# SECTION 4.6

# GEOLOGY AND SOILS

This section describes federal, state and local regulations applicable to geology and soils. It also describes the environmental setting of the Project area with regard to the soils, seismicity and geologic conditions. A discussion of geology and soil impacts is also provided and mitigation measures are identified as appropriate. The analysis in this section is based on the *Soil Survey of Imperial County, California, Imperial Valley Area* (USDA 1981) and the *Preliminary Geotechnical Investigation, Proposed Seville Solar Energy Facility, Allegretti Farms Site, Located East of Ocotillo Wells and South of SR-78, Imperial County, California* (PETRA 2012a). This document is included as **Appendix D** of the Technical Appendices of this EIR on the attached CD.

## 4.6.1 REGULATORY FRAMEWORK

### A. STATE

#### Alquist-Priolo Earthquake Fault Zoning Act

The Alquist-Priolo Earthquake Zoning Act (Chapter 7.5, Division 2, Public Resources Code, State of California, effective May 4, 1975) provides a statewide mechanism for reducing losses from surface fault rupture. The Act promotes public safety by prohibiting siting of most structures for human occupancy across traces of active faults that constitute a hazard to structures from surface faulting or fault creep. In accordance with the Act, the Office of State Geologist delineated Special Study Zones that encompass potentially and recently active traces of four major faults: San Andreas, Calaveras, Hayward and San Jacinto. The County of Imperial is responsible for enforcing the Act by ensuring that homes, offices, hospitals, public buildings, and other structures for human occupancy that are built on or near active faults or within a special study zone, are designed and constructed in compliance with the County of Imperial Codified Ordinance (Imperial County, Seismic and Public Safety Element).

The Project area is not located within a Fault Hazard Zone, as defined by the state of California in the Alquist-Priolo Earthquake Fault Zoning Act. No faults are known to align through the solar farm complex site (PETRA 2012a, p. 6).

#### California Building Code

Title 24 of the California Code of Regulations (CCR), commonly referred to as the California Building Code (CBC), is published and updated by the California Building Standards Commission. The most recent version (2013) went into effect as of January 1, 2014. Cities and counties are required by state law to enforce CCR Title 24. Title 24 applies to all building occupancies, and related features and equipment throughout the State of California, and contains requirements related to the structural, mechanical, electrical, and plumbing systems, and requires measures for energy conservation, green design, construction and maintenance, fire and life safety, and accessibility. Among other elements, Chapter 16 of this code dictates the design and construction standards applicable to resist seismic shaking on structures. Based on the CUP application submittal prior to January 1, 2014, the Project is subject to compliance with the 2010 CBC.

#### California Department of Transportation Bridge Design Specifications, Section 8

The California Department of Transportation (Caltrans) has established Bridge Design Specifications (BDS) to establish integrity in the design of bridges. The specifications include 18 Sections covering the full range of issues related to bridge design including siting, loads, foundations, retaining walls, culverts and materials. Section 8 – Reinforced Concrete, provides guidance on how to protect concrete against corrosion (Caltrans 2003). This aspect of the BDS is applicable to the proposed Project with regard to metallic elements encased in concrete such as building components and panel foundations.

### Surface Mining and Reclamation Act

The Surface Mining and Reclamation Act (SMARA) of 1975 acknowledges that mineral extraction is essential to California's economy and that the reclamation of mined lands after extraction is necessary to prevent or minimize adverse effects on the environment and to protect the public health and safety. SMARA also classifies mineral resources in the State and provides information to local governments regarding mineral resources. Designating lands that contain regionally significant mineral resources is the responsibility of local governments. Typically local governments preserve such areas from encroachment or conversion to other uses as part of the General Plan. The law has resulted in the preparation of Mineral Land Classification Maps delineating Mineral Resource Zones (MRZ) for aggregate resources (sand, gravel, and stone). Mining does occur throughout the County of Imperial as shown on the Active Surface Mining Operations Map (County of Imperial, 2003). However, the solar farm complex site is not located in an area with any MRZ zones.

## B. LOCAL

### County Land Use Ordinance

Title 9 Division 15 (Geological Hazards) of the County Land Use Ordinance has established procedures and standards for development within earthquake fault zones. Per County regulationsm, construction of buildings intended for human occupancy are prohibited across the trace of an active fault. An exception exists when such buildings located near the fault or within a designated Special Studies Zone are demonstrated through a geotechnical analysis and report not to expose a person to undue hazard created by the construction. The proposed Project does not include any residential structures. In addition, no faults are known to align through the Project area nor are any active faults located across the solar farm complex site (PETRA 2012a, p. 6).

### Imperial County General Plan

The Seismic and Public Safety Element of the Imperial County General Plan contains goals, objectives, programs and policies to minimize the risks associated with natural and human-made hazards including seismic/geological hazards, flood hazards, and Imperial Irrigation District Lifelines. **Table 4.6-1** analyzes the consistency of the Project with the applicable goals and objectives relating to seismic hazards and soil conditions in the Imperial County General Plan. While this EIR analyzes the Project's consistency with the General Plan pursuant to CEQA Guidelines Section 15125(d), the Imperial County Board of Supervisors ultimately determines consistency with the General Plan.

**TABLE 4.6-1**
**IMPERIAL COUNTY GENERAL PLAN CONSISTENCY ANALYSIS**

| General Plan Goals and Objectives | Consistent with General Plan? | Analysis |
|---|---|---|
| **SEISMIC AND PUBLIC SAFETY ELEMENT** | | |
| **Land Use Planning and Public Safety** | | |
| **Goal 1:** Include public health and safety considerations in land use planning. | Yes | The proposed Project is located in southwestern Imperial County, a highly rural area removed from population centers. Public health and safety would not be affected in association locating the proposed Project in this area based on its |

**TABLE 4.6-1**
**IMPERIAL COUNTY GENERAL PLAN CONSISTENCY ANALYSIS**

| General Plan Goals and Objectives | Consistent with General Plan? | Analysis |
|---|---|---|
| | | location removed from population centers. Therefore, the proposed Project is consistent with this goal. |
| **Objective 1.4** Require, where possessing the authority, that avoidable seismic risks be avoided; and that measures, commensurate with risks, be taken to reduce injury, loss of life, destruction of property, and disruption of service. | Yes | The proposed Project is sited in an area subject to seismic shaking. However, no faults are known to align through the solar farm complex site (PETRA 2012a, p. 6). Several faults are located between 1 and 10 miles of the Project area. As a result, the proposed Project could experience strong ground shaking during an earthquake. However, the Project would be designed in accordance with all applicable federal, State and local building codes. No residential structures are proposed as part of the Project and the O&M buildings would not be occupied on a permanent basis. Damage to proposed structures can be mitigated through engineering and compliance with building standards (refer to mitigation measure MM 4.6.1). Therefore, the proposed Project is consistent with this objective. |
| **Objective 1.7** Require developers to provide information related to geologic and seismic hazards when siting a proposed Project. | Yes | A Preliminary Geotechnical Investigation has been prepared by PETRA Geotechnical, Inc. for the proposed Project. The Investigation was used in the analysis of geology and soils. The Investigation included recommendations to address potential geologic or seismic hazards that may be associated with the project site. These recommendations have been included in this EIR as mitigation measure MM 4.6.1. Therefore, the proposed Project is consistent with this objective. |

**TABLE 4.6-1**
**IMPERIAL COUNTY GENERAL PLAN CONSISTENCY ANALYSIS**

| General Plan Goals and Objectives | Consistent with General Plan? | Analysis |
|---|---|---|
| **Emergency Preparedness** | | |
| **Goal 2:** Minimize potential hazards to public health, safety, and welfare and prevent the loss of life and damage to health and property resulting from both natural and human-related phenomena. | Yes | The proposed Project is not located within an Alquist-Priolo Earthquake Fault Zone, and would be designed in accordance with all applicable federal, CBC and local building requirements. Therefore, the proposed Project is consistent with this goal. |
| **Objective 2.8** Prevent and reduce death, injuries, property damage, and economic and social dislocation resulting from natural hazards including flooding, land subsidence, earthquakes, other geologic phenomena, levee or dam failure, urban and wildland fires and building collapse by appropriate planning and emergency measures. | Yes | The Project is located in a seismically active area. The Preliminary Geotechnical Investigation prepared for the Project includes recommendations that all structures be designed in accordance with the CBC. In addition, recommendations of the Investigation have been included as mitigation measure MM 4.6.1 to reduce risks associated with seismic hazards. Therefore, the proposed Project is consistent with this objective. |
| **Programs and Policies** | | |
| **Seismic/Geologic Hazards** | | |
| **4.** Ensure that no structure for human occupancy, other than one-story wood frame structures, shall be permitted within fifty feet of an active fault trace as designated under the Alquist-Priolo Geologic Hazards Zone Act. | Yes | The proposed Project does not include any residential structures and is not located within fifty feet of an active fault. O&M Buildings would be designed in accordance with the CBC and recommendations of the Preliminary Geotechnical Investigation. Therefore, the proposed Project is consistent with this policy. |

## 4.6.2 ENVIRONMENTAL SETTING

### A. SOLAR FARM COMPLEX

**Geology**

***Regional***

The proposed Project is located near the eastern boundary of the Imperial Valley, which is part of the Salton Trough geomorphic province of California. The Salton Trough encompasses the Coachella, Imperial and Mexicali Valleys, which extend from northeast of Palm Springs near San Gorgonio Pass to the Gulf of California. The geologic structure of the trough is a result of extensional forces within the Earth's crust. The Imperial Valley is generally bounded by the Chocolate Mountains on the east, the Salton Sea on the north, the Peninsular Ranges on the west, and Mexicali Valley on the south (PETRA 2012a, p. 5).

