towers closest to a spring are turbines D-1 and F-4. The soil does not appear to be saturated, although during construction the flow of the springs, high water table, and heavy precipitation should be monitored to avoid and reduce the risk of liquefaction impacts. Mitigation measure GS-2 would identify areas containing Mottsville soil and a high groundwater table to reduce potential liquefaction impacts to less than significant with mitigation.

Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater

The proposed project O&M facility is located on La Posta loamy coarse sand, 5 to 30 percent slopes eroded (LaE2). This soil has a severe rating and is not conducive to the use of septic tanks. Although the generation of wastewater is expected to be minimal, this rating indicates progressively greater limitations and the need for compensating measures. Appropriate measures will be required to accommodate the soil limitations. Impacts and limitations of soils for septic tanks and wastewater capability will require further analysis upon the completion of the groundwater study and site specific percolation tests prior to construction. Impacts would be less than significant with implementation of mitigation measure GS-3.

3.8.8 Comparison of Alternatives

In developing the alternatives to be addressed in this environmental document, the potential alternatives were evaluated in terms of their ability to meet the basic objectives of the project, while avoiding or reducing the environmental impacts of the project. The alternatives will contain all of the same

components and construction corridors as the proposed project, except they may vary in number and location.

No Project/No Action Alternative

Under the No Project/No Action Alternative, the proposed project would not be implemented and the impacts associated with the project as described in Section 3.8.3 would not occur. Although there would be no impacts to geology, minerals, or soil by the Tule Wind Project, the BLM's determination that the area is conducive to wind and renewable energy development will still be valid, thus leaving the area available for another project. Also, this alternative would still leave the San Diego County region dependent on electricity generated by fossil fuels and without a more reliable source of electricity. The BLM, State, and County would be forced to continue to search for renewable energy projects to contribute to their renewable energy mandates and portfolios. Additionally, the County of San Diego would not move closer to meeting air quality and attainment goals. Fewer impacts are identified for this alternative as those identified for the proposed project and other alternatives.

This alternative would have less impacts to geologic, mineral, or soil resources than the proposed project.

Alternative Transmission Line Alternative #1

The Alternate Transmission Line Alternative #1 (T-line Alternative #1) would include all of the same components as the proposed project except for an alternate overhead 138 kV transmission line (T-line Alternative #1), as shown in **Figure 2.0-12**. The T-line Alternative #1 would be located parallel to, but in lieu of, the proposed transmission line. T-line Alternative #1 would be located further west and run from either the proposed or deviant collector substation approximately 5.5 miles south to the Rough Acres Ranch (south of turbine G-19). From Rough Acres Ranch, the line would continue west to Ribbonwood Road. The line would continue south on Ribbonwood Road to Old Highway 80, and east along Old Highway 80 to the SDG&E proposed Rebuilt Boulevard Substation.

This alternative would increase the land disturbance by approximately 7.6 acres, from 772.7 acres to 780.3 acres, utilizing the deviant collector substation. The 138 kV transmission line would increase in distance from 9.7 miles to 11.7 miles and would increase the amount of transmission line poles from 116 poles to 152 poles, utilizing the deviant collector substation. The 34.5 kV overhead collector lines would remain the same distance of 9.4 miles, and would require the same amount of collector line poles (250), and the underground collector lines would also remain the same distance of 29.3 miles, utilizing the deviant collector substation.

Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving, earthquake faults, ground shaking, liquefaction, or landslides

Construction, Operation and Maintenance, and Decommissioning

Faults and Ground Shaking

This alternative would be comparable with the proposed project and experience the same level of impacts related to faults and ground shaking. The area with turbines J-6, K-1, K-2, K-3, J-13, L-1, L-2, A-4, A-5, A-6, and P-5 would require additional engineering to provide stability for the turbines located adjacent to the identified faults. Impacts due to earthquakes and ground shaking regarding turbines, the transmission lines and the O&M/Substation facility are less than significant with the proposed mitigation.

