5.5 Geologic Hazards and Resources

This section discusses the potential effects of the Blythe Solar Power Project (BSPP or Project) on geologic resources and the potential geologic hazards that the Project may encounter. It begins with identification of applicable laws, ordinances, regulations, and standards (LORS), describes existing environmental conditions, assesses Project impacts, and identifies mitigation measures needed to avoid or reduce adverse impacts.

The geologic hazards and resources presented in the following pages is intended to support compliance by the California Energy Commission (CEC) with the requirements of the California Environmental Quality Act (CEQA), and by the Bureau of Land Management (BLM) with the requirements of the National Environmental Policy Act (NEPA). The two agencies are conducting a joint review of the Project and a combined CEQA/NEPA document will be prepared.

Summary

The Project would not have significant adverse impacts on geologic hazards or resources. No major unique geologic or physical features have been identified in the Project area. No active fault zones are present within the Project boundaries or within a 1.5-mile radius of the site. The Project site is located in Seismic Zone 3, the second highest seismic activity zone. All Project structures will be designed to meet the seismic design standards established for Seismic Zone 3. Geotechnical investigations are being performed at present to provide additional data regarding site conditions to support the design of foundations of Project structures and other elements of site development; the results of these investigations will be provided when available. Additional geotechnical investigations are expected in support of detailed design.

Evidence of ground subsidence (e.g., fractures possibly caused by historic groundwater extraction) has not been noted at the Project site, although the site is in an area considered to be susceptible to subsidence. Given the high historic use of local groundwater resources for agricultural development near the Project vicinity (although not on the site) with no subsidence reported, it is not anticipated that the Project’s limited pumping program will induce subsidence below the site due to groundwater pumping. Although seismically induced subsidence can occur at the site due to soil conditions, adherence to the recommendations of Project geotechnical investigations would mitigate these hazards to a less-than-significant level.

5.5.1 LORS Compliance

This section addresses the LORS applicable to geologic hazards and resources that are relevant to the BSPP. Table 5.5-1 summarizes these LORS.

Table 5.5-1 Summary of Applicable Geological Resources and Hazards LORS

LORS	Applicability	Where Discussed in AFC
Federal:		
Uniform Building Code (UBC)	The Uniform Building Code specifies acceptable design criteria for structures and excavations with respect to seismic design and load bearing capacity.	Section 5.5.2
State:		
California Building Code (CBC)	Specifies acceptable design criteria for structures and excavations with respect to seismic design and load bearing capacity.	Section 5.5.2
Alquist-Priolo Earthquake Fault Zoning Act	Identifies areas subject to surface rupture from active faults.	Sections 5.5.2 and 5.5.3
The Seismic Hazards Mapping Act: Title 14 California Code of Regulations (CCR) Division 2, Chapter 8, Subchapter 1, Article 10.	Identifies non-surface fault rupture earthquake hazards, including liquefaction and seismically induced landslides.	Sections 5.5.2 and 5.5.3
Local:		
Riverside County Implementation of the Alquist-Priolo Earthquake Fault Zoning Act (Ordinance 547)	Geologic report required for permitted projects within designated zones.	Sections 5.5.2 and 5.5.3
Riverside County Grading Code	Riverside County requires a grading permit when at least 50 cubic yards of earth is cut, filled, or imported on a site.	Section 5.5.1
Riverside County Floodplain Management (Ordinance 458.13)	Riverside County requires a development permit prior to any construction or other development within any area of special flood hazards and requires that flood capacity of any altered watercourse be maintained.	Section 5.5.1

5.5.1.1 Federal LORS

The Uniform Building Code specifies acceptable design criteria for structures with respect to seismic design and load bearing capacity. The State has adopted these provisions in the CBC, discussed below.

5.5.1.2 State LORS

The Project is subject to the applicable sections of the CBC, which is administered by the California Building Standards Commission. The Riverside County Building Department is responsible for implementing the CBC for the Project.

