3.7 Geology and Soils

This section includes an evaluation of the project in relation to existing geologic and soils conditions within the project site. Information contained in this section is summarized from the *Geotechnical Feasibility Study* prepared by Chambers Group (Appendix F of this EIR) and the *Archaeological and Paleontological Assessment Report for the Brawley Solar Project* prepared by Chambers Group (Appendix E of this EIR).

3.7.1 Existing Conditions

Regional Geology

The project site is located in Imperial County in the Salton Trough geomorphic province of California. The Salton Trough encompasses the Coachella, Imperial and Mexicali Valley which extend from northeast of Palm Springs near San Gorgonio Pass to the Gulf of California. The Imperial Valley is bounded by the Chocolate Mountains to the northeast, the Salton Sea to the north, the Peninsular Ranges to the Southwest, and Mexicali Valley to the south, and is dominated by lacustrine and alluvial sediments. Unexposed succession of Tertiary- and Quaternary-aged sedimentary rocks lie below the alluvial and lake sediments from depths of 11,000 feet or more. Basement rocks consisting of Mesozoic granite and probably Paleozoic metamorphic rocks are estimated to exist at depths between 15,000 and 20,000 feet (Appendix F of this EIR).

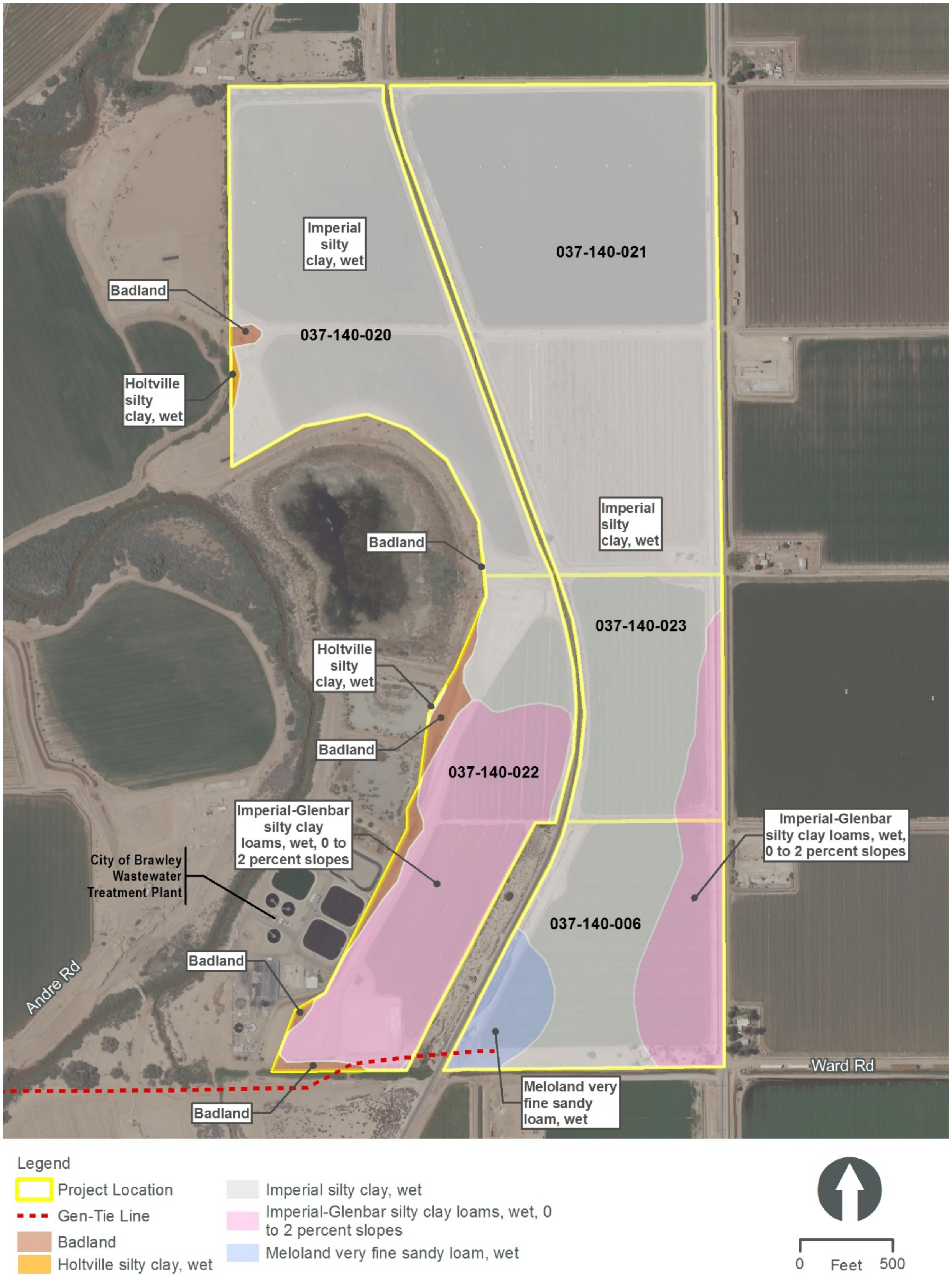
The geologic conditions present within the County contribute to a wide variety of hazards that can result in loss of life, bodily injury, and property damage. The primary seismic hazard at the project site is the potential for strong ground shaking. The Salton Trough is a seismically active area and the Imperial Valley in particular has numerous northwest-treading active faults.