The dominant geologic units of the Imperial Valley are lacustrine (i.e. related to lakes) and alluvial sediments. Specifically, the Project region is underlain by Quaternary Lake Cahuilla beds, Pleistocene Borrego Formation, and the Pliocene Palm spring Formation. The Lake Cahuilla lacustrine deposits consist of interbedded lenticular and tabular sand, silt, and clay and alluvial deposits consisting of gravelly sands. The Palm Spring Formation consists of a least 6,000 feet of reddish clay and light gray arkosic sands. The Borrego Formation consists of gray lacustrine clays with interbedded sands (GSLyon 2013, p. 5).Unexposed succession of Tertiary- and Quaternary-aged sedimentary rocks lies below the alluvial and lake sediments ranging in depth from 11,000 feet or more at the margins to more than 20,000 feet in the central portion of the Salton Trough. Basement rocks consisting of Mesozoic granite and probably Paleozoic metamorphic rocks are estimated to exist at depths between 15,000 and 20,000 feet (PETRA 2012a, p. 5).

The watershed of the Salton Trough empties into the Salton Sea at the lowest part of the basin. Depending on which side of its delta the Colorado River would drain, this basin was periodically filled with water to form the ancient Lake Cahuilla. The sediments of the delta form a topographic high that separates the Salton basin, which is below sea level, from the Gulf of California. The Project site lies near the western boundary of the meandering shoreline of ancient Lake Cahuilla and approximately 14 miles from the southern tip of the present-day Salton Sea. The Salton Sea is currently approximately 226 feet below mean sea level (msl) (PETRA 2012a, p. 5).

#### *Site-Specific*

The Project area is underlain by alluvial and eolian (i.e. arising from the wind) deposits consisting of interbedded clean sands, silty sands, silts and sandy silts. A thin, isolated layer of plastic silty clay, 1 to 2 feet thick, was encountered in eight of the exploratory borings. The top of the thin clay layer was encountered at depths varying from approximately 3 to 11 feet below grade. The clean sands are prevalent in the upper 20 to 25 feet over the northern and northeastern portions of the solar farm complex site while the finer-grained silty sands, silts and sandy silts are more prevalent in the upper 10 to 25 feet over the southern and southwestern portions of the solar farm complex site. The alluvial soils were generally found to be loose in the upper approximately 2 feet, medium dense at a depth interval of approximately 2 to 5 feet, and dense to very dense to the depths explored (PETRA 2012a, pp. 5-6).

Undocumented artificial fill of undetermined depth associated with the in-filling of San Felipe Creek exists within the southern portion of the solar farm complex site along the previous alignment of San Felipe Creek. (The location of the previous alignment of San Felipe Creek was estimated based on a review of old topographic maps and is depicted in Figure 2 of the Preliminary Geotechnical Investigation included as **Appendix D** to this EIR). Minor amounts of shallow undocumented artificial fill also exist in several areas along the existing dirt access roads. In addition, a tilled horizon related to farming activities exists within the agricultural fields, and the depth of the tilled surface is estimated to be approximately 2 feet (PETRA 2012a, p. 6).

According to the Preliminary Geotechnical Investigation, "Site elevations range from a high of approximately 5 feet below mean sea level (msl) at the northwest property comer to a low of approximately 40 feet below msl at the southeast corner (PETRA 2012a, pp. 2-3).

# 4.6 GEOLOGY AND SOILS

## Seismicity

The Salton Trough is a seismically active area, especially within the Imperial Valley. Numerous northwest-trending active faults align through the Valley (**Figure 4.6-1**). However, the solar farm complex site is not located within a Fault Hazard Zone, as defined by the state of California in the Alquist-Priolo Earthquake Fault Zoning Act, and no faults are known to extend through the Project area. The closest active faults to the site include: the Coyote Creek fault, approximately one mile to the southwest; the Borrego Mountains fault, approximately 5 miles to the northwest; the Superstition Hills fault, approximately 6.1 miles to the southeast; and the Elmore Ranch fault, approximately 10 miles to the southeast. The Coyote Creek and Borrego Mountain faults are segments of the San Jacinto Fault Zone (SJFZ) and the Superstition Hills fault is also believed to be a segment of the SJFZ. An "active" fault is defined as a fault that has had displacement within the Holocene epoch, or last 11,000 years. A "potentially active" fault is a fault that does not have evidence of movement within the last 11,000 years, but has moved within the last 1.6 billion years (PETRA 2012a, p. 6).

Historically, the Imperial Fault generated the 1979 and 1940 earthquakes. The Elmore Ranch fault generated the November 23, 1987 earthquake that is thought to have triggered the November 24, 1987 earthquake that occurred on the Superstition Hills and Wienert faults (PETRA 2012a, p. 7). Strong ground shaking can be expected for magnitudes of 6.0 to 7.2 events on these faults. The recurrence interval of 6.0 magnitude or greater events on the Imperial Fault is 29 years (GS Lyon 2013, p. 9). **Table 4.6-2** lists select recorded earthquakes felt at the site area (PETRA 2012a, p. 7).

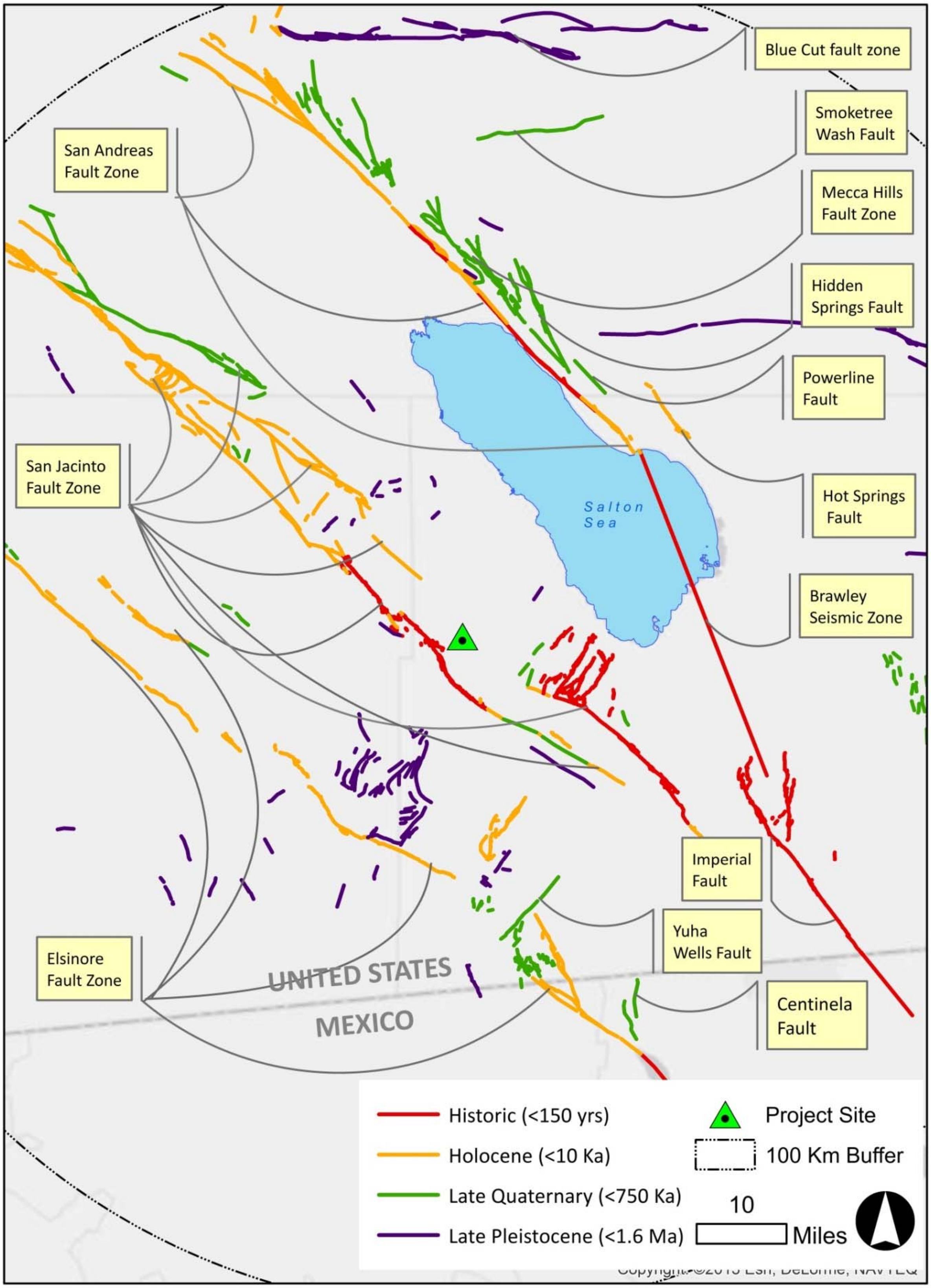
**TABLE 4.6-2**
**SIGNIFICANT HISTORIC EVENTS**