Alquist-Priolo Earthquake Fault Zoning Act

The Alquist-Priolo (AP) Earthquake Fault Zoning Act was enacted by the State of California in 1972 to mitigate the hazard of surface faulting to structures planned for human occupancy and other critical structures. This law was a direct result of the 1971 San Fernando Earthquake, which was associated with extensive surface fault ruptures that damaged numerous homes, commercial buildings, and other structures. The State has established regulatory zones (known as Earthquake Fault Zones and often referred to as "AP zones") around the surface traces of active faults and has issued "Earthquake Fault Zone Maps" to be used by government agencies in planning and reviewing new construction. In addition to residential projects, structures planned for human occupancy that are associated with industrial and commercial projects are of concern.

Seismic Hazards Mapping Act

The purpose of the Seismic Hazards Mapping Act is to protect public safety from the effects of strong ground shaking, liquefaction, landslides, or other ground failure, and other hazards caused by earthquakes. The program and actions mandated by the Seismic Hazards Mapping Act closely resemble those of the Alquist-Priolo Earthquake Fault Zoning Act, which addresses only surface fault-rupture hazards.

5.5.1.3 Local LORS

The Project is subject to the Riverside County's Department of Building and Safety requirements for building, grading, and flood development permits. The flood development permit is for development in areas within special flood hazards. The Riverside County Grading Code requires a grading permit for earth-moving activities exceeding 50 cubic yards.

The Riverside County Floodplain Management Ordinance requires that if a watercourse is to be altered or relocated, adjacent communities and the California Department of Water Resources must be notified prior to such alteration or relocation of a watercourse, and evidence of such notification must be submitted to the Federal Insurance Administration and Federal Emergency Management Agency. The ordinance also requires that the flood carrying capacity of the altered or relocated portion of said watercourse be maintained.

5.5.1.4 Involved Agencies

The agency and person(s) to contact for grading, building, National Pollutant Discharge Elimination System (NPDES), and floodplain development permits are identified in Table 5.5-2.

Table 5.5-2 Agencies and Agency Contacts

Agency Contact	Phone/E-mail	Permit/Issue
John Carmona Water Resources Control Engineer Colorado River Basin RWQCB Palm Desert Office 73-720 Fred Waring Dr., Suite 100 Palm Desert, CA 92260	(760) 340-4521 JCarmona@waterboards.ca.gov	Waste Discharge Requirements (WDR), NPDES and Storm Water Permits, CWA 401
Scott Arnold Riverside County Planning Department 4080 Lemon Street Riverside, CA 92502-1629	(951) 955-1852 sarnold@rctlma.org	Large scale (non-residential) grading permits, flood hazard areas permit

5.5.1.5 Required Permits and Permit Schedule

Building and grading permits are required by the Riverside County Engineering and Survey Services Department, Building Inspections Division. Applications are required at least six weeks prior to construction. Table 5.5-3 discusses such permits.

Table 5.5-3 Permits Required and Permit Schedule

Permit/Approval	Schedule
Building permit	Application must be submitted six weeks prior to the start of construction.
Grading permit	Application must be submitted six weeks prior to the start of construction.
Floodplain development permit	Application must be submitted six weeks prior to the start of construction.

5.5.2 Affected Environment

This section discusses the existing geologic environment of the BSPP site. Underlying geologic structures, seismicity, and geologic hazards are discussed.

5.5.2.1 Geological Setting

The BSPP site is located in the northwestern Colorado Desert, which is part of the greater Colorado Desert Geomorphic Province. The Colorado Desert Province is characterized by isolated mountain ranges separated by broad alluvium-filled basins of Cenozoic sedimentary and volcanic materials overlying older rocks (Norris and Webb 1990). The flood plain of the Colorado River forms the east margin of the area. The structural geology of the area is dominated by deformations associated with historic tectonic activity and recent and historical alluvial deposits associated with the Colorado River and the local mountain erosion patterns. Much of the Colorado Desert lies at low elevations, with some areas below sea level. The Colorado Desert province includes the Salton Sea, the Imperial Valley in the south, and the Coachella Valley in the north (Norris and Webb 1990).