Liquefaction

This alternative would be comparable with the proposed project and experience the same level of impacts related to liquefaction. The incorporation of mitigation measure GS-2 would reduce impacts to less than significant.

Landslides

This alternative would be comparable with the proposed project and experience the same level of impacts related to landslides. The risk of landslides would be reduced by the general grading standards of the UBC and CBC building standards and the County of San Diego General Plan regulations concerning grading, and excavation. Subsequent geotechnical investigation will be required prior to construction and the grading plan. County regulations, UBC grading standards, and CBC building standards would be incorporated to reduce the level of significance to less than significant.

Result in substantial soil erosion or the loss of topsoil

Construction, Operation and Maintenance, and Decommissioning

This alternative would be comparable with the proposed project and experience the same level of impacts related to soil erosion and the loss of topsoil. During construction, soil erosion shall be controlled through the implementation of a project-specific SWPPP, as well as BAT and Best Conventional Pollutant Control Technology. Impacts from soil erosion or the loss of topsoil are less than significant.

Be located on a geologic unit or soil that is unstable or that would become unstable as a result of the project and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse

Construction, Operation and Maintenance, and Decommissioning

This alternative would be comparable with the proposed project and experience the same level of impacts related to unstable soils. As described previously, this area does not contain soils which would cause subsidence or liquefaction. Additional geotechnical studies, a grading plan, and a SWPPP will be completed prior to construction that would identify and address any potential impacts from landslides, lateral spreading, subsidence, liquefaction, or collapse, thus impacts are less than significant.

Be located on expansive soil, as defined in Table 18-1B of the Uniform Building Code (1994), creating substantial risks to life or property

Construction, Operation and Maintenance, and Decommissioning

The project area including the alternate transmission line contains silty sand and gravel, which are not identified as having expansive properties. This alternative would be comparable with the proposed project. Impacts are less than significant.

Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater

Construction, Operation and Maintenance, and Decommissioning

This alternative would be comparable with the proposed project and experience the same level of impacts and limitations of soils for septic tank and alternative wastewater disposal systems. Impacts due to soils for septic tanks and wastewater capability would still require further analysis upon the completion of the groundwater study and site specific percolation tests prior to construction.

Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state

Construction, Operation and Maintenance, and Decommissioning

This alternative would be comparable with the proposed project as to the loss of known mineral resources. Impacts to mineral resources are less than significant.

Result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan

Construction, Operation and Maintenance, and Decommissioning

This alternative would be comparable with the proposed project as to the loss of mineral resource recovery sites. No impacts are identified for this issue area.

The Alternate Transmission Line Alternative #1 has the same level of impacts as the proposed project.

Alternate Transmission Line #2 and Collector Substation Alternative

The Alternate Transmission Line #2 and Collector Substation Alternative would include the alternate O&M/Substation facility co-located on Rough Acres Ranch (T17S R7E Sec9), the Alternate Transmission Line #2 (138 kV), as well as an alternate overhead collector system, as shown in **Figure 2.0-13**. This alternative would consist of two 34.5 kV lines connecting the turbines to the alternate collector substation location. All other elements of the project including the turbine locations, parking and laydown areas, roadway upgrades, and batch plant would remain as described in the proposed project. The Alternate Transmission Line #2 would run from the alternate collector substation south along McCain Valley Road, and then west along Old Highway 80 until reaching the SDG&E proposed Rebuilt Boulevard Substation.

This alternative would increase the land disturbance by 1.9 acres, from 772.7 acres to 774.6 acres. The 138 kV transmission line would decrease in distance as a result of this alternative from 9.7 miles to 3.8 miles and would decrease the amount of transmission line poles from 116 poles to 44 poles. The 34.5 kV overhead collector lines would increase in distance from 9.4 miles to 17 miles, and would increase the amount of collector line poles from 250 to 452 poles. The underground collector lines would decrease in distance from 29.3 miles to 28.9 miles.

Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving, earthquake faults, ground shaking, liquefaction, or landslides

Construction, Operation and Maintenance, and Decommissioning

Faults and Ground Shaking

All other components of the project would remain consistent with the proposed project. The area identified by turbines J-6, K-1, K-2, K-3, J-13, L-1, L-2, A-4, A-5, A-6, and P-5 would require additional engineering to provide stability for the turbines located adjacent to the identified faults. It is anticipated that the seismicity would not supersede the turbine design loads, although turbine foundations will need to be site-specific. Impacts due to earthquakes and ground shaking regarding turbines are less than significant with the proposed mitigation.

Liquefaction

This alternative contains soils identified as containing Mottsville loamy coarse sand, 2 to 9 percent slopes throughout. This soil has the potential for liquefaction on 0 to 2 percent slopes with the availability of water. The soil does not appear to be saturated, although with the location of area springs, this could have the potential for liquefaction; consequently, the overall risk of liquefaction appears to be low, although spring locations will need to be avoided to reduce liquefaction impacts. Further analysis will be required in areas identified with this soil prior to construction. Incorporation of mitigation measure GS-2 would reduce impacts to less than significant.

Landslides

The project site has areas of steep slopes with some greater than 25 percent. The majority of the project area contains tonalite of La Posta (Early and Late Cretaceous). This unit is largely undeformed and inclusion-free and moderately to strongly foliated, which generally does not have the potential for landslides. General grading plan regulations concerning grading, excavation, and UBC grading standards will reduce landslides impacts to less than significant.

Result in substantial soil erosion or the loss of topsoil

Construction, Operation and Maintenance, and Decommissioning

This area of the O&M/Substation facility is located on contains La Posta rocky loamy coarse sand, 5 to 30 percent slopes, eroded (LcE2). This soil type moderately steep and is 16 to 30 inches deep over weathered grandiorite. The available water holding capacity is 1 to 2 inches. Runoff is medium, and the erosion hazard is severe with slope. During construction, soil erosion shall be controlled through the implementation of a project-specific SWPPP, as well as BAT and Best Conventional Pollutant Control Technology. Impacts due to soil erosion or the loss of topsoil are less than significant.

Be located on a geologic unit or soil that is unstable or that would become unstable as a result of the project and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse

Construction, Operation and Maintenance, and Decommissioning

The project site has areas of steep slopes with some greater than 25 percent. The majority of the project area contains tonalite of La Posta (Early and Late Cretaceous). This unit is largely undeformed and

inclusion-free and moderately to strongly foliated, which generally does not have the potential for landslides. The proposed project will reduce the potential of unstable soils by conducting site-specific geotechnical investigations prior to earth disturbance activities and by preparing a project-specific grading plan, and SWPPP. Impacts due to the location of the project on unstable geologic units or soils are less than significant.

Be located on expansive soil, as defined in Table 18-1B of the Uniform Building Code (1994), creating substantial risks to life or property

Construction, Operation and Maintenance, and Decommissioning

The project area including the alternate transmission line contains silty sand and gravel, which is not identified as having expansive properties. This alternative would be consistent with the proposed project. Impacts due to expansive soil are less than significant.

Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater

Construction, Operation and Maintenance, and Decommissioning

No septic or alternative wastewater systems will be utilized in the construction or decommissioning of the project. This alternative the O&M facility is located in an area with La Posta Loamy rocky coarse sand, 5 to 30 percent slopes eroded (LcE2). This soil has a severe septic tank rating and is not conducive to the use of septic tanks. Although the generation of wastewater is expected to be minimal, this rating indicates progressively greater limitations and the need for compensating measures. Appropriate measures will be required to accommodate the soil limitations. Impacts due to soils for septic tanks and wastewater capability will require further analysis upon the completion of the groundwater study and site specific percolation tests prior to construction.

Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state

Construction, Operation and Maintenance, and Decommissioning

This alternative would be consistent with the proposed project. Impacts to mineral resources are less than significant.

Result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan

Construction, Operation and Maintenance, and Decommissioning

This alternative would remain consistent with the proposed project. Although this area contains a high potential for construction materials, the area is not conducive for a safe rock quarry. No impacts to mineral resources are identified.