Local Geology and Surface Conditions

The project site is generally within the floodplain of the New River and underlain by Quaternary Lake Deposits. The Western Boundary of the project site which has a descending slope is the former bank of the New River. The surface of the project site is observed to contain a topsoil/tilled horizon related to previous agricultural usage of the project site, and minor amounts of undocumented artificial fill related to the boundary roads and paths, adjacent drainage channels, and the railway that bisects the site. The fill in these areas include local lean, to fat clay derived from the native lake deposits. The dominant geologic unit below the project site is young lake deposits which consist of silts and clays with occasional interbeds of silty sand (Appendix F of this EIR). As shown on Figure 3.7-1, soil series mapped on the project site include:

- 102 Badland
- 110 Holtville silty clay, wet
- 114 Imperial silty clay, wet
- 115 Imperial-Glenbar silty clay loams, wet, 0 to 2 percent slopes
- 122 Meloland very fine sandy loam, wet

Figure 3.7-1. Soils Mapped on the Project Site



Groundwater Conditions

Groundwater was encountered at approximately 42 feet below the existing grade in the western end of the project site, and perched groundwater was encountered at approximately 12 feet below grade in the northeast corner of the site. Within the project site, water is channeled within the drainage ditches and channels along the northern and southern property lines just below surface elevation. Additionally, six geothermal wells are present throughout the site.

Faulting and Seismicity

Earthquakes are the result of an abrupt release of energy stored in the earth. This energy is generated from the forces which cause the continents to change their relative position on the earth's surface, a process called “continental drift.” The earth's outer shell is composed of a number of relatively rigid plates which move slowly over the comparatively fluid molten layer below. The boundaries between plates are where the more active geologic processes take place. Earthquakes are an incidental product of these processes.

Southern California straddles the boundary between two global tectonic plates known as the North American Plate (on the east) and the Pacific Plate (on the west). The main plate boundary is represented by the San Andreas Fault, which extends northwest from the Gulf of California in Mexico, through the desert region of the Imperial Valley, through the San Bernardino region, and into Northern California, where it eventually trends offshore, north of San Francisco (Appendix F of this EIR).

In Southern California, the plate boundary is a complex system of numerous faults known as the San Andreas Fault System that spans a 150-mile-wide zone from the main San Andreas fault in the Imperial Valley westward to offshore of San Diego. As shown in Figure 3.7-2, the closest active faults to the project site include: the Brawley Seismic Zone which is approximately 2.4 miles to the west, the Imperial Fault which is approximate 8.3 miles to the south, the Superstition Hills Fault which is approximately 11.9 miles to the southwest, the Superstition Mountain Fault which is approximately 14.5 miles to the southwest, the Elmore Ranch Fault which is approximately 15.8 miles to the west, and the San Andreas Fault which is 25.5 miles to the northwest (Appendix F of this EIR).

The project site is within an active tectonic area with several significant faults that are capable of producing moderate to strong earthquakes. The Imperial Fault, Superstition Hills Fault, and Superstition Mountain Fault are the three closest faults to the project site. Based on probabilistic analysis from the California Geological survey website, the peak ground acceleration at the project site is estimated to be approximated 0.48g, based on a probability of 10 percent in 50 years (Appendix F of this EIR).

Seismic Ground Shaking

Ground shaking is the byproduct of an earthquake and is the energy created as rocks break and slip along a fault during an earthquake. The amount of ground shaking that an area may be subject to during an earthquake is related to the proximity of the area to the fault, the depth of the hypocenter (focal depth), location of the epicenter and the size (magnitude) of the earthquake. Soil type also plays a role in the intensity of shaking. Bedrock or other dense or consolidated materials are less prone to intense ground shaking than soils formed from alluvial deposition.

As the project site is located in the seismically active southern California region, strong ground shaking can be expected at the project site during moderate to severe earthquakes in the general region.