The Project is located in the alluvial-filled basin of the Palo Verde Mesa. The geology of this area is shown on Figure 5.5-1, Regional Geology of the Blythe Solar Power Project. The basin is bound by the McCoy Mountains to the west, the Little Maria Mountains to the northwest, and the Big Maria Mountains to the northeast. This area has a generally low relief until near the surrounding mountains. Approximately 3 miles east of the eastern site boundary, a sharp break in slope forms the boundary between the Palo Verde Mesa and the Palo Verde Valley, which is 80 to 130 feet below the mesa. In the region, the Palo Verde Valley is roughly equivalent to the recent historic floodplain of the Colorado River.

Regionally, this valley formed as a result of regional deformation and metamorphism, followed by faulting, local volcanism, and sedimentation during the early Tertiary (CH2MHill 2008). Beginning in Miocene and continuing into the Holocene, alluvial fans formed on the flanks of the surrounding mountains. Alluvial plains occur in the central portion of the valleys along with more recent outwash associated with local drainage. These younger alluvial sediments are generally subdivided based on morphology. Locally, the Project site is underlain by Quaternary Alluvium and Jurassic metasediments (CH2MHill 2008).

Regionally, the ground surface slopes gently downward in a southeast direction at a gradient of less than one percent. Topography at the BSPP site slopes gently away from the McCoy Mountains from the west to the southeast. Site grades typically range from 0.4 percent in the central and western portions of the site to 0.8 percent in the southeastern portion of the site (CH2MHill 2008). Steeper grades (10 to 15 percent) are present along the western side of the unnamed mound in Sections 5, 6, and 7 (T06S R22E). Ground surface elevations at the plant site range from 830 feet above mean sea level (msl) in the west to 410 feet above msl in the east (United State Geological Survey [USGS] 1975, 1983 and Towill 2009).

Surface water in Palo Verde Mesa drains to the southeast and towards the Colorado River. At the Project site, numerous dry washes occur on the west. These originate on the flanks of the McCoy Mountains and enter the site where they either combine to form a larger dry wash (southwest corner of the site) or disperse as they enter the sandier alluvial plain (on the northern end of the site) [CH2MHill 2008). The McCoy Wash is the largest of the surface water features in the immediate vicinity. Flow in the McCoy Wash can be as high as 4,000 cubic feet per second, as measured in 1976 during historical flooding in the watershed (CH2MHill 2008). Prior to the reduction in the ROW, it cut through the northeastern portion of the site trending northwest to southeast. The reduction in the ROW to its current size and configuration excluded McCoy Wash. Only a very small portion of a tributary wash remains in the northeastern most corner of the Project.

There are no permanent bodies of water located on the Project site. Groundwater in the area of the site is contained within the Palo Verde Mesa Groundwater Basin. Groundwater levels at the site are estimated to be 250 feet below ground surface. A more detailed discussion of groundwater conditions at the BSPP plant site is provided in Section 5.17, Water Resources.

5.5.2.2 Seismicity

The BSPP site is located in seismically active Southern California, a region that has experienced numerous earthquakes in the past. A review of the AP Earthquake Fault maps (Division of Mines and Geology 2000) and the Riverside County Alquist-Priolo Earthquake Hazard Zone Map (General Plan 2000) indicates that there are no AP fault zones within the Project boundaries. In addition, no active fault zones are present within one mile of the Project site; however, the site is approximately 1.5 miles east of an unnamed fault located at the western end of the McCoy Mountains (DMG 1967, 1994). This fault has not been mapped by the USGS (2009) as a Quaternary (sufficiently active) fault, and is not listed by the EQFAULT (Blake, 2000) program as a fault potentially affecting the Project site.