The Alternate Transmission Line #2 and Collector Substation Alternative has the same level of impacts as the proposed project.

Alternate Transmission Line #3 and Collector Substation Alternative

The Alternate Transmission Line #3 and Collector Substation Alternative would include the alternate O&M/Substation facility co-located on Rough Acres Ranch (T17S R7E Sec9), the Alternate Transmission Line #3 (138kV), as well as an alternate overhead collector system as shown in **Figure 2.0-14**. This alternative would consist of two 34.5 kV lines connecting the turbines to the alternate collector substation. All other elements including the turbine locations, parking and laydown areas, roadway upgrades, and batch plant would remain as described in the proposed project. The Alternate Transmission Line #3 would run from the alternate collector substation west to Ribbonwood Road, continue south along Ribbonwood Road, and then east along Old Highway 80 until reaching the SDG&E proposed Rebuilt Boulevard Substation.

This alternative would increase the land disturbance by 7.3 acres; from 772.7 acres to 780.0 acres. The 138 kV transmission line would decrease in distance as a result of this alternative from 9.7 miles to 5.4 miles and would decrease the amount of transmission line poles from 116 poles to 60 poles. The 34.5 kV overhead collector lines would increase in distance from 9.4 miles to 17 miles, and would increase the amount of collector line poles from 250 to 452 poles. The underground collector lines would decrease in distance from 29.3 miles to 28.9 miles.

Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving, earthquake faults, ground shaking, liquefaction, or landslides

Construction, Operation and Maintenance, and Decommissioning

Faults and Ground Shaking

All other components of the project would remain consistent with the proposed project. The area identified by turbines J-6, K-1, K-2, K-3, J-13, L-1, L-2, A-4, A-5, A-6, and P-5 would require additional engineering to provide stability for the turbines located adjacent to the identified faults. It is anticipated that the seismicity would not supersede the turbine design loads, although the turbine foundations will need to be site-specific. Impacts due to earthquakes and ground shaking regarding turbines are less than significant with the proposed mitigation.

Liquefaction

This alternative would be consistent with Alternative Transmission Line #2 and Collector Substation Alternative, except for the transmission line location. This area contains the following soils:

- La Posta loamy coarse sand, 5 to 30 percent slopes, eroded (LaE2);
- La Posta rocky loamy coarse sand, 5 to 30 percent slopes, eroded (LcE2);
- La Posta-Sheephead complex, 9 to 30 percent slopes (LdE)
- Mottsville loamy coarse sand, 2 to 9 percent slopes (MvC);
- Tollhouse rocky coarse sandy loam, 5 to 30 percent slopes, eroded (ToE2).

The majority of these soils are not subject to liquefaction except the Mottsville series with no slope and available water. This area is not located adjacent to the identified springs and is not anticipated to be subject to a high water table. Impacts to liquefaction are less than significant.

Landslides

The project site has areas of steep slopes with some greater than 25 percent. The majority of the project area contains tonalite of La Posta (Early and Late Cretaceous). This unit is largely undeformed and inclusion-free, and moderately to strongly foliated, which generally does not have the potential for landslides. Subsequent geotechnical investigation will be required prior to construction and the grading plan; in addition the county regulations, UBC grading standards and CBC building standards will be incorporated to reduce the level of significance to less than significant.

Result in substantial soil erosion or the loss of topsoil

Construction, Operation and Maintenance, and Decommissioning

The area the alternate O&M/Substation facility is located on contains La Posta rocky loamy coarse sand, 5 to 30 percent slopes, eroded (LcE2). The erosion hazard is severe with surface soil texture. Erosion of the project site would have the potential to decrease the stability of structures on the project site and to decrease the water quality of nearby waterways. During construction, soil erosion shall be controlled through the implementation of a project-specific SWPPP, as well as BAT and Best Conventional Pollutant Control Technology; thus, impacts are less than significant.