| Earthquake Events | Moment Magnitude (Mw) |
|---|---|
| El Mayor/Cucapah Mexicali (April 4, 2010) | 7.2 |
| Superstition Hills (November 24, 1987) | 6.6 |
| Elmore Ranch (November 23, 1987 | 6.2 |
| Mexicali (June 9, 1980) | 6.1 |
| Imperial Valley (October 15, 1979) | 6.4 |
| Borrego Mountain (April 8, 1968) | 6.5 |
| Imperial Valley (May 18, 1940 | 6.9 |
| Laguna Salada (February 23, 1892) | 7.0 |

*Source: PETRA 2013a, p. 8.*

## Groundwater

The groundwater in the Project area was previously used for irrigation purposes (GS Lyon 2013, p. 7). Free groundwater was not encountered within exploratory borings. However, perched groundwater was encountered in boring B-2 at a depth of approximately 43 feet below ground surface (PETRA 2012a, p. 6). Other records have identified groundwater at a depth of 77 to 91 feet below ground surface about a mile to the west of the solar farm complex site. Both of these groundwater sources may be perched, disconnected from the lower aquifer. The groundwater aquifer is expected to be at depths greater than 200 feet based on groundwater level data from the United State Geologic Service (GS Lyon 2013, p. 7). Depth to groundwater may fluctuate due to localized geologic conditions, precipitation, irrigation, drainage and construction practices in the region. Based on regional topography, groundwater flow is




*Source: Earthquake Hazards Program of the USGS, ESRI.*

**FIGURE 4.6-1**
**REGIONAL FAULTS MAP**

assumed to be generally towards the southwest within the solar farm complex site. Flow directions may also vary locally within the Project area (GS Lyon 2013, p. 7).

**Landslides**

According to the Preliminary Geotechnical Investigation, the solar farm complex site exhibits a generally flat topography. Likewise no landslides exist within or near the solar farm complex site. Based on the topography across the solar farm complex site, the potential for landsliding is considered negligible (PETRA 2012a, p. 9).

**Soil Map Units**

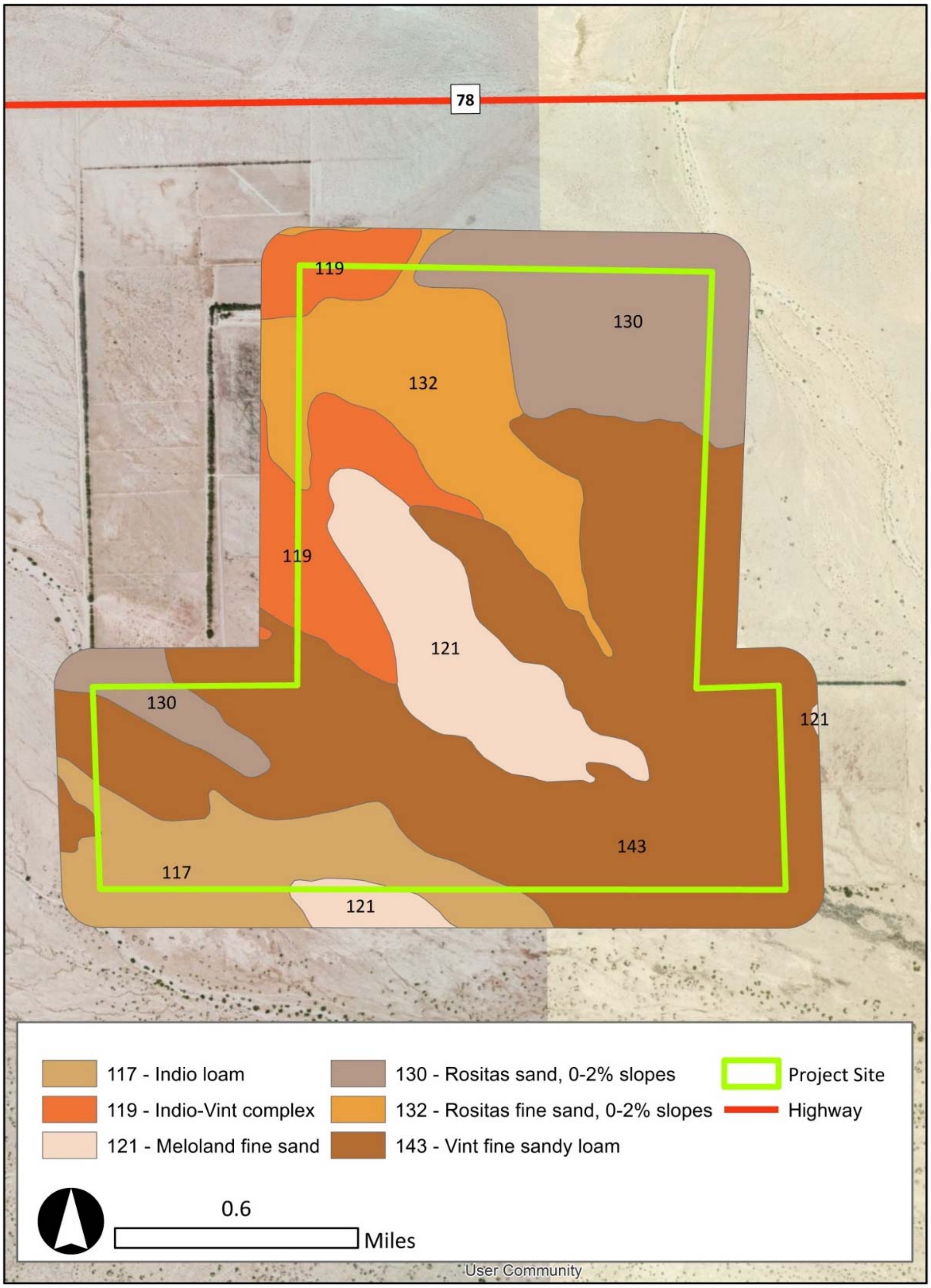
Surficial deposits at the solar farm complex site and surrounding area consist predominantly of silty sand loams of the Indio, Meloland, Rositas, and Vint soil groups. These loams and sands are formed in sediment and alluvium of mixed origin (Colorado River overflows, mountain run-off and fresh-water lakebed sediments. **Figure 4.6-2** depicts the soil map units within the boundaries of the solar farm complex site. **Table 4.6-3** provides a brief summary of the characteristics of the six soil types within the solar farm complex site boundaries, followed by additional details of each soil. Soils within the transmission line corridor already support the existing IID 12.5 kV line. The existing poles would be replaced to accommodate the 92 kV transmission line overbuild. Likewise, soils within the existing boundary of the Anza Substation accommodate existing facilities. The proposed modifications would occur with a 0.24 acre expansion area adjacent to the existing substation. Thus, soils within the transmission line corridor and Anza Substation modifications would occur within areas that currently support structures and are not identified in the table below.