Regardless of whether there are faults across the Project site, because the Project is located in a seismically active area, all Project structures must be designed to comply with the CBC and UBC Zone 3 requirements. The CBC and UBC are considered to be standard safeguards against major structural failures and loss of life. The goals of the Codes are to provide structures that will: (1) resist minor earthquakes without damage; (2) resist moderate earthquakes without structural damage but with some non-structural damage; and (3) resist major earthquakes without collapse but with some structural and non-structural damage. The CBC and UBC base seismic design on minimum lateral seismic forces ("ground shaking"). The CBC and UBC requirements operate on the principle that providing appropriate foundations, among other aspects, helps to protect buildings from failure during earthquakes.

Although the BSPP is in an area that does not include mapped AP zones, a geotechnical/geologic constraints evaluation will be conducted to identify and evaluate geologic and geotechnical constraints that could affect the Project. This will include an evaluation of whether fault rupture; moderate to severe seismic shaking; subsidence and ground failure related to groundwater withdrawal; and/or expansive or collapsible alluvial soils exist within the Project site. The results of this evaluation will be included in a Preliminary Geotechnical/Geologic Constraints Evaluation Report provided once the investigation is completed.

Site geotechnical work will include soil borings and test pits in the solar array fields, and borings in the area of the power blocks and other proposed project structures. Soil borings will be drilled to obtain samples of the site soils for laboratory testing and soil classification. The purpose of the test pits is to gain a better spatial assessment of the near-surface soil materials and to provide a better understanding of the general grading recommendation, such as stripping depths and effects of the existing moisture conditions on the general grading operations. The investigation will include excavation and logging of test pits which will be approximately five feet long and approximately 10 feet deep.

5.5.2.3 Geologic Hazards

Seismic hazards related to ground shaking include ground rupture, slope stability, liquefaction, subsidence, tsunamis, and seiches. Due to the inland location of the Project site and the absence of nearby large bodies of water, there is no potential for the Project site to be impacted by tsunamis or seiches.

Seismic Ground Shaking

The Project is located in a seismically active area and therefore will likely be subjected to ground shaking from movement along one or more of the sufficiently active or well-defined faults in the region. A “sufficiently active fault” (previously referred to as an “active fault”) is defined as a fault that has broken the surface in the past 11,000 years (California Geological Survey, 2007). A “well-defined fault” (previously referred to as “potentially active fault”) is defined as a fault whose trace is clearly detectable by a trained geologist as a physical feature at or just below the ground surface.

An EQFault search (Blake, 2000) was conducted that identified a total of 18 sufficiently active faults and well-defined faults within a 100-mile radius of the Project site. It is important to note that none of the 18 faults identified have the potential to generate ground accelerations of 0.1 gravity (g). The 0.1g value is an industry standard for significance in terms of foundational design, and this potential acceleration can be managed with proper foundational design and site geotechnical investigation. The Southern Segment of the San Andreas fault, located approximately 59 miles to the southwest of the site, has the greatest ground acceleration potential (0.055 g), found in the vicinity of the Project. This segment, from the Cajon Pass to the Salton Sea, may be capable of generating a moment magnitude 7.9 earthquake, which would be considered the maximum credible event that could impact the Project (RCIP 200). Studies suggest that the San Andreas fault has a slip rate of 20 to 35 millimeters per year with a recurrence interval for large earthquakes of 20 years to over 300 years (SCEC 2009). The San Andreas fault (Southern Segment) has an estimated slip rate of 24 mm per year (RICP 2000). The maximum historical earthquake magnitude within a 62-mile (100-kilometer [km]) radius was 7.9 from the Fort Tejon Earthquake on the Mojave Segment of the San Andreas and occurred on January 9, 1857 (SCEC 2009).

The closest seismically active area to the site is the Brawley Seismic Zone. This fault zone is located approximately 59 miles to the southwest and has the potential to generate a moment magnitude of 6.4 (Blake 2000); however, the possible maximum ground acceleration for this fault zone is 0.023 g.