Be located on a geologic unit or soil that is unstable or that would become unstable as a result of the project and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse

Construction, Operation and Maintenance, and Decommissioning

Some bedrock units such as schists have foliations and other planes of weakness that could contribute to instability of constructed cut slopes. This area is identified as having bedrock geology that may become unstable and experience landslides, lateral spreading, subsidence, liquefaction or collapse if not properly excavated and graded, and treated with appropriate BMPs. The proposed project will reduce the potential of unstable soils by conducting site-specific geotechnical investigations prior to earth disturbance activities and by preparing a project-specific grading plan and SWPPP. Impacts are less than significant.

Be located on expansive soil, as defined in Table 18-1B of the Uniform Building Code (1994), creating substantial risks to life or property

Construction, Operation and Maintenance, and Decommissioning

The project area including the alternate transmission line contains silty sand and gravel, which do not have expansive properties. As the project will follow all UCB and CBC requirements, the potential for expansion is lowered. Impacts due to expansive soils are less than significant.

Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater

Construction, Operation and Maintenance, and Decommissioning

This alternative would be comparable with the proposed project and experience the same level of impacts and limitations of soils for septic tank and alternative wastewater disposal systems. Impacts due to soils

for septic tanks and wastewater capability would still require further analysis upon the completion of the groundwater study and site specific percolation tests prior to construction.

Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state

Construction, Operation and Maintenance, and Decommissioning

This alternative would be comparable with the proposed project as to the loss of known mineral resources. Impacts due to mineral resources are less than significant.

Result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan

Construction, Operation and Maintenance, and Decommissioning

This alternative would remain consistent with the proposed project. Although this area contains a high potential for construction materials, the area is not conducive for a safe rock quarry. No impacts are identified due to this issue area.

This Alternate Transmission Line #3 and Collector Substation Alternative has the same level of impacts as the proposed project.

Operation and Maintenance Facility Location #1 Alternative

The O&M Facility Location #1 Alternative would be located on private property (T17S R7E Sec4), north of the alternate collector substation and located west of McCain Valley Road, as shown in **Figure 2.0-13**. This alternative would consist of separating the 5-acre O&M building site from the collector substation; however, both would remain on Rough Acres Ranch property. Alternate Transmission Line #2 would be utilized under this alternative, as well as the Alternate Overhead Collector System consisting of two 34.5 kV lines connecting the turbines to the alternate collector substation. All other elements of the project including the turbine locations, parking and laydown areas, and batch plant would remain as described in the proposed project.

This alternative is estimated to have the same land disturbance impacts as the Alternate Transmission Line #2 and Collector Substation Alternative. However, by relocating the O&M building site to the northern portion of Rough Acres Ranch, this alternative would require an approximate 650-foot new access road to be constructed on the west side of McCain Valley Road, thus necessitating an approximate 0.24 acres of temporary disturbance area, and resulting in 0.07 acres of permanently impacted area and a temporary impact of 0.55 acres. In comparison to the proposed project, this alternative would decrease the land disturbance by approximately 2.5 acres, from 772.7 acres to 775.2 acres. The 138 kV transmission line would decrease in distance as a result of this alternative from 9.7 miles to 3.8 miles and would decrease the amount of transmission line poles from 116 poles to 44 poles. The 34.5 kV overhead collector lines would increase in distance from 9.4 miles to 17 miles, and would increase the amount of collector line poles from 250 to 452 poles. The underground collector lines would decrease in distance from 29.3 miles to 28.9 miles.

Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving, earthquake faults, ground shaking, liquefaction, or landslides

Construction, Operation and Maintenance, and Decommissioning

Faults and Ground Shaking

All other components of the project would remain consistent with the proposed project. The area identified by turbines J-6, K-1, K-2, K-3, J-13, L-1, L-2, A-4, A-5, A-6, and P-5 would require additional engineering to provide stability for the turbines located adjacent to the identified faults. It is anticipated that the seismicity would not supersede the turbine design loads, although the turbine foundations will need to be site-specific. Impacts due to earthquakes and ground shaking regarding turbines are less than significant with the proposed mitigation.