**TABLE 4.6-3**
**SUMMARY OF PROJECT SITE SOIL MAP UNITS**

| Soil | Texture[1] | Depth of Surface Layer[1] | Wind Erodability Group[2] | Erosion (K) Factor[3] | Permeability Inches Per Hour[3] |
|---|---|---|---|---|---|
| **Glenbar Complex** | Loam | 0-13 | 4L | 0.43 | 0.6-2.0 |
| **Indio Loam** | Loam | 0-12 | 4L | 0.55 | 0.6-2.0 |
| **Indio-Vint Complex** | Loam | 0-12 | 4L | 0.55 | 0.6-2.0 |
| **Rositas Fine sand (0 to 2 percent slopes)** | Sand | 0-27 | 5 | 0.20 | 6.0-20 |
| **Rositas Sand (2 to 5 percent slopes)** | Fine Sand | 0-9 | 5 | 0.20 | 6.0-20 |
| **Vint Fine Sandy Loam** | Fine Sandy Loam | 0-12 | 3 | 0.37 | 0.9-2.0 |

*Source: USDA 1981, EGI 2013.*
*Notes: N/A = not applicable or not available.*
*[1] Taken from Table 11, Engineering Index Properties.*
*[2] Wind erodibility groups range from 1 to 8, with 1 being highly erodible and 8 having low erodibility. Taken from Table 12, Physical and Chemical Properties of Soils.*
*[3] This is an index of erodibility for standard condition and includes susceptibility of soil to erosion and rate of runoff. Low K values (below 0.15) indicate low erosion potential. High K values (above 0.4) are highly erodible. Taken from Table 12, Physical and Chemical Properties of Soils*

**117-Indio Loam –** very deep, well drained, nearly level soil is on flood plains and basin floors. Elevation is 35 feet above sea level to 230 feet below. Permeability is moderate, and available water capacity is high to very high. Surface runoff is slow and the hazard of erosion is slight. The Indio soil is well suited to homesites and urban areas though limited by dustiness. Septic tank absorption fields can function well if designed to compensate for the soil's moderate permeability. Ponds and reservoirs will develop seepage problems unless sealed or lined (USDA 1981, p. 20-21).




*Source: Bing Maps, U.S. Department of Agriculture, Natural Resources Conservation Services, U.S. Department of Commerce Tiger/Line Shapefiles, Project Applicant*

**FIGURE 4.6-2**
**SOLAR FARM COMPLEX SITE SOILS MAP**

**119-Indio-Vint Complex –** These nearly level soils are on flood plains and alluvial basin floors and are so intricately mixed that they were not separated on the soil map. Elevation is 200 feet above sea level to 230 feet below. Permeability of the Indio soil is moderate, and available water capacity is high to very high. Surface runoff is slow, and the hazard of erosion is slight. The hazard of soil blowing is moderate. Permeability of the Vint soil is moderately rapid and available water capacity is moderate. Surface runoff is slow, and the hazard of erosion is slight. The unit is well suited to homesites and urban areas although dustiness and sandy soil materials affect use. Septic tank absorption fields can function well. These soils

are too permeable for water impoundment construction, so ponds and reservoirs need an impervious lining to prevent seepage (USDA 1981, p. 22).

**130-Rositas Sand (0 to 2 percent slopes) –** very deep, somewhat excessively drained, nearly level soil is on flood plains, basins, and terraces. Elevation is 300 feet above sea level to 200 feet below. Permeability is rapid and available water capacity is low. Surface runoff is slow, and the hazard of erosion is slight. There is high hazard of soil blowing and abrasion to young plants. Septic tank absorption fields can function well, but there is a hazard of ground water contamination from septic tank absorption effluent because of rapid permeability. This soil is too permeable to be good material for water impoundments. Ponds and reservoirs need an impervious lining to prevent seepage (USDA 1981, p. 30).

**132-Rositas Fine Sand (2 to 5 percent slopes) –** this very deep, somewhat excessively drained, nearly level soil is on flood plains, basins, and terraces. Elevation is 300 feet above sea level to 200 feet below. Permeability is rapid, and available water capacity is low. Surface runoff is slow and the hazard of erosion is slight. There is a high hazard of soil blowing and abrasion to young plants. The Rositas soil is well suited to homesites and urban areas, although it's sandy texture affects use. Septic tank absorption fields generally function well, but here is a hazard of ground water contamination from septic tank effluent because of rapid permeability. This soil is too permeable to be good material for water impoundments Ponds and reservoirs need an impervious lining to prevent seepage (USDA 1981, p. 31).

**143-Vint Fine Sandy Loam –** this very deep, well drained, nearly level soil is on flood plains, basins, and terraces. Elevation is 35 to 300 feet. Permeability is moderately rapid, and available water capacity is moderate. Surface runoff is slow and the hazard of erosion is slight, although geologic erosion has etched most areas with rills and arroyos. The hazard of soil blowing is moderate. Vint soil is well suited to homesites and urban areas, though dustiness and sandy soils materials affect use. Septic tank absorption fields can function well but there is a hazard of ground water contamination from septic tank effluent in the permeable subsurface strata. This soil is too permeable to be good material for water impoundments, so ponds and reservoirs need impervious lining to prevent seepage (USDA 1981, p. 37).

### Subsurface Soils

Subsurface soil conditions were previously discussed relative to the solar farm complex site. Refer to the discussion under Geology, Site Specific, above.

### Shrinkage and Subsidence

Volumetric changes in earth quantities will occur when excavated on-site soils are replaced as properly compacted fill. Accordingly, it is estimated that a shrinkage factor on the order of 15 to 20 percent will occur when on-site soils are excavated and placed as compacted fill (PETRA 2012a, p. 15). Subsidence from scarification and re-compaction of exposed bottom surfaces in over-excavated areas is expected to be on the order of approximately 0.10 to 0.15 feet (PETRA 2012a, p. 15).

**Expansive Soils**

The results of laboratory tests performed on representative samples of near-surface soils within the solar farm complex site indicate that the soils exhibit expansion potentials that are within the Very Low to Low range (Expansion Index from 0 to 50). As such, the site soils are classified as "expansive" as defined in Section 1803.5.3 of the 2010 CBC (PETRA 2012a, p. 18).

**Differential Settlement**

Based on the general settlement characteristics of the in situ alluvial soils and compacted fills comprised of soils that are similar to those that exist on the solar farm complex site, as well as the recommended allowable-bearing value, it is estimated that the total settlement of conventional footings for a static loading condition will be less than approximately 1 inch. Maximum differential settlement is estimated to be about 3/4 inch over a horizontal distance of 40 feet (PETRA 2012a, p. 17).

**Soil Corrosivity**

General corrosivity screening was performed on representative samples of on-site soils to identify potential corrosive characteristics. Soils containing soluable sulfates were present which could affect concrete used in footings and interior slabs-on-ground, foundations walls, and concrete exposed to weather (PETA 2012a, p. 29). Soils containing a soluable chloride concentration beyond a certain threshold level are considered corrosive to metallic elements such as reinforcement bars, cables, bolts, etc. that are encased in concrete. Likewise elevated concentrations of soluable salts in soils tend to induce low level electrical currents in metallic objects in contact with such soils which promotes metal corrosion. The results of the corrosivity screening indicate that on-site soils are moderate to severely corrosive to ferrous metals and copper (PETRA 2012a, pp. 27-30).

**Permeability**

Based on the Unified Soil Classification System presented in the Soils Survey Report, the permeability of solar farm complex soils range from high to medium (GS Lyon 2013, p. 6).

**Mineral Resources**

Imperial County contains diverse mineral resources. Those with the highest economic value include gold, gypsum, sand, gravel, lime, clay, and stone. Geologic factors restrict mining operations to the relatively few locations where mineral deposits are feasible for extraction. The majority of the mining areas are in the eastern portion of Imperial County as depicted on Figure 5, Mining Resources, of the Imperial County General Plan Conservation and Open Space Element (Imperial County 1993). The solar farm complex is located in an area of former active farmland. A portion of the transmission line extends through desert lands under the jurisdiction of the BLM with native vegetation cover and the Anza Substation is on land owned by the IID. The Project area appears to contain no mineral resources, and no mining activities occur in the vicinity of, or on, the solar farm complex site.

### B. TRANSMISSION LINE

The Preliminary Geotechnical Investigation did not include the portion of the transmission line located outside of the solar farm complex site (i.e. on private land north of Lot 5, lands under the jurisdiction of the BLM) or the proposed modifications to the Anza Substation on land owned by the IID. The overbuilt 92 kV transmission line was granted IID right-of-way (ROW) CACA 044554 by the BLM to be constructed as part of a larger IID project (BLM 2001). The ROW through BLM land is 50 feet wide and 18,480 feet long and contains approximately 21.21 acres. However, the regional settings described for the Seville Solar Farm Complex would also apply to the transmission line and the substation modifications.