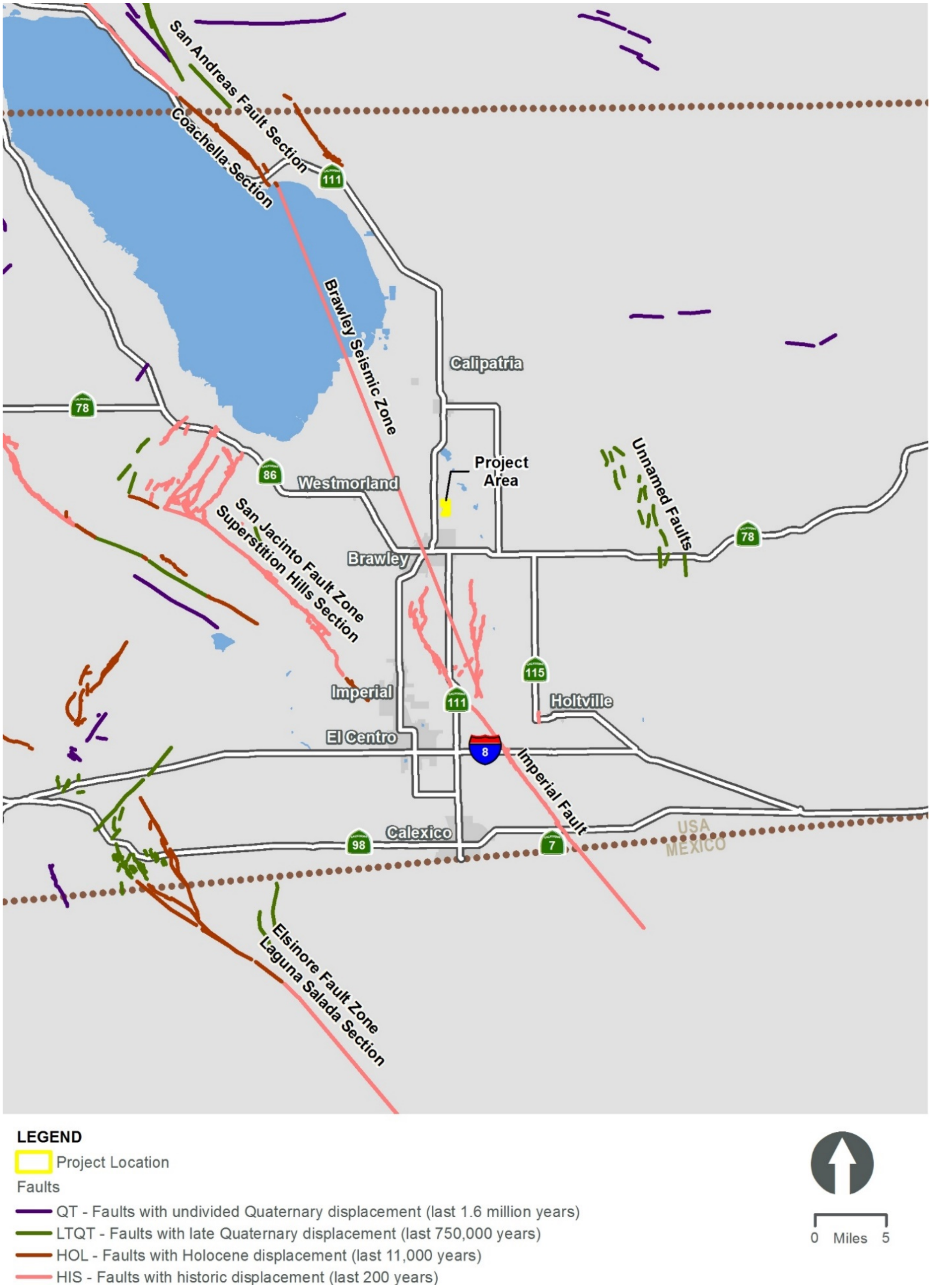
Surface Rupture

Surface rupture occurs when movement along a fault results in actual cracking or breaking of the ground along a fault during an earthquake; however, it is important to note that not all earthquakes result in surface rupture. Surface rupture almost always follows preexisting fault traces, which are zones of weakness. Rupture may occur suddenly during an earthquake or slowly in the form of fault creep. Fault creep is the slow rupture of the earth's crust. Sudden displacements are more damaging to structures because they are accompanied by shaking.

The California Geologic Survey (CGS) established criteria for faults as active, potentially active, and inactive. Active faults are those that show evidence of surface displacement within the last 11,000 years (Holocene age). Potentially active faults are those that demonstrate displacement within the past 1.6 million years (Quaternary age). Faults showing no evidence of displacement within the last 1.6 million years may be, in general, considered inactive for most structures, except for critical structures (Appendix F of this EIR).

In 1972 the Alquist-Priolo Special Studies Earthquake Hazards Act (APEHA) was passed, which required fault studies within 500 feet of active or potentially active faults. The APEHA designates "active" and "potentially active" faults utilizing the same age criteria as that used by the CGS. The project site is not located within a currently mapped APEHA zone. As previously mentioned above, the nearest active major fault is the Brawley Seismic Zone which is approximately 2.4 miles to the west of the project site (Appendix F of this EIR). Based on this distance, the potential for surface fault rupture to occur on the project site is considered low.

Figure 3.7-2. Regional Fault Map



Liquefaction

Liquefaction occurs when granular soil below the water table is subjected to vibratory motions, such as those produced by earthquakes. With strong ground shaking, an increase in pore water pressure develops as the soil tends to reduce in volume. If the increase in pore water pressure is sufficient to reduce the vertical effective stress (suspending the soil particles in water), the soil strength decreases, and the soil behaves as a liquid (similar to quicksand). The factors known to influence liquefaction potential include soil type, relative density, grain size distribution, confining pressure, depth to groundwater, and the intensity and duration of the seismic ground shaking. Liquefaction is most prevalent in loose- to medium-dense, silty, sandy, and gravelly soils below the groundwater table.

The predominate soil type encountered in the borings include fine-grained silts and clays. Based on site observation of the soil encountered during drilling for exploratory borings and the lack of shallow groundwater table, the potential for liquefaction at the project site is considered to be very low. (Appendix F of this EIR).

Landslides

Landslides are the descent of rock or debris caused by natural factors, such as the pull of gravity, fractured or weak bedrock, heavy rainfall, erosion, and earthquakes. The project site has a relatively flat topography; therefore, the potential for landsliding is considered negligible (Appendix F of this EIR). Additionally, according to the County of Imperial General Plan, Seismic and Public Safety Element (County of Imperial 1997a), the project site is not within an area with moderate or low potentials for landslides.

Lateral Spreading

Lateral spreading typically occurs as a form of horizontal displacement of relatively flat lying alluvial material toward an open or “free” face such as an open body of water, channel, or excavation. This movement is generally due to failure along a weak plane, and may often be associated with liquefaction. As cracks develop within the weakened material, blocks of soil displace laterally toward the open face. Cracking and lateral movement may gradually propagate away from the face as blocks continue to break free. Based on the site conditions and gentle to relatively flat topography across the majority of the project site, lateral spreading is considered unlikely (Appendix F of this EIR).