Liquefaction

This alternative would be consistent with proposed project with the exception of the transmission line. This area contains La Posta rocky loamy coarse sand, 5 to 30 percent slopes, eroded. This alternative would be comparable with the Alternate O&M/Substation #2 Alternative and experience the same level of impacts related to liquefaction. The incorporation of mitigation measure GS-2 would reduce impacts to less than significant.

Landslides

This alternative would be comparable with the proposed project and experience the same level of impacts related to landslides. The risk of landslides would be reduced by the general grading standards of the UBC and CBC building standards and the County of San Diego General Plan regulations concerning grading, and excavation. Subsequent geotechnical investigation will be required prior to construction and the grading plan. County regulations, UBC grading standards, and CBC standards would be incorporated to reduce the level of significance to less than significant.

Result in substantial soil erosion or the loss of topsoil

Construction, Operation and Maintenance, and Decommissioning

This alternative would be comparable with the proposed project and experience the same level of impacts related to soil erosion and the loss of topsoil. During construction, soil erosion shall be controlled through the implementation of a project-specific SWPPP, as well as BAT and Best Conventional Pollutant Control Technology. Impacts from soil erosion or the loss of topsoil are less than significant.

Be located on a geologic unit or soil that is unstable or that would become unstable as a result of the project and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse

Construction, Operation and Maintenance, and Decommissioning

This alternative would be comparable with the proposed project and experience the same level of impacts related to unstable soils. As described previously, this area does not contain soils which would cause subsidence or liquefaction. Additional geotechnical studies, a grading plan, and SWPPP will be completed prior to construction that would identify and address any potentials impacts from landslides, lateral spreading, subsidence, liquefaction, or collapse; thus, impacts are less than significant.

Be located on expansive soil, as defined in Table 18-1B of the Uniform Building Code (1994), creating substantial risks to life or property

Construction, Operation and Maintenance, and Decommissioning

The project area including the alternate transmission line contains silty sand and gravel, which is not identified as having expansive properties. This alternative would be consistent with the proposed project. Impacts due to expansive soil are less than significant.

Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater

Construction, Operation and Maintenance, and Decommissioning

This alternative is located on soil Loamy alluvial land (Lu) that has a severe 5 rating for septic. This alternative would be comparable with the proposed project and experience the same level of impacts and limitations of soils for septic tank and alternative wastewater disposal systems. Impacts due to soils for septic tanks and wastewater capability would still require further analysis upon the completion of the groundwater study and site specific percolation tests prior to construction.

Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state

Construction, Operation and Maintenance, and Decommissioning

This alternative would be consistent with the proposed project. Impacts due to the loss of mineral resources are less than significant.

Result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan

Construction, Operation and Maintenance, and Decommissioning

This alternative would remain consistent with the proposed project. Although this area contains a high potential for construction materials, the area is not conducive for a safe rock quarry. No impacts are identified due to this issue area.

The O&M Facility Location #1 Alternative has the same level of impacts as the proposed project.

Operation and Maintenance Facility Location #2 Alternative

The O&M Facility Location #2 Alternative would be located on private property (T17S R7E Sec 16), south of the alternate collector substation and located west of McCain Valley Road, as illustrated in **Figure 2.0-13**. This alternative would consist of separating the 5-acre O&M building site from the collector substation; however, both would remain on Rough Acres Ranch property. Alternate Transmission Line #2 would be utilized under this alternative, as well as the Alternate Overhead Collector System consisting of two 34.5 kV lines connecting the turbines to the alternate collector substation. All other elements of the project including the turbine locations, parking and laydown areas, and batch plant would remain as described in the proposed project.

This alternative is estimated to have the same land disturbance impacts as the Alternate Transmission Line #2 and Collector Substation Alternative. However, by relocating the O&M building site to the southern portion of Rough Acres Ranch, this alternative would result in a very slight difference of 1.0 acre of permanent impacts and 0.08 acre of temporary impacts resulting from the construction of new access roads than those described in **Table 2.0-10**. In comparison to the proposed project, this alternative would increase the land disturbance by approximately 2.0 acres; from 772.7 acres to 774.7 acres.