### 4.6.3 IMPACTS AND MITIGATION MEASURES

#### A. STANDARDS OF SIGNIFICANCE

The impact analysis provided below is based on the following CEQA Guidelines, as listed in Appendix G. The Project would result in a significant impact to geology and soils if it would result in any of the following:

a) 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? Refer to Division of Mines and Geology Special Publication 42.

   ii) Strong Seismic ground shaking.

   iii) Seismic-related ground failure, including liquefaction and seiche/tsunami.

   iv) Landslides.

b) Result in substantial soil erosion or the loss of topsoil.

c) 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 landslides, lateral spreading, subsidence, liquefaction or collapse.

d) Be located on expansive soil, as defined in the latest Uniform Building Code, creating substantial risk to life or property.

e) Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water.

Note: One additional issue, corrosive soils, was identified in the Preliminary Geotechnical Investigation and is discussed in the analysis of Project Impacts and Mitigation Measures.

#### B. ISSUES SCOPED OUT AS PART OF THE INITIAL STUDY

Several checklist criteria were eliminated from further evaluation as part of the Initial Study and review of the Preliminary Geotechnical Investigation. Criterion "a-i" was scoped out because the Project area is not within a designated State of California Alquist-Priolo Earthquake Fault Zone. In addition, no known active faults have been identified to align through the solar farm complex site. While fault rupture would most likely occur along established fault traces, fault rupture could occur at other locations. However the potential for active fault rupture at the site is considered to be very low. Therefore, no impact is anticipated.

Criterion "a-iii" regarding seismic-related ground failure, including liquefaction and seiche/tsunami was scoped out. The Preliminary Geotechnical Investigation prepared for the proposed solar farm complex site examined potential for seismic related ground failure. Secondary effects of seismic activity normally considered as possible hazards to a site include several types of ground failure, as well as earthquake-induced flooding. Liquefaction occurs when dynamic loading of a saturated sand or silt causes pore-water pressures to increase to levels where grain-to-grain contact is lost and material temporarily behaves as a viscous fluid. Based on the liquefaction analyses performed as part of the Preliminary Geotechnical Investigation, no liquefiable soil layers were identified at the six cone penetration test sounding locations on the solar farm complex site. [Note: The complete liquefaction analysis is contained in Appendix D to the Preliminary Geotechnical Report which is included as part of **Appendix D** of this EIR.] Therefore, no impact would occur in association with liquefaction and this issue will not be discussed in the analysis.

Criterion "a-iv" was scoped out because the site exhibits a generally flat topography and no landslides exist within or near the site. Based on the topography across the site, the potential for landsliding is considered negligible. Thus, no impact is identified for this issue area and it will not be discussed in the EIR.

Seismically induced flooding that might be considered a potential hazard to a site normally includes flooding due to tsunami or seiche (i.e., a wave-like oscillation of the surface of water in an enclosed basin that may be initiated by a strong earthquake) or failure of a major reservoir or retention structure upstream of the solar farm complex site. The Salton Sea is situated approximately 14 miles from the Project area with an elevation differential greater than approximately 180 feet. In addition, no major reservoir is located near, or upstream of the Project area. Therefore, the potential for seiche or inundation is considered negligible. Because of the inland location of the Project, flooding due to a tsunami is also considered negligible. Therefore, impacts associated with seismic-related ground failure would be less than significant and are not discussed further in this section.

Criterion "c" regarding unstable soil units was scoped out based on the findings of the Preliminary Geotechnical Investigation (PETRA 2012a, pp. 5-6). Various general types of ground failures which might occur as a consequence of severe ground shaking in the Project area include ground subsidence, ground lurching, and lateral spreading. The probability of occurrence of each type of ground failure depends on the severity of the earthquake, distance from faults, topography, sub-soil and groundwater conditions, in addition to other factors. Based on the Project area conditions and relatively flat topography, ground subsidence, ground lurching and lateral spreading are considered unlikely to affect any component of the Project and will not be discussed further in this section.

## C. Methodology

Existing conditions were evaluated based on potential to be affected by construction activities, operation and reclamation of the Project. Construction, operation, and reclamation were provided by the Applicant. Geology and soils impacts were formulated based on the findings of the *Preliminary Geotechnical Investigation, Proposed Seville Solar Energy Facility, Allegretti Farms Site, Located East of Ocotillo Wells and South of SR-78, Imperial County, California* prepared by PETRA Geotechnical, Inc. (PETRA 2012a) included in **Appendix D** of the Technical Appendices of this EIR on the attached CD.

## D. Project Impacts and Mitigation Measures

### Strong Seismic Ground Shaking

**Impact 4.6.1** The Project area is located in an active tectonic area with several significant faults capable of producing moderate to strong earthquakes. This is considered a **potentially significant impact.**

#### *Construction*

Exposure to strong seismic ground shaking during construction could damage work in progress resulting in a **potentially significant impact**. However, impacts associated with strong seismic ground shaking during construction would be addressed through Project design. The Project would be designed based on the CBC to ensure that all foundations and structures are constructed to withstand a seismic event during operation of the Project as discussed below.

### *Operation*

As previously discussed, the Project area is near (10 miles or less) four identified active faults .The Coyote Creek fault, the Borrego Mountain fault, the Superstition Hills fault and the Elmore Ranch fault are all in close proximity to the Project area and capable of producing strong ground motions (PETRA 2012a, p. 7). Because the Project is proposed in a seismically active area, the potential exists for ground motion to affect future improvements.

According to the American Society of Civil Engineers' Site Classification for Seismic Design, the Project area is classified as "D" Stiff soil (PETRA 2012a, p 10). Imperial County is classified as Seismic Zone 4 by the Uniform Building Code (Sections 1626 through 1635). Developments within in Seismic Zone 4 (highest risk on a scale of 0 to 4) are required to incorporate the most stringent earthquake resistant measures. While the Project does not include habitable structures (such as a home that would be permanently occupied), the proposed O&M buildings could be damaged by strong seismic shaking. Thus, impacts associated with strong seismic shaking are considered **potentially significant**.

### *Reclamation*

Reclamation of the solar farm complex would involve removal of all on-site facilities. No PV or CPV panels, O&M buildings, gen-tie lines, etc., would remain and the solar farm complex site would be reclaimed to its end state to approximate the existing idle farmland. However, the IID-owned facilities (IID switchyard and 92 kV transmission line on the Property; 92 kV transmission line with underbuilt 12.5 kV distribution line; 12.5 kV distribution line system constructed on the Property; and the IID Anza Substation modifications) would not be decommissioned until IID determined that these improvements were no longer needed and could be retired and removed. Likewise, the roads constructed on Lot B to access each of the parcels created under the major subdivision and all of the water wells would not be decommissioned or reclaimed. However, the amount of infrastructure susceptible to damage would be greatly diminished as part of reclamation. N**o impacts** resulting from strong seismic ground shaking are anticipated in association with reclaiming the solar farm complex site to approximate the existing idle farmland

<u>**Mitigation Measures**</u>

**MM 4.6.1** Structures with the Project area shall be designed and constructed to resist the effects of seismic ground motions as provided in Section 1613 of the 2010 California Building Code. The Project shall be engineered using the 2010 California Building Code, Section 1613 Design Coefficients for the proposed structures.

*Timing/Implementation:* *Prior to approval of final building plans/As part of Project design.*

*Enforcement/Monitoring:* *Imperial County Planning and Development Services Department and Imperial County Department of Public Works.*

<u>**Significance After Mitigation**</u>

Implementation of mitigation measure MM 4.6.1 would reduce potential structural damage caused by strong seismic ground shaking by adhering to the appropriate provisions of the 2010 CBC. Thus, this impact is can be mitigated to a **less than significant** level through adherence to applicable codes and standards.

**Erosion**

**Impact 4.6.2** Construction, operation, and reclamation activities could result in earth disturbance and potential for erosion and loss of top soil in the Project area. Multiple requirements have been established to address erosion with which the Applicant must comply. Therefore, this impact is considered **less than significant**.

### *Construction*

Disturbance for the solar energy project lots (1 thru 5) totals approximately 1,181 acres; common access roads (Lot B) totals 11 acres; and the IID Switch/Project Substations (Lots C and D) total 10 acres (refer to Table 2.0-3 in Chapter 2.0, Project Description). In addition to the solar energy project lots, approximately 34 acres would be disturbed to construct the corridor for the gen-tie lines from each solar energy project to the electrical substations (Lot A); 2.3 acres would be disturbed in association with construction of the IID 92 kV Transmission; and approximately 0.24 acre would be disturbed in association with the proposed Anza Substation modifications (refer to Table 2.0-3 in Chapter 2.0, Project Description).