Land Subsidence

Land subsidence is the sinking of the ground surface caused by the compression of earth materials or the loss of subsurface soil because of underground mining, tunneling, or erosion. The major causes of subsidence include fluid withdrawal from the ground, decomposing organics, underground mining or tunneling, and placing large fills over compressible earth materials. The effective stress on underlying soils is increased resulting in consolidation and settlement. Subsidence may also be caused by tectonic processes. Based on the site conditions and gentle to relatively flat topography across the majority of the project site, ground subsidence is considered unlikely (Appendix F of this EIR).

Expansive Soils

Expansive soils are characterized by their ability to undergo significant volume changes (shrink or swell) due to variations in moisture content. Changes in soil moisture content can result from precipitation, landscape irrigation, utility leakage, roof drainage, perched groundwater, drought, or other factors and may result in unacceptable settlement or heave of structures. Expansive soils are known to be present throughout the Imperial Valley and based on preliminary laboratory testing, medium to highly expansive soils were encountered within the upper 5 feet of the project site. As previously stated, the project site is predominately underlain by fine-grained silts and clays. Generally, sands are considered not expansive while soils and clays may exhibit moderate to high expansion potential due to variation in moisture content (Appendix F of this EIR).

Collapsible Soils

Collapsible soil is generally defined as soil that will undergo a sudden decrease in volume and its internal support is lost under applied loads when water is introduced into the soil. The internal support is considered to be a temporary strength and is derived from a number of sources including capillary tension, cementing agents, e.g. iron oxide and calcium carbonate, clay-welding of grains, silt bonds, clay bonds and clay bridges. Soils found to be most susceptible to collapse include loess (fine grained wind-deposited soils), valley alluvium deposited within a semi-arid to arid climate, and residual soil deposits. It is unknown whether collapsible soils are present on the project site.

Corrosive Soils

Corrosive soils can damage underground utilities including pipelines and cables, or weaken roadway structures. Based on screening tests conducted on a representative sample of near surface soils, severely corrosive soils to both concrete material and metallic elements are present (Appendix F of this EIR).

Paleontological Resources

Paleontological resources (fossils) are the remains of prehistoric plant and animal life. Fossil remains, such as bones teeth, shell, and wood, are found in geologic deposits (rock formations) within which they were originally buried. Many paleontological fossil sites are recorded in Imperial County and have been discovered during construction activities. Paleontological resources are typically impacted when earthwork activities, such as mass excavation cut into geological deposits (formations) with buried fossils.

Late Pleistocene to Holocene Lake Cahuilla deposits exposed and/or underlying the proposed project area consist of dark brown to gray, silty clays interpreted as freshwater lacustrine; and, in drainages where exposed, these same sediments are interbedded with finer to medium sands containing pebbles. The Lake Cahuilla Beds have yielded well-preserved subfossil remains of freshwater clams and snails and sparse remains of freshwater fish. The paleontological resources of the Lake Cahuilla Beds are considered significant because of the paleoclimatic and palaeoecological information they can provide, and these deposits are therefore assigned a high paleontological potential. Therefore, although no paleontological resources were discovered during the survey within exposed cuts, the site does have paleontological sensitivity, with high potential for paleontological resource discovery (Appendix E of this EIR).

3.7.2 Regulatory Setting

This section identifies and summarizes laws, policies, and regulations that are applicable to the project.

Federal

Earthquake Hazards Reduction Act

The Earthquake Hazards Reduction Act was enacted in 1977 to "reduce the risks to life and property from future earthquakes in the United States through the establishment and maintenance of an effective earthquake hazards and reduction program." To accomplish this, the Act established the National Earthquake Hazards Reduction Program (NEHRP). This program was significantly amended in November 1990 by NEHRP, which refined the description of agency responsibilities, program goals, and objectives.

NEHRP's mission includes improved understanding, characterization, and prediction of hazards and vulnerabilities; improvement of building codes and land use practices; risk reduction through post-earthquake investigations and education; development and improvement of design and construction techniques; improvement of mitigation capacity; and accelerated application of research results. The NEHRP designates the Federal Emergency Management Agency as the lead agency of the program and assigns it several planning, coordinating, and reporting responsibilities. Programs under NEHRP help inform and guide planning and building code requirements such as emergency evacuation responsibilities and seismic code standards such as those to which the project would be required to adhere.

State

Alquist-Priolo Special Studies Earthquake Hazards Act

The APEHA was passed into law following the destructive February 9, 1971 San Fernando earthquake. The APEHA provides a mechanism for reducing losses from surface fault rupture on a statewide basis. The intent of the APEHA is to ensure public safety by prohibiting the siting of most structures for human occupancy across traces of active faults that constitute a potential hazard to structures from surface faulting or fault creep. The state geologist (Chief of the California Division of Mines and Geology) is required to identify "earthquake fault zones" along known active faults in California. Counties and cities must withhold development permits for human occupancy projects within these zones unless geologic studies demonstrate that there would be no issues associated with the development of projects. The project site is not located within a currently mapped APEHA zone.

California Building Code

The California Building Standards Commission is responsible for coordinating, managing, adopting, and approving building codes in California. CCR Title 24 is reserved for state regulations that govern the design and construction of buildings, associated facilities, and equipment, known as building standards. The California Building Code (CBC) is based on the Federal Uniform Building Code used widely throughout the country (generally adopted on a state-by-state or district-by-district basis). The California Health and Safety Code (HSC) Section and 18980 HSC Section 18902 give CCR Title 24 the name of California Building Standards Code. The updates to the 2019 California Building Standards Code were published on January 1, 2021, with an effective date of July 1, 2021.