Based on available online Seismic Hazard Zone Maps by the California Geological Survey (2008), the plant site is located in an area that has not been mapped for seismic hazards. Based on the California Geological Survey’s Probabilistic Seismic Hazards Mapping Ground Motion Page (2003), there is a 10 percent probability of earthquake ground motion exceeding 0.138 g at the BSPP site over a 50-year period.

Ground Rupture

Although located in an acknowledged seismically active area, the Project site is not located on a fault trace as designated by mapping as part of the Alquist-Priolo Earthquake Fault Zoning Act. Therefore, the Project is not subject to the AP Earthquake Fault Zoning Act and the risk of earthquake-induced ground rupture is considered to be low. Fissures caused by the lowering of groundwater tables and by hydrocollapse when groundwater tables have risen have been reported in Riverside County (RCIP 2000). In addition, fissures have occurred along active faults that bound the San Jacinto Valley and Elsinore Trough approximately 100 miles east of the Site (RCIP 2000). Fissures associated with groundwater levels or faults have not been reported at the site. Site-specific soil properties that may contribute to fissuring will be investigated during the preliminary geotechnical investigation.

Slope Stability

The Project is not considered to be in an area with the potential for permanent ground displacement due to earthquake-induced landslides because surface topography at and near the site is relatively flat. A review of aerial photographs (Google Earth 2009) did not identify any active or inactive landslides at the site or in the adjacent areas. The McCoy Mountains are directly adjacent to the western portion of the Site. These mountains have slopes with angles of 30 percent or greater and have a high potential for seismically induced rockfalls and landslides (RCIP 2000). The steepest slope (eight percent) near the Project is located approximately 500 feet to the west of the western property boundary in Section 8 of Township 6 South, Range 21 East. Given the relatively flat topography, it is unlikely that falling rock would reach the edge of the Project site. During a field reconnaissance (CH2MHill 2008), no boulders were observed at the then-current limits of the Project site. Based on topography and field observations, the potential for seismically induced rockfalls and landslides to affect the site is low.

Erosion

Erosion is the displacement of solids (soil, mud, rock, and other particles) by wind, water, or ice and by downward or down-slope movement in response to gravity. Due to generally flat terrain, the Project site currently is not prone to significant mass wasting. Soil characteristics at the Project site are not known because this area has not been mapped by the United States Department of Agriculture, Natural Resource Conservation Service; however, the Riverside County General Plan (RCIP 2000) has classified the soils at the site as having a moderate to high susceptibility to wind erosion hazards. Soil erosion from wind and water during construction activities is further evaluated in Section 5.12, Soils. The geotechnical investigation that will provide the soils information that will enable calculating current and potential future soil loss due to erosion is currently underway. The results of this investigation will be provided to the regulatory agencies and other stakeholders when they are available. In any case, the Best Management Practices (BMP) provided in the Drainage, Erosion and Sediment Control Plan (DESCP) and Stormwater Pollution Prevention Plan (SWPPP) that will be implemented (see preliminary construction SWPPP/DESCP in Appendix L), would reduce water and wind erosion of soils to less than significant levels.

Liquefaction

Liquefaction is a soil condition in which seismically induced ground motion causes an increase in soil water pressure in saturated, loose, sandy soils, resulting in loss of soil shear strength. Liquefaction can lead to near-surface ground failure, which may result in loss of foundation support and/or differential ground settlement. Sandy deposits deeper than 50 feet below ground surface (bgs) usually are not prone to causing surface damage. In addition, soils above the groundwater table (soils that are not saturated) will not liquefy. Based on the Riverside County General Plan (RCIP 2000), the majority (85 percent) of the Project is located in an area with deep groundwater that is moderately susceptible to liquefaction. Depth to water at Blythe is estimated to be 250 ft bgs. This estimate is based on depth to water measurements (1971 and 1992) in two wells located approximately 2.5 miles east (6S/22E-1S18A) and 2.5 miles northeast (5S22E-1S31E) of the Project site, respectively (DWR 1963). Based on the estimated depth of the groundwater at the site, liquefaction is considered unlikely (see Section 5.17, Water Resources). It is possible that, given the aeolian (wind) and alluvial (streams and washes) deposition of the site soils, there may be loose deposits across portions of the Project site that may be subject to partial collapse and settlement if they are subjected to long-term wetting (CH2MHill 2008). These conditions will be investigated during the preliminary geotechnical investigation.