Soil erosion could result during construction of the proposed Project in association with ground preparation activities required for foundation areas, parking lots, access roads, sheet graded areas and cut areas. Each of the solar and common interest lots to be developed have been previously been graded and used for agriculture. The transmission line corridor through BLM land and the IID Anza Substation property have been preserved as open desert aside from the existing poles and equipment.

Fine grading would be required to establish internal access roads and pads for electrical equipment (inverters and step–up transformers). Additional grading would be required for constructing the on-site storm water retention basin(s) and directing on-site storm water to drain to these basins. Trenching would be required for installation of the underground electrical collection lines; installation of the support piles, solar frames, PV or CPV panels and inverters; and construction of the aboveground transmission lines within each solar energy project lot.

During construction, erosion would be controlled by watering and, as necessary, the use of other dust suppression methods and materials accepted by the Imperial County Air Pollution Control District (ICAPCD) (i.e. Rule 801) or the California Air Resources Board (CARB). The Project would also be subject to preparation, review and approval of a grading plan by the County Engineer and compliance with the National Pollutant Discharge Elimination System (NPDES) Construction General Permit (discussed further in Section 4.11, Hydrology and Water Quality). These actions would mitigate the potential soil erosion impacts during construction to **less than significant**.

### *Operation*

Dust would be controlled during operations by the periodic application and maintenance of soil binders to exposed soil surfaces. Daily operations and routine maintenance (such as occasional PV panel washing) are not anticipated to increase erosion. Likewise, during operation soil erosion and sedimentation would be controlled in accordance with the Best Management Practices (BMPs) included as part of the project's Storm Water Pollution Prevention Plan (SWPPP) (discussed further in Section 4.11, Hydrology and Water Quality). Thus, erosion impacts would be reduced to less than significant levels during operations.

### *Reclamation*

Activities associated with reclamation include concrete removal; removal and dismantling of underground utilities; excavation and removal of soil; and final site contour. The IID-owned facilities (IID switchyard and 92 kV transmission line on the Property; 92 kV transmission line with underbuilt 12.5 kV distribution line; 12.5 kV distribution line system constructed on the Property; and the IID Anza Substation modifications) would not be decommissioned until IID determined that these improvements were no longer needed and could be retired and removed. Likewise, the roads constructed on Lot B to access each of the parcels created under the major subdivision and all of the water wells would not be decommissioned or reclaimed. However, infrastructure that would be removed presents the potential to expose soils to erosion. During reclamation, soil erosion and sedimentation is anticipated to be controlled in accordance with implementation of a Dust Control Plan (Rule 801) and compliance with NPDES Construction General Permit. These actions would mitigate the potential soil erosion impacts to **less than significant.** Some natural erosion from wind or rain may occur after the solar farm complex site is reclaimed to approximate the existing idle farmland.

**Mitigation Measures**

None required.

**Significance After Mitigation**

Not applicable.

**Expansive Soils**

**Impact 4.6.3** The expansion potential of the surface and subsurface soils across the Project site vary from very low to low. Soils exhibiting a low expansion potential can affect the performance of concrete slabs or structures with shallow foundations. This is considered a **potentially significant impact**.

***Construction***

Impacts associated with expansive soils during construction would be addressed through Project design. With proper design as specified by the recommendations of the Preliminary Geotechnical Investigation, expansive soils impacts during construction would be reduced to **less than significant**.

***Operation***

Soils exhibiting a low expansion potential are present in the upper 10 to 25 feet over the southerly and southwesterly portions of the site. The results of PETRA's laboratory tests on representative samples of near-surface soils within the site indicate that the soils exhibit expansion potentials that are within the Very Low to Low range (Expansion Index from 0 to 50). As such, the solar farm complex site soils are classified as "expansive" as defined in Section 1803.5.3 of the 2010 CBC (PETRA 2012a, p.18). This is considered **a potentially significant impact**.

***Reclamation***

Reclamation of the solar farm complex would involve removal of concrete, removal and dismantling of underground utilities and excavation and removal of soil. The on-site soils would be ripped to the depth necessary to remove all miscellaneous buried solar project equipment. However, the IID-owned facilities (IID switchyard and 92 kV transmission line on the Property; 92 kV transmission line with underbuilt 12.5 kV distribution line; 12.5 kV distribution line system constructed on the Property; and the IID Anza Substation modifications) would not be decommissioned until IID determined that these improvements were no longer needed and could be retired and removed. Likewise, the roads constructed on Lot B to access each of the parcels created under the major subdivision and all of the water wells would not be decommissioned or reclaimed. These remaining features are not anticipated to be subject to expansive soils as any impacts would have been addressed as part of Project design and mitigated during construction. The solar farm complex would be reclaimed to its end state to approximate the existing idle farmland. As a result, impacts associated with expansive soils during reclamation would be **less than significant**.

**Mitigation Measure**

**MM 4.6.3** The design of foundations and slabs-on-ground shall be performed in accordance with the procedures outlined in Sections 1808.6.1 and 1808.6.2 of the 2010 CBC and the latest edition of the Wire Reinforcement Institute (WRI) publication "Design of Slab-on-Grade Foundations." An effective plasticity index of 12 shall be used by the project structural engineer to design slabs-on-grade within an interior grade beam system in accordance with the WRI publication.

| | |
|---|---|
| *Timing/Implementation:* | *Prior to issuance of building permits.* |
| *Enforcement/Monitoring:* | *Imperial County Planning and Development Services Department.* |

**Significance After Mitigation**

Implementation of mitigation measure MM 4.6.3 would reduce exposure of foundations to damage caused by expansive soils during operation of the Project. Thus, impacts associated with expansive soils would be reduced to **less than significant**.

**Soil Capability to Support Septic Systems**

**Impact 4.6.4** The proposed Project includes development of an on-site sanitary waste septic system. The solar farm complex site may contain soils that cannot support the use of the proposed septic system. If soils are incapable of supporting a septic system, an underground tank would be used for storage of waste streams. Therefore, a **less than significant impact** is identified with regard to soil capability to support septic systems.

***Construction***

Impacts associated with soil capability to support septic systems during construction would not be an issue as portable toilets would be located on site during construction and sanitary waste would be removed from the Project area by a local contractor. Therefore, **no impact** would occur.

***Operation***

An engineered septic system is proposed to treat on-site wastewater flows at the Project site. The system will be designed based on the number of permanent employees (approximately 9) and the soil and subsurface conditions within the Project area. According to the Preliminary Geotechnical Investigation "The site is underlain by alluvial and eolian deposits consisting of interbedded clean sands, silty sands, silts and sandy silts" (PETRA 2012a, p. 5). The ten soil types within the Project site boundaries are identified **Table 4.6-3** and described following the table. Generally, the sandier on-site soils are likely capable of supporting on-site sewage disposal in the form of leach lines. However, some on-site soils (e.g. Glenbar Complex, Holtville Silty Sand, Meloland Fine Sand) may not be capable of supporting an onsite sanitary waste septic system due to low permeability and perched water. Prior to final engineering of the septic wastewater system, the Applicant would hire a qualified geotechnical consultant to conduct additional percolation tests at the location of the leach lines. The tests would be conducted pursuant to Imperial County Environmental Health Services Department rules and regulations. If the tests reveal the site cannot accommodate a leach field, the septic system may be designed to direct waste streams to an underground tank for storage until it is pumped out (on a periodic or as-needed basis) and transported for disposal at a licensed waste treatment facility. Because an alternative means of accommodating septic waste is available if soils cannot accommodate a leach field, impacts to soil capability to support septic systems are considered **less than significant**.

***Reclamation***

As part of the reclamation process, all solar equipment and other on-site facilities (chain link fence, gates, posts and concrete footings, solar generation facilities, electrical switchyard and substation facilities, transmission lines, control/warehouse buildings, water tanks, foundations, septic systems) would be removed and salvaged if economically feasible. However, the IID-owned facilities (IID switchyard and 92 kV transmission line on the Property; 92 kV transmission line with underbuilt 12.5 kV distribution line; 12.5 kV distribution line system constructed on the Property; and the IID Anza Substation modifications) would not be decommissioned until IID determined that these improvements were no longer needed and could be retired and removed. Likewise, the roads constructed on Lot B to access each of the parcels created under the major subdivision and all of the water wells would not be decommissioned or reclaimed. After the solar farm complex site is cleared and contoured, it would be reclaimed to its end state to approximate the existing idle farmland and would not require septic systems. As a result, impacts associated with soil capability to support septic systems during reclamation would be **less than significant**.

**Mitigation Measure**

None required.

**Significance After Mitigation**

Not applicable.