Local

County of Imperial 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 regulations, 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.

County of Imperial General Plan

The County of Imperial General Plan, Seismic and Public Safety Element identifies potential natural and human-induced hazards and provides policy to avoid or minimize the risk associated with hazards. The Seismic and Public Safety Element identifies 'lifelines and critical facilities' whose disruption could endanger the public safety. Lifelines are defined as networks of services that extend over a wide area and are vital to the public welfare, and can be classified into four categories: energy, water, transportation, and communications. The IID has a formal Disaster Readiness Standard Operating Procedure for the Water Department, Power Department, and the entire District staff for response to earthquakes and other emergencies.

Table 3.7-1 analyzes the consistency of the project with specific policies contained in the County of Imperial General Plan associated with geology, soils, and seismicity. 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 3.7-1. Project Consistency with Applicable General Plan Policies

General Plan Policies	Consistency with General Plan	Analysis
Seismic and Public Safety Element		
Goal 1. Include public health and safety considerations in land use planning.	Consistent	Division 15 of the County Land Use Ordinance has established procedures and standards for development within earthquake fault zones. Per County regulations, construction of buildings intended for human occupancy which are located across the trace of an active fault are prohibited. 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. Since the project site is located in a seismically active area, the project is required to be designed in accordance with the CBC for near source factors derived from a design basis earthquake based on a peak ground acceleration of 0.48 gravity. It should be noted
Objective 1.1. Ensure that data on geological hazards is incorporated into the land use review process, and future development process.		
Objective 1.3. Regulate development adjacent to or near all mineral deposits and geothermal operations.		
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.		

Table 3.7-1. Project Consistency with Applicable General Plan Policies

General Plan Policies	Consistency with General Plan	Analysis
Objective 1.7. Require developers to provide information related to geologic and seismic hazards when siting a proposed project.		that, the project would be remotely operated and would not require any habitable structures on site. In considering these factors in conjunction with mitigation requirements outlined in the impact analysis, the risks associated with seismic hazards would be minimized. A preliminary geotechnical study has been prepared for the proposed project. The preliminary geotechnical study has been referenced in this environmental document. Additionally, a design-level geotechnical investigation will be conducted to evaluate the potential for site specific hazards associated with seismic activity.
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.		
Objective 2.2. Reduce risk and damage due to seismic hazards by appropriate regulation.		
Objective 2.5 Minimize injury, loss of life, and damage to property by implementing all state codes where applicable.		
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.		

Source: County of Imperial 1997

3.7.3 Impacts and Mitigation Measures

This section presents the significance criteria used for considering project impacts related to geologic and soil conditions, the methodology employed for the evaluation, an impact evaluation, and mitigation requirements, if necessary.

Thresholds of Significance

Based on CEQA Guidelines Appendix G, project impacts related to geology and soils are considered significant if any of the following occur:

- Directly or indirectly cause potential substantive adverse effects, including the risk of loss, injury, or death involving:
  - Rupture of a known earthquake fault, as delineated on the most recent AP 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)
  - Strong seismic ground shaking
  - Seismic related ground failure, including liquefaction
  - 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 18-1-B of the Uniform Building Code (1994), creating substantial direct or indirect 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 waste water
- Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature

Methodology

This analysis evaluates the potential for the project, as described in Chapter 2, Project Description, to interact with local geologic and soil conditions, as well as paleontological resources on the project site. A *Geotechnical Feasibility Study* prepared by Chambers Group (Appendix F of this EIR) and *Archaeological and Paleontological Assessment Report for the Brawley Solar Project* prepared by Chambers Group (Appendix E of this EIR) was prepared for the project. The information obtained from these studies were reviewed and summarized to present the existing geologic and soil conditions on the project site. This analysis considers whether these conditions would result in an exceedance of one or more of the applied significance criteria as identified above.

Impact Analysis

Impact 3.7-1 Would the project directly or indirectly cause potential substantive adverse effects, including the risk of loss, injury, or death involving:

Rupture of a known earthquake fault, as delineated on the most recent AP 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)?

As previously discussed above, the project site is located in the seismically active Imperial Valley of southern California with several mapped faults of the San Andreas Fault System traversing the region. As shown in Figure 3.7-2, the project site is not located on an active fault. Furthermore, no portion of the project site is within or near a designated APEHA zone, and, therefore, the potential for ground rupture to occur within the project site is considered unlikely. As such, the probability of surface fault rupture within the project site during construction and operation is considered low and the project would not increase or exacerbate existing hazards related to fault rupture. The proposed project would not directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury or death involving rupture of a major fault as delineated on the most recent Alquist-Priolo Fault Zoning map. This impact would be less than significant.

Mitigation Measure(s)

No mitigation measures are required.

Impact 3.7-2 Would the project directly or indirectly cause potential substantive adverse effects, including the risk of loss, injury, or death involving:

Strong seismic ground shaking?

As previously discussed above, the closest mapped fault to the project site is the Brawley Seismic Zone which is approximately 2.4 miles to the west. In the event of an earthquake along this fault or another regional fault, seismic hazards related to ground motion could occur in susceptible areas within the project site. The intensity of such an event would depend on the causative fault and the distance to the epicenter, the moment magnitude, and the duration of shaking.