Subsidence

Subsidence due to groundwater withdrawal has been documented in three regions of Riverside County: the Elsinore Trough, including Temecula and Murrieta; the San Jacinto Valley from Hemet to Moreno Valley; and the southern Coachella Valley (RCIP 2000), all approximately 25 miles or more west of the Project site. No subsidence has been documented at the Project site, although the site is in an area considered to be susceptible to subsidence (RCIP 2000).

The Project is located within the Palo Verde Mesa Groundwater Basin. Groundwater development within the basin is sparse, with the exception of the Blythe area. Groundwater was developed east of the site in the mid-1960s when approximately 200 acres of land were irrigated (CH2MHill 2008). In the 1970s and 1980s, agricultural groundwater development on the Palo Verde Mesa increased substantially to over 6,500 acres, but by the late 1980s and early 1990s the majority of this agricultural effort had failed (CH2MHill 2008). Groundwater level data shows an overall decline (less than 25 feet) in the water table during the 1960s and 1970s, with some recovery (CH2MHill 2008).

Pumping rates at the peak of agricultural developments are not available and total consumptive use (historical and current) for agricultural wells in the area is not known. Regional subsidence attributed to historical groundwater withdrawal has not been reported in the area of the Project or in the vicinity; therefore, subsidence from groundwater withdrawal associated with the Project is considered to be less than significant. Section 5.17 Water Resources evaluates pumping rates and total consumptive use for the wells in this basin. If data are available, an evaluation will be conducted to compare historical and current groundwater use with the proposed groundwater use of the Project and subsidence due to groundwater withdrawal will be evaluated.

Seismically induced settlement can occur in areas where earthquake shaking causes densification of relatively loose sediments. Settlement can cause damage to surface and near-surface structures. However, with implementation of planned mitigation measures the potential for damage due to seismically induced settlement is considered to be low at the Project site. Additional geotechnical investigations will be completed to assess seismically induced settlement in the vicinity of the Project site as part of the detailed design process. Although the potential for damage due to seismically induced settlement is considered to be low, the results of the investigation will be used to support Project-specific detailed design and construction.

Collapsible Soil Conditions

Alluvial soils in arid and semi-arid environments have the tendency to possess characteristics that make them prone to collapse with increase in moisture content and without increase in external loads. In Riverside County, collapsible soils occur predominantly at the bases of the mountains, where Holocene-aged alluvial sediments have been deposited during rapid runoff events (RCIP 2000). Additionally, some windblown sands may be vulnerable to collapse and hydroconsolidation (RCIP 2000). The Project is located in a geologic environment where the potential exists for collapsible soils. Site-specific soil properties that may contribute to collapsible soil conditions will be investigated during the preliminary geotechnical investigation. However, the potential for damage due to collapsible soils is considered to be very low, provided that measures for sub-grade improvements are implemented as part of the Project design process. Although specific information will not be available until after completion of the in-process geotechnical investigation, design measures and construction procedures to minimize soil erosion and collapse are expected to include:

- Engineering berms and drainage to minimize wetting of these soils; and directing runoff away from the power block;

- Pre-watering the plant site to induce hydro-consolidation in advance of the grading program that will be part of Project construction; and
- Removing collapsible soils as part of the grading program.