The 138 kV transmission line would decrease in distance as a result of this alternative from 9.7 miles to 3.8 miles and would decrease the amount of transmission line poles from 116 poles to 44 poles. The 34.5 kV overhead collector lines would increase in distance from 9.4 miles to 17 miles, and would increase the amount of collector line poles from 250 to 452 poles. The underground collector lines would decrease in distance from 29.3 miles to 28.9 miles.

Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving, earthquake faults, ground shaking, liquefaction, or landslides

Construction, Operation and Maintenance, and Decommissioning

Faults and Ground Shaking

All other components of the project would remain consistent with the proposed project. The area identified by turbines J-6, K-1, K-2, K-3, J-13, L-1, L-2, A-4, A-5, A-6, and P-5 would require additional engineering to provide stability for the turbines located adjacent to the identified faults. It is anticipated that the seismicity would not supersede the turbine design loads, although turbine foundations will need to be site specific. Impacts due to earthquakes and ground shaking regarding turbines are less than significant with the proposed mitigation.

Liquefaction

This alternative would be consistent with proposed project with the exception of the transmission line. This area contains La Posta loamy coarse sand 5 to 30 percent. This soil is not subject to liquefaction; therefore, no impacts are identified.

Landslides

This alternative would be comparable with the proposed project and experience the same level of impacts related to landslides. The risk of landslides would be reduced by the general grading standards of the UBC and CBC standards and the County of San Diego General Plan regulations concerning grading, and excavation. Subsequent geotechnical investigation will be required prior to construction and the grading plan. County regulations, UBC grading standards, and CBC standards would be incorporated to reduce the level of significance to less than significant.

Result in substantial soil erosion or the loss of topsoil

Construction, Operation and Maintenance, and Decommissioning

This alternative would be comparable with the proposed project and experience the same level of impacts related to soil erosion and the loss of topsoil. During construction, soil erosion shall be controlled through

the implementation of a project-specific SWPPP, as well as BAT and Best Conventional Pollutant Control Technology. Impacts from soil erosion or the loss of topsoil are less than significant.

Be located on a geologic unit or soil that is unstable or that would become unstable as a result of the project and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse

Construction, Operation and Maintenance, and Decommissioning

This alternative would be comparable with the proposed project and experience the same level of impacts related to unstable soils. As described previously, this area does not contain soils which would cause subsidence or liquefaction. Additional geotechnical studies, a grading plan, and SWPPP will be completed prior to construction that would identify and address any potential impacts from landslides, lateral spreading, subsidence, liquefaction, or collapse, thus impacts are less than significant.

Be located on expansive soil, as defined in Table 18-1B of the Uniform Building Code (1994), creating substantial risks to life or property

Construction, Operation and Maintenance, and Decommissioning

The project area including the alternate transmission line contains silty sand and gravel, which are not identified as having expansive properties. This alternative would be consistent with the proposed project. Impacts due to expansive soils are less than significant.

Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater

Construction, Operation and Maintenance, and Decommissioning

In this alternative, the alternate O&M building would be located on private property located on soils similar to the Alternate O&M/Substation Facility #2 Alternative. The area of the La Posta Loamy rocky loamy coarse sand, 5 to 30 percent slopes eroded (LcE2). This soil has a severe septic tank rating and is not conducive to the use of septic tanks. Although the generation of wastewater is expected to be minimal, this rating indicates progressively greater limitations and the need for compensating measures. Appropriate measures will be required to accommodate the soil limitations. Impacts due to soils for septic tanks and wastewater capability will require further analysis upon the completion of the groundwater study and site specific percolation tests prior to construction.

Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state

Construction, Operation and Maintenance, and Decommissioning

This alternative would be consistent with the proposed project. Impacts due to the loss of mineral resources are less than significant.

Result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan

Construction, Operation and Maintenance, and Decommissioning

This alternative would remain consistent with the proposed project. Although this area contains a high potential for construction materials, the area is not conducive for a safe rock quarry. No impacts are identified due to this issue area.

The O&M Facility Location #2 Alternative has the same level of impacts as the proposed project.

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