Even with the integration of building standards that are designed to resist the effects of strong ground motion, ground shaking within the project site could cause some structural damage to the facility structures or, at least, cause unsecured objects to fall. During a stronger seismic event, ground shaking could result in structural damage or collapse of electrical distribution facilities. Given the potentially hazardous nature of the project facilities, the potential impact of ground motion during an earthquake is considered a significant impact, as proposed structures, such as the substation and transmission lines could be damaged. However, the proposed project would be constructed in accordance with the applicable geotechnical and seismic design standards as well as the site-specific design recommendations in the final geotechnical report per Mitigation Measure GEO-1; and upon operation, the project would not result in any significant changes related to the risk of seismic hazards on the project site when compared to existing conditions, nor would project operation increase or exacerbate the potential for strong seismic ground shaking to occur. Impacts would be less than significant.

Mitigation Measure(s)

GEO-1 **Prepare Geotechnical Report(s) as Part of Final Engineering for the Project and Implement Required Measures.** Facility design for all project components shall comply with the site-specific design recommendations as provided by a licensed geotechnical or civil engineer to be retained by the project applicant. The final geotechnical and/or civil engineering report shall address and make recommendations on the following:

- Site preparation
- Soil bearing capacity
- Appropriate sources and types of fill
- Potential need for soil amendments
- Structural foundations
- Grading practices
- Soil corrosion of concrete and steel
- Erosion/winterization
- Seismic ground shaking
- Liquefaction

- Expansive/unstable soils

In addition to the recommendations for the conditions listed above, the geotechnical investigation shall include subsurface testing of soil and groundwater conditions, and shall determine appropriate foundation designs that are consistent with the version of the CBC that is applicable at the time building and grading permits are applied for. All recommendations contained in the final geotechnical engineering report shall be implemented by the project applicant. The final geotechnical and/or civil engineering report shall be submitted to Imperial County Public Works Department, Engineering Division for review and approval prior to issuance of building permits.

Significance after Mitigation

With implementation of Mitigation Measure GEO-1, potential impacts associated with strong seismic ground shaking would be reduced to a level less than significant with the implementation of recommendations made by a licensed geotechnical engineer in compliance with the CBC prepared as part of a formal geotechnical investigation.

Impact 3.7-3 Would the project directly or indirectly cause potential substantive adverse effects, including the risk of loss, injury, or death involving:

Seismic related ground failure, including liquefaction?

As previously discussed above, the factors known to influence liquefaction potential include soil type, relative density, grain size distribution, confining pressure, depth to groundwater, and the intensity and duration of the seismic ground shaking. Liquefaction is most prevalent in loose- to medium-dense, silty, sandy, and gravelly soils below the groundwater table.

The predominate soil type encountered in the borings include fine-grained silts and clays. Based on site observation of the soil encountered during drilling for exploratory borings, the potential for liquefaction at the project site is considered to be very low (Appendix F of this EIR). However, given that the project site is underlain by fine-grained silts and clays, there is a potential for liquefaction to occur on the project site. Additional geotechnical investigation would be required in order to assess the risk of liquefaction on the project site. The potential impact on liquefaction is considered a significant impact. Implementation of Mitigation Measure GEO-1, which requires the preparation of a design-level geotechnical report, would reduce the potential impact associated with liquefaction to a level less than significant.

Mitigation Measure(s)

No additional mitigation measures beyond Mitigation Measure GEO-1 are required.

Significance after Mitigation

With implementation of Mitigation Measure GEO-1, potential impacts associated with seismic ground failure such as liquefaction would be reduced to a level less than significant with the implementation of recommendations made by a licensed geotechnical engineer in compliance with the CBC prepared as part of a formal geotechnical investigation.

Impact 3.7-4 Would the project directly or indirectly cause potential substantive adverse effects, including the risk of loss, injury, or death involving:

Landslides?

Along the western boundary of the project site, there is a descending slope where there is a potential for general slope instability. The southern portion of this slope does appear to have been recently graded while the northern portion appears to be natural and in a somewhat over-steepened condition. Minor slumping was also observed within localized areas of this natural descending slope, as well as several areas that were heavily eroded. However, as stated above, the project site has a relatively flat topographic gradient to the north, east, and west of the site; and runoff water is allowed to freely drain over the top of the observed slope. Based on these factors the potential for a landslide is considered negligible (Appendix F of this EIR). Therefore, the project would not directly or indirectly cause potential substantive adverse effects, including the risk of loss, injury, or death involving landslides and no impact would occur.

Mitigation Measure(s)

No mitigation measures are required.

Impact 3.7-5 Would the project result in substantial soil erosion or the loss of topsoil?

During the site grading and construction phases, large areas of unvegetated soil would be exposed to erosive forces by water for extended periods of time due to ICAPCD dust suppression requirements. Unvegetated soils are much more likely to erode from precipitation than vegetated areas because plants act to disperse, infiltrate, and retain water. Construction activities will involve demolition and grubbing, grading of the project site to establish access roads and pads for electrical equipment, trenching for underground electrical collection lines, and the installation of solar equipment and security fencing which could result in increased erosion and sedimentation to surface waters. Construction could produce sediment-laden stormwater runoff (nonpoint source pollution), a major contributor to the degradation of water quality. If precautions are not taken to contain contaminants, construction-related erosion impacts are considered a significant impact.