Expansive Soil

Expansive soil consists of fine-grained clay which occurs naturally. It is generally found in areas that were historically a flood plain or lake area, but can occur in hillside areas also. Expansive soil is subject to swelling and shrinkage, varying in proportion to the amount of moisture present in the soil. As water is initially introduced into the soil (by rainfall or watering) expansion takes place. If dried out, the soil will contract, often leaving small fissures or cracks. Excessive drying and wetting of the soil can progressively deteriorate structures over the years by leading to differential settlement within buildings and other improvements.

Based on two preliminary surface soil samples collected at the Project site (CH2MHill 2008), soils would be expected to consist of silty sand with gravel (SM) and silty, clayey sand (SC-SM). Although preliminary, these samples suggest that the expansion potential of onsite is low. One sample collected approximately 600 feet north of the site in Section 34, Township 5 South, Range 21 East shows that soils consist of lean clay with sand (CH2MHill 2008). The expansion potential near this part of the site may be a bit higher than the rest of the site. A preliminary geotechnical investigation is planned to support the Project's final design. This study will further evaluate and verify the expansion potential of the native soil deposits.

5.5.2.4 Geologic Resources

Recreational and unique geologic resources and features typically include rock or mineral collecting, surface hydrothermal features, or surface expression of geologic features unique enough to generate recreational interests of the general public (natural bridges, caves, waterfalls, etc.). Based on a search of State recreation-related websites (California State Parks and Recreation.gov 2009), there are no known recreational or unique geologic resources associated with the Project site.

Division of Oil, Gas, and Geothermal Resources oil and gas maps were reviewed to check for the presence of oil or gas resources beneath the Project site and in the adjacent areas. However, there is no map coverage for the Project area, which is located in the eastern portion of District 1 (Division of Oil, Gas, and Geothermal Resources 2009).

5.5.3 Environmental Impacts

Environmental impacts associated with the construction and operation of the BSPP are discussed in the following sections.

5.5.3.1 Construction

Construction-related impacts to the geologic environment primarily are related to terrain modification (cuts, fills, and drainage diversion measures) and dust generation (excavation and grading). Dust generation and the potential for erosion related impacts associated with construction are discussed further in Section 5.12, Soils. No major unique geologic or physical features have been identified at the plant site. Based on the conceptual grading plan (see Appendix L) for the Project site, construction will require cut and fill activities on the site, but import/export of earthen materials to and from the site will not be required. Therefore, potential construction related impacts to the geologic environment will be confined to the Project site.

Evidence of ground subsidence as a result of past groundwater withdrawal has not been documented in the Project area (see Section 5.17, Water Resources). Groundwater modeling for the period of significant water usage of an estimated 498,540 gallons per day for the first 69 months of site development reveal a moderate 25 feet of drawdown below the plant site. It is anticipated that the moderate level of probable temporary drawdown during this short period of pumping will not induce subsidence.

The applicant will conduct a preliminary geotechnical investigation, consisting of soil borings and test pits, at the site, and will provide information on soil properties that may contribute to fractures and collapsible soil conditions (when wetted), as well as expansive soil conditions.

BMPs implemented during construction will reduce the potential for directing surface water to drainage channels and away from the expansive and collapsible soils. In addition, engineering measures such as wetting the soils in advance of grading to induce consolidation and removal of these soils and re-compaction may also be implemented.

The Project site is in the seismically active southern California region; thus, the Project site is subject to ground shaking, and potentially subject to fault movement from earthquakes along faults in the region. The potential for earthquake-related impacts would begin during Project construction. However, seismic impacts would be of greater concern during long-term Project operation than during the limited duration of the Project construction phase. These impacts are discussed immediately below.

5.5.3.2 Operation

Regional and local geologic conditions will not be altered significantly by the long-term operation of the BSPP. No major unique geologic or physical features have been identified at the Project site. The Project area may be underlain by deposits of sand and gravel, and these resources could not be recovered and used during the active life of the Project. No other impacts to the geologic environment have been identified.