**Soil Corrosivity**

**Impact 4.6.5** Soils within the solar farm complex site are corrosive to concrete and metals. This is considered a **potentially significant impact.**

***Construction***

Impacts associated with soil corrosivity during construction would be addressed through Project design to accommodate long-term operation of the Project. With proper design, as recommended by a structural engineer and the contractor responsible for concrete placement, soil corrosivity impacts during construction would be reduced to **less than significant**.

***Operation***

*Concrete in Contact with Soils*

Soils containing soluble sulfates beyond certain threshold levels as well as acidic soils are considered to be detrimental to the integrity of concrete. PETRA Geotechnical Inc., performed a laboratory testing program that included preliminary soil corrosivity screening (soluble sulfate and chloride content, pH and minimum resistivity) on representative samples of on-site soils. The results of the tests indicate that on-site soils within the solar farm complex site contain water soluble sulfate contents of 0.006 to 0.072 percent and moderately alkaline with respect to pH (8.0 to 8.3). With regard to concrete contact with these soils, the exposure class per the Section 4.3 of American Concrete Institute (ACI) 318, is SO (i.e. conditions where the water soluable sulfate concentration in contact with concrete is low and injurious sulfate attack is not a concern) (PETRA 2012a, p. 28). As directed by Table 4.3.1 of ACI 318-08, no restriction for cement or maximum water-cement ratio for the fresh concrete would be required for this condition. However, the concrete minimum unconfined compressive strength should not be less than 2,500 psi (PETRA 2012a, p. 28). Based on the limited in-house testing, and according to Caltrans BDS requirements (which considered the combined effects of soluable sulfates and soil pH), a commercially available Type II Modified cement may be used on the solar farm complex site. However, impacts to concrete are considered **potentially significant** unless the concrete's composition is based on the recommendations of a structural engineer.

*Metals Encased in Concrete*

Soils containing a soluble chloride concentration beyond a certain threshold level are considered corrosive to metallic elements such as reinforcement bars, cables, bolts, etc. that are encased in concrete that, in turn, is in contact with such soils.

The results of limited screening tests performed in accordance with California Test Method No. 422 indicate that on-site soils contain a water-soluble chloride concentrations of 112 to 362 parts per million (ppm) (PETRA 2012a, p. 29). Section 1904.4 of CBC 2010 requires that reinforcement in concrete be protected from the corrosive effects of chloride exposure in accordance with Section 4.4 of ACI 318. It should be noted that Section 4.4 of ACI 318-08 pertains to freeze-and-thaw conditions that are not applicable to the proposed Project. However, regardless of the level of chlorides in soils in contact with concrete, Table 4.2.1 of ACI 318-08 assigns an exposure class of C1 for concrete that will be exposed to moisture but not necessarily to external sources of chlorides. As such, a Moderate exposure to chloride may be expected for metallic elements encased in concrete which are in turn placed in contact with the on-site soils materials (PETRA 2012a, p. 29). This is considered **a potentially significant impact** unless the concrete's composition is based on the recommendations of a structural engineer.

One method of protecting reinforcement in concrete where elevated chloride concentrations are present in the soils is to increase the thickness of the concrete cover over the reinforcement. However, Table 8.22.1 of Caltrans BDS 2003 provides no minimum concrete cover when chloride concentration is less than 500 ppm (as is the case for the solar farm complex site). This recommendation should be verified by the Project's structural engineer (PETRA 2012a, p. 29).

*Metallic Elements in Contact with Site Soils*

Elevated concentrations of soluble salts in soils tend to induce low level electrical currents in metallic objects. This process promotes metal corrosion and can lead to distress to building components that are in contact with soils containing elevated concentrations of soluble salts. The minimum electrical resistivity indicates the relative concentration of soluble salts in the soil and, therefore, can be used to estimate soil corrosivity with regard to metals.

The minimum electrical resistivity for on-site soils was found to be 480 to 3,700 ohm-cm based on limited testing performed in accordance with California Test Method No. 643. This result indicates that on-site soils are Moderately to Severely Corrosive to ferrous metals and copper (PETRA 2012a, p. 30). This is considered **a potentially significant impact** unless ferrous metal or copper components are protected.

***Reclamation***

Reclamation of the solar farm complex would involve removal of concrete and underground utilities. Equipment and foundations to support the project would no longer be in contact with corrosive soils. However, the IID-owned facilities (IID switchyard and 92 kV transmission line on the Property; 92 kV transmission line with underbuilt 12.5 kV distribution line; 12.5 kV distribution line system constructed on the Property; and the IID Anza Substation modifications) would not be decommissioned until IID determined that these improvements were no longer needed and could be retired and removed. Likewise, the roads constructed on Lot B to access each of the parcels created under the major subdivision and all of the water wells would not be decommissioned or reclaimed. After the solar farm complex site is cleared and contoured, it would be reclaimed to its end state to approximate the existing idle farmland. No structures are proposed as part of reclaiming the site. As a result, impacts associated with corrosive soils during reclamation would be **less than significant**.

**Mitigation Measures**

**MM 4.6.5a Concrete in Contact with Site Soils**

The type of concrete to be used in construction of the Project shall be follow the recommendation of a structural engineer and the contractor responsible for concrete placement used in footings and interior slabs-on-ground, foundation walls, and concrete exposed to weather.

*Timing/Implementation:* *Prior to issuance of building permit/during construction.*
*Enforcement/Monitoring:* *Imperial County Planning and Development Services Department, Division of Building & Safety.*

**MM 4.6.5b Metal Encased in Concrete**

The thickness of the concrete cover over the reinforcement shall be determined by a structural engineer to protect against elevated chloride levels. The thickness shall be determined based upon the chloride concentration of on-site soils.

*Timing/Implementation:* *Prior to issuance of building permit/during construction.*
*Enforcement/Monitoring:* *Imperial County Planning and Development Services Department, Division of Building & Safety.*

**MM 4.6.5c Metallic Elements in Contact with Site Soils**

- The recommendations of a corrosion engineer shall be implemented to mitigate the detrimental effects of corrosive soils on buried metallic and other building materials that may be exposed to corrosive soils.
- Any ferrous metal or copper components of the proposed buildings or panel foundations placed in direct contact with Project soils shall be protected against detrimental effects of severely corrosive soils.
- Sampling and testing of near-surface soils shall be performed during the final stages of site grading by a qualified corrosion engineer to provide a complete assessment of soil corrosivity.

*Timing/Implementation:* *Prior to issuance of building permit/during construction and the final stages of site grading.*
*Enforcement/Monitoring:* *Imperial County Planning and Development Services Department, Division of Building & Safety.*

**Significance After Mitigation**

Implementation of mitigation measures MM 4.6.5a, MM 4.6.5b and MM 4.6.5c would ensure that the project is designed and constructed to protect against corrosion through proper testing and appropriate protection of materials in contact with on-site soils. With implementation of these measure impacts resulting from soil corrosivity would be reduced to **less than significant**.

### 4.6.4 CUMULATIVE SETTING, IMPACTS AND MITIGATION MEASURES

#### A. CUMULATIVE SETTING

The geographic scope for the cumulative geology and soils setting is the Imperial Valley portion of the Salton Trough physiographic province of Southern California. A list of large scale proposed, approved and reasonably foreseeable renewable energy projects is identified in Table 3.0-1 of Chapter 3.0, Introduction to the Environmental Analysis and Assumptions Used. None of these projects are adjacent to or in close proximity to the Project. In general, geology and soils impacts are site-specific and limited to the boundaries of each individual project rather than cumulative in nature.

#### B. CUMULATIVE IMPACTS AND MITIGATION MEASURES

**Cumulative Exposure to Geologic and Seismic Impacts**

**Impact 4.6.6** Implementation of the proposed Project, in combination with existing, approved, proposed, and reasonably foreseeable development, may result in cumulative exposure to geologic and seismic hazards. This is considered a **less than cumulatively considerable impact**.

### *Construction*

Project exposure to geology and soil impacts such as ground shaking, expansive soils, or corrosive soils would be addressed through constructing the Project in accordance with applicable building codes and Project design features as recommended in the Geotechnical Report. Construction phase soil erosion would be controlled on site with site specific measures; a grading plan approved by the County Engineer; implementation of a Dust Control Plan for fugitive dust during construction as required by ICAPCD Regulation VIII (MM 4.4.1a, Section 4.4, Air Quality); compliance with the NPDES Construction General Permit; and compliance with the required Storm Water Pollution Prevention Plan (SWPPP). Construction-phase geology and soils impacts are primarily considered potentially significant short-term, site-specific impacts under CEQA. Therefore, geology and soils impacts are not expected to combine with similar impacts of large scale proposed, approved and reasonably foreseeable renewable energy projects identified in Table 3.0-1 in Chapter 3.0, Introduction to the Environmental Analysis and Assumptions Used. Therefore, the proposed Project would have a less than cumulatively considerable contribution to soil erosion impacts. Likewise, cumulative impacts associated with soil erosion would be **less than cumulatively considerable** during Project construction.