As provided in Mitigation Measure GEO-1, during final engineering for the project, a design-level geotechnical study would identify appropriate measures for the project related to soil erosion. In addition, as part of Mitigation Measure HYD-1 provided in Section 3.10 Hydrology/Water Quality, potential impacts from erosion during construction activities would be reduced to a level less than significant with the preparation of a SWPPP for sediment and erosion control and implementation of BMPs to reduce erosion from the construction site.

The project is not expected to result in substantial soil erosion or the loss of topsoil over the long term. The project applicant would be required to implement on-site erosion control measures in accordance with County standards, which require the preparation, review, and approval of a grading plan by the County Engineer. Therefore, with implementation of Mitigation Measure GEO-1 and Mitigation Measure HYD-1 identified in Section 3.10 Hydrology/Water Quality, impacts from construction-related erosion would be reduced to a level less than significant.

Mitigation Measure(s)

No additional mitigation measures beyond Mitigation Measure GEO-1 and Mitigation Measure HYD-1 are required.

Significance after Mitigation

With implementation of Mitigation Measure GEO-1 and Mitigation Measure HYD-1 in Section 3.10 Hydrology/Water Quality, potential impacts from erosion during construction activities would be reduced to a level less than significant with the preparation of a SWPPP and implementation of BMPs to reduce erosion from the construction site.

Impact 3.7-6 Would the project 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?

Based on the site conditions and gentle to relatively flat topography across the majority of the project site, lateral spreading is considered unlikely. However, additional geotechnical investigation would be required in order to assess the risk of lateral spreading to occur on the project site. The potential impact associated with lateral spreading is considered a significant impact.

The general project area is not experiencing subsidence which it typically attributed to the extraction of groundwater. The proposed project facility is not expected to exacerbate or otherwise trigger significant subsidence; however, there are six geothermal wells on the project site that could potentially result in subsidence if large quantities of ground water are extracted, lowering the water table. Therefore, further geotechnical investigation would be required in order to address the issue of potential subsidence related to the operation of these geothermal wells. The potential impact associated with lateral spreading is considered a significant impact.

As described above, given that the project site is predominately underlain by fine-grained silts and clays and based on site observation of the soil encountered during drilling for exploratory borings and the lack of shallow groundwater table, the potential for liquefaction at the project site is considered to be very low. Additional geotechnical investigation would be required in order to assess the risk of liquefaction on the project site. The potential impact on liquefaction is considered a significant impact.

It is unknown whether collapsible soils are present on the project site. Additional geotechnical investigation would be required in order to assess the risk of collapsible soils to occur on the project site. The potential impact associated with collapsible soils is considered a significant impact.

Implementation of Mitigation Measure GEO-1, which requires the preparation of a design-level geotechnical report, would reduce the potential impacts associated with lateral spreading, liquefaction, and collapsible soils to a level less than significant.

Mitigation Measure(s)

No additional mitigation measures beyond Mitigation Measure GEO-1 are required.

Significance after Mitigation

With implementation of Mitigation Measure GEO-1, potential impacts associated with lateral spreading, liquefaction, and collapsible soils would be reduced to a level less than significant with the implementation of recommendations made by a licensed geotechnical engineer in compliance with the CBC prepared as part of a formal geotechnical investigation.

Impact 3.7-7 Would the project be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial direct or indirect risks to life or property?

As stated above, expansive soils are characterized by their ability to undergo significant volume changes (shrink or swell) due to variations in moisture content. Changes in soil moisture content can result from precipitation, landscape irrigation, utility leakage, roof drainage, perched groundwater, drought, or other factors and may result in unacceptable settlement or heave of structures. The project site is predominately underlain by fine-grained silts and clays. According to Section 1803.5.3 of the 2010 CBC, these soils should be considered “expansive.” Further, based on preliminary laboratory testing, medium to highly expansive soils were encountered within the upper 5 feet of the project site.

Therefore, unless properly mitigated, shrink-swell soils could exert additional pressure on buried structures and electrical connections producing shrinkage cracks that could allow water infiltration and compromise the integrity of backfill material. These conditions could be worsened if structural facilities are constructed directly on expansive soil materials. This potential impact would be significant as structures could be damaged by these types of soils.

Additionally, based on screening tests conducted on a representative sample of near surface soils, it was found that the soils contain a water-soluble sulfate content of 0.27 percent; therefore, a severe exposure to sulfates may be expected for concrete placed in contact with soil materials. Careful control of water-cement ratio and concrete compressive strength will be necessary in order to provide proper resistance again concrete deteriorate from sulfates. Further, the on-site soils, particularly clay/silty clay, are severely corrosive to ferrous metals and copper and can damage underground utilities including pipelines and cables or weaken roadway structures. Therefore, any ferrous metal or copper components of proposed project features that would be buried in direct contact with the site’s soil would also need to be protected against detrimental effects of severely corrosive soil materials. A site-specific geotechnical investigation would be required at the project site to determine the extent and effect of problematic soils which have been identified during preliminary laboratory screenings of near surface on-site soils. Implementation of Mitigation Measure GEO-1, which requires the preparation of a design-level geotechnical report, would reduce potential impacts associated with expansive and corrosive soils to a level less than significant.

Mitigation Measure(s)

No additional mitigation measures beyond Mitigation Measure GEO-1 are required.

Impact 3.7-8 Would the project 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 waste water?

The proposed project would not require an operations and maintenance building. The proposed solar facility would be remotely operated, controlled and monitored and with no requirement for daily on-site employees. Therefore, no septic or other wastewater disposal systems would be required for the project and no impact would occur.

Mitigation Measure(s)

No mitigation measures are required.

Impact 3.7-9 Would the project directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?

The Lake Cahuilla Beds have yielded well-preserved subfossil remains of freshwater clams and snails and sparse remains of freshwater fish. The paleontological resources of the Lake Cahuilla Beds are considered significant because of the paleoclimatic and palaeoecological information they can provide, and these deposits are therefore assigned a high paleontological potential. Therefore, the project site is considered to be paleontologically sensitive with a high potential for paleontological resource discovery (Appendix E of this EIR). Project construction has the potential to unearth and/or potentially destroy previously undiscovered paleontological resources. This potential impact is considered a significant impact. However, implementation of Mitigation Measures GEO-2, through GEO-7 would reduce the potential impact on paleontological resources to a level less than significant.

Mitigation Measure(s)

GEO-2 **Paleontological Mitigation and Monitoring Plan.** Once a geotechnical report has been completed for the project, a qualified paleontologist shall review the boring logs and determine how deep paleontologically sensitive formations may be across the project site. The paleontologist shall use this information along with the results of the paleontological survey to determine if paleontological monitoring is warranted. If monitoring is warranted, a qualified paleontologist shall prepare a mitigation and monitoring plan to be implemented during project construction.

GEO-3 **Paleontological Monitoring.** Prior to construction, the project applicant shall retain the services of a Qualified Paleontologist and require that all initial ground-disturbing work be monitored by someone trained in fossil identification in monitoring contexts. A Supervising Paleontological Specialist and a Paleontological Monitor, to be retained by the project applicant, will be required to be present at the project construction phase kickoff meeting.

GEO-4 **Worker Awareness Program.** Prior to any ground disturbance, the Supervising Paleontological Resources Specialist and Paleontological Resources Monitor shall conduct initial Worker Environmental Awareness Program (WEAP) training to all construction personnel, including supervisors, present at the outset of the project construction work phase, for which the Lead Contractor and all subcontractors shall make their personnel available. This WEAP training will educate construction personnel on how to work with the monitor(s) to identify and minimize impacts to paleontological resources and maintain environmental compliance and be performed periodically for new personnel coming on to the project as needed.

GEO-5 **Schedule of Ground-Disturbing Activities.** During construction, the construction contractor shall provide the Supervising Paleontological Resources Specialist with a schedule of initial potential ground-disturbing activities. A minimum of 48 hours will be provided of commencement of any initial ground-disturbing activities such as vegetation grubbing or clearing, grading, trenching, or mass excavation.

As detailed in the schedule provided, a Paleontological Monitor shall be present on site at the commencement of ground-disturbing activities related to the project. The monitor, in consultation with the Supervising Paleontologist, shall observe initial ground-disturbing activities and, as they proceed, make adjustments to the number of monitors as needed to provide adequate observation and oversight. All monitors will have stop-work authority to allow for recordation and evaluation of finds during construction. The monitor will maintain a daily record of observations to serve as an ongoing reference resource and to provide a resource for final reporting upon completion of the project.

The Supervising Paleontologist, Paleontological Monitor, and the Lead Contractor and subcontractors shall maintain a line of communication regarding schedule and activity such that the monitor is aware of all ground-disturbing activities in advance in order to provide appropriate oversight.

GEO-6 **Discovery of Paleontological Resources.** During construction, if paleontological resources are discovered, construction shall be halted within 50 feet of any paleontological finds and shall not resume until a Qualified Paleontologist can determine the significance of the find and/or the find has been fully investigated, documented, and cleared.

GEO-7 **Paleontological Resources Monitoring Report.** At the completion of all ground-disturbing activities, the Supervising Paleontological Specialist shall prepare a Paleontological Resources Monitoring Report summarizing all monitoring efforts and observations, as performed, and any and all paleontological finds.

Significance after Mitigation

Implementation of Mitigation Measures GEO-2 through GEO-7 would reduce the potential impact on paleontological resources to a level less than significant. In the event that unanticipated paleontological resources or unique geologic resources are encountered during ground-disturbing activities, work must cease within 50 feet of the discovery and a paleontologist shall be hired to assess the scientific significance of the find.

3.7.4 Decommissioning/Restoration and Residual Impacts

Decommissioning/Restoration

If at the end of the PPA term, no contract extension is available for a power purchaser, no other buyer of the energy emerges, or there is no further funding of the project, the project will be decommissioned and dismantled. Decommissioning and restoration of the project site at the end of its use as a solar facility would involve the removal of structures and restoration to prior (pre-solar project) conditions. No geologic or soil impacts associated with the restoration activities would be anticipated, and, therefore, no impact is identified.

No impact is anticipated from restoration activities as the ground disturbance and associated impacts on paleontological resources will have occurred during the construction phase of the project.

Residual

With implementation of Mitigation Measure GEO-1, impacts related to strong seismic ground shaking, liquefaction, lateral spreading, collapsible soils, expansive soils, and corrosive soils would be reduced to a level less than significant. With implementation of Mitigation Measure GEO-1 and Mitigation Measure HYD-1 in Section 3.10 Hydrology/Water Quality, potential impacts from erosion during construction activities would be reduced to a level less than significant. Implementation of Mitigation Measures GEO-2 through GEO-7 would reduce the potential impact on paleontological resources to a level less than significant. The project would not result in residual significant and unmitigable impacts related to geology and soil resources.

This page is intentionally blank.