### *Operation*

#### *Ground Shaking*

As discussed above, the Project is located in a seismically active area which would make it susceptible to seismic ground shaking in the event of an earthquake during Project operations and maintenance. Mitigation measure MM 4.6.1 requires structures to be designed and constructed in conformance with the 2010 CBC, 2010 UBC or the standards of care established by the Structural Engineers Association of California and the County of Imperial building requirements. Mitigation measures MM 4.6.1 would apply during final Project design, and prior to and during construction of the proposed Project. Implementation of mitigation measure MM 4.6.1 would reduce the Project's exposure to damage from seismic ground shaking to less than significant during operation and maintenance. Furthermore, ground shaking impacts are site-specific and would not combine with similar impacts of large scale proposed, approved and reasonably foreseeable renewable energy projects identified in Table 3.0-1 in Chapter 3.0, Introduction to the Environmental Analysis and Assumptions Used. The proposed Project would have a less than cumulatively considerable contribution to ground shaking impacts and result in a **less than cumulatively considerable impact** during operation and maintenance of the proposed Project.

#### *Soil Erosion*

Soil erosion would occur during Project operation and maintenance activities. Operation and maintenance-phase soil erosion would be controlled on-site with site-specific measures, compliance with a Dust Control Plan MM 4.4.1a, Section 4.4, Air Quality), and compliance with the Project's SWPPP. Furthermore, soil erosion impacts are site-specific and would not combine with similar impacts of large scale proposed, approved and reasonably foreseeable renewable energy projects identified in Table 3.0-1 in Chapter 3.0, Introduction to the Environmental Analysis and Assumptions Used. Therefore, the proposed Project would have a less than cumulatively considerable contribution to exposure to soil erosion during operations and maintenance. Likewise, a **less than cumulatively considerable** soil erosion impact would occur during operation and maintenance of the proposed Project.

#### *Expansive Soils*

As described under Impact 4.6.3, representative samples of near-surface soils within the solar farm complex site exhibit expansion potentials that are within the Very Low to Low range (Expansion Index from 0 to 50). As such, the solar farm complex site soils are classified as "expansive" as defined in Section 1803.5.3 of the 2010 CBC (PETRA 2012a, p.18). Implementation of mitigation measure MM 4.6.2

would reduce the Project's potential exposure to damage from expansive soils during operations and maintenance to less than significant by requiring that the design foundations and slabs-on-ground be performed in accordance with the procedures outlined in Sections 1808.6.1 and 1808.6.2 of the 2010 CBC and the latest edition of WRI publication "Design of Slab-on-Grade Foundations." Mitigation measures MM 4.6.2 would apply during final Project design, and prior to and during construction of the proposed Project. Furthermore, expansive soil impacts are site-specific and would not combine with similar impacts of large scale proposed, approved and reasonably foreseeable renewable energy projects identified in Table 3.0-1 in Chapter 3.0, Introduction to the Environmental Analysis and Assumptions Used. Therefore, the proposed Project would have a less than cumulatively considerable contribution to exposure to expansive soils. Likewise, a **less than cumulatively considerable** impact regarding expansive soils would occur during operation and maintenance of the proposed Project.

*Septic Systems*

As described under Impact 4.6.4, Project site soils may not be capable of supporting septic system (s) proposed by the Project during operations and maintenance. Mitigation measure MM 4.6.3 would reduce impacts associated with development of an on-site septic system by requiring that additional percolation tests be conducted where leach lines are to be located to ensure proper placement. Alternatively, the septic system may be designed to direct waste streams to an underground tank for storage. Mitigation measure MM 4.6.3 would apply during final Project design, and prior to and during construction of the proposed Project. The capability of the solar farm complex site soils to support a septic system is a site-specific impact and would not combine with similar impacts of large scale proposed, approved and reasonably foreseeable renewable energy projects identified in Table 3.0-1 in Chapter 3.0, Introduction to the Environmental Analysis and Assumptions Used. Therefore, operation and maintenance of the proposed Project would have a less than cumulatively considerable contribution to soil capabilities to support onsite septic systems. Likewise, a **less than cumulatively considerable** impact regarding soil capabilities to support onsite septic systems would occur during operation and maintenance of the proposed Project.

*Corrosive Soils*

Soils containing soluble sulfates, soluble chloride concentrations, or elevated concentrations of soluble salts have the potential to impact concrete and metals during long-term operation of the Project. Contact of such soils with concrete, metals encased in concrete, and metallic elements, can prove damage without proper materials, engineering and protection. Mitigation measures MM 4.6.4a, 4.6.4b and 4.6.4c would require that the Project be designed and engineered to avoid impacts to concrete and metal foundations during operation. Mitigation measures MM 4.6.4a, 4.6.4b and 4.6.4c would apply during final Project design, and prior to and during construction of the proposed Project. Corrosive soils impacts are site-specific and would not combine with similar impacts of large scale proposed, approved and reasonably foreseeable renewable energy projects identified in Table 3.0-1 in Chapter 3.0, Introduction to the Environmental Analysis and Assumptions Used. Therefore, operation and maintenance of the proposed Project would have a less than cumulatively considerable contribution to corrosive soils impacts. Likewise, cumulative impacts associated with corrosive soils would be **less than cumulatively considerable** during operation and maintenance of the proposed Project.

***Reclamation***

As part of the reclamation process, all solar equipment and other on-site facilities (chain link fence, gates, posts and concrete footings, solar generation facilities, electrical switchyard and substation facilities, transmission lines, control/warehouse buildings, water tanks, foundations, septic systems) would be removed and salvaged if economically feasible. However, the IID-owned facilities (IID switchyard and 92 kV transmission line on the Property; 92 kV transmission line with underbuilt 12.5 kV distribution line; 12.5 kV distribution line system constructed on the Property; and the IID Anza Substation modifications) would not be decommissioned until IID determined that these improvements were no longer needed and could be retired and removed. Likewise, the roads constructed on Lot B to access each of the parcels created under the major subdivision and all of the water wells would not be decommissioned or reclaimed. After the solar farm complex site is cleared and contoured, it would be reclaimed to its end state to approximate the existing idle farmland.

Project exposure to geology and soil impacts such as ground shaking, expansive soils, or corrosive soils would be addressed through constructing the Project in accordance with applicable building codes and Project design features as recommended in the Geotechnical Report. During reclamation, all of these facilities would be removed negating any impact associated with future damage caused by ground shaking, expansive soils, or corrosive soils. Construction soil erosion impacts could occur in association with reclamation activities. Erosion is primarily considered potentially significant short term, site specific impact under CEQA. All reclamation activities would implement appropriate fugitive dust control measures consistent with applicable ICAPCD requirements in effect at the time of Project reclamation. Similarly, all reclamation activities would implement appropriate BMPs and other measures consistent with applicable County and RWQCB requirements in effect at the time of Project reclamation. Thus, reclamation activities would result in a **less than cumulatively considerable** contribution to soil erosion impacts. However, if the end reclaimed state of the solar farm complex site as idle farmland was reestablished as active farmland, dust and soil disturbance may be generated similar to levels historically occurring. Dust would be mitigated through required adherence to ICAPCD Rule 800, and soils erosion would be mitigation through adherence to County and RWQCB requirements.

**Mitigation Measures**

As discussed throughout this analysis, the proposed Project would be subject to all applicable building codes and standards including the 2010 CBC (MM 4.6.1) as well as any further engineering requirements set forth in the Final Geotechnical Evaluation (MM 4.6.3). Likewise, the Project would be subject to further engineering with regard to expansive soils (MM 4.6.2) and corrosive soils (MM 4.6.4a, MM 4.6.4b and MM 4.6.4c). Finally, the Project would be required to implement a Dust Control Plan (MM 4.4.1a), comply with the requirements of the SWRCB's Construction General Permit, and prepare and implement a Project-specific SWPPP to address potential soil erosion impacts. Therefore, following mitigation, cumulative geologic and seismic impacts would be reduced to **less than cumulatively considerable**.

**Significance After Mitigation**

Project-specific impacts are mitigated on a project-by-project basis. Upon compliance with mandatory regulatory requirements, and following implementation of mitigation measures MM 4.6.1, MM 4.6.2, MM 4.6.3, and MM 4.6.4a, MM 4.6.4b and MM 4.6.4c, geology and soils impacts would be reduced to **less than cumulatively considerable** levels.

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