Ground shaking may present the most significant geologic hazard to the BSPP, and the Project area is subject to ground shaking from nearby and distant earthquakes. Ground acceleration lower than 0.1 g may be experienced at the BSPP site, which represents the potential for moderate to severe shaking. The BSPP site is located in Seismic Zone 3, the zone with a moderately high potential for seismic ground shaking. The San Andreas – Southern fault has been identified as having the greatest potential to affect the Project site and thus, impacts resulting from severe shaking at the Project site may be anticipated. Project structures will be designed to meet the seismic design standards appropriate for Seismic Zone 3. The BSPP preliminary geotechnical investigation program will address site-specific soil conditions and the potential for significant seismicity. Due to the depth to groundwater (250 feet), liquefaction is not expected to occur.

Evidence of ground subsidence, such as fractures possibly caused by groundwater extraction, has not been noted at the BSPP site. The potential for local settlement due to groundwater withdrawal could be present at the Project site if the regional groundwater table were to be lowered significantly. As discussed in Section 5.17, Water Resources, groundwater pumping is expected to lower the water table below the plant site a moderate 20 feet after 30 years of operation. Given that historical groundwater use has been significantly higher as a result of agricultural developments and that no subsidence has been reported, it is not anticipated that the Project's limited pumping program will induce subsidence below the site.

After the preliminary geotechnical study is performed, the applicant will perform a more detailed study of the potential for subsidence-related ground failure. The study may include a review of previous groundwater records including drawdown rates, groundwater usage, and other groundwater and well records, as well as groundwater modeling to quantify the amount of anticipated future settlement. Additional geotechnical investigations will be conducted to support the Project detailed design process.

Soils at the BSPP plant site may have a potential for collapse. Soil properties will be investigated during the preliminary geotechnical investigation to approximate the level of collapse potential. To ensure that collapse potential is minimized, all foundations for plant facilities will be designed in accordance with the recommendations of the preliminary and future geotechnical investigations. Recommendations may include overexcavation and recompaction where necessary.

In summary, the only identified potential geologic hazards for the BSPP site are ground shaking and ground rupture from earthquakes and the potential for localized soil collapse. Additional geologic hazards, such as collapse, may be identified after the preliminary geotechnical investigation is completed. Construction of facilities in accordance with the mitigation measures identified below will ensure that earthquake-related impacts and impacts from potential soil collapse are minimized such that geologic impacts associated with the Project are considered less than significant.

5.5.3.3 Cumulative Impacts

The BSPP will be designed and constructed to meet UBC/CBC requirements for industrial facilities located in Seismic Zone 3 and will adhere to standard engineering and other professional practices and appropriate regulatory requirements related to geologic hazards (e.g., grading, slope stability). For these reasons, the Project is expected to have no significant impacts on geologic hazards or resources. Other projects in the same vicinity also would be expected to adhere to the appropriate professional standards and regulatory requirements. As a result, the BSPP would not be expected to contribute to significant cumulative effects on geologic resources and hazards during construction or operation.

5.5.4 Mitigation Measures

5.5.4.1 Construction

Geologic impacts associated with the construction of the BSPP are expected to be less than significant. Site-specific geotechnical, seismic, and collapsible soil conditions will be appropriately addressed during Project detailed design and during construction. The following mitigation measures are proposed to ensure that impacts are less than significant.

GEOL-1 Power plant structures and equipment as well as offsite linear facilities (natural gas, pipeline; transmission line) will be designed in accordance with Seismic Zone 3 requirements.

GEOL-2 Project foundations will be designed in accordance with recommendations (e.g., overexcavation and recompaction beneath project structures and paved areas) provided in the Preliminary Geotechnical/Geologic Constraints Evaluation Report and as amended by future geotechnical investigations.

5.5.4.2 Operations

Geologic impacts associated with the BSPP operations are expected to be less than significant. Thus, no geology-related mitigation measures are proposed for Project operation.

5.5.5 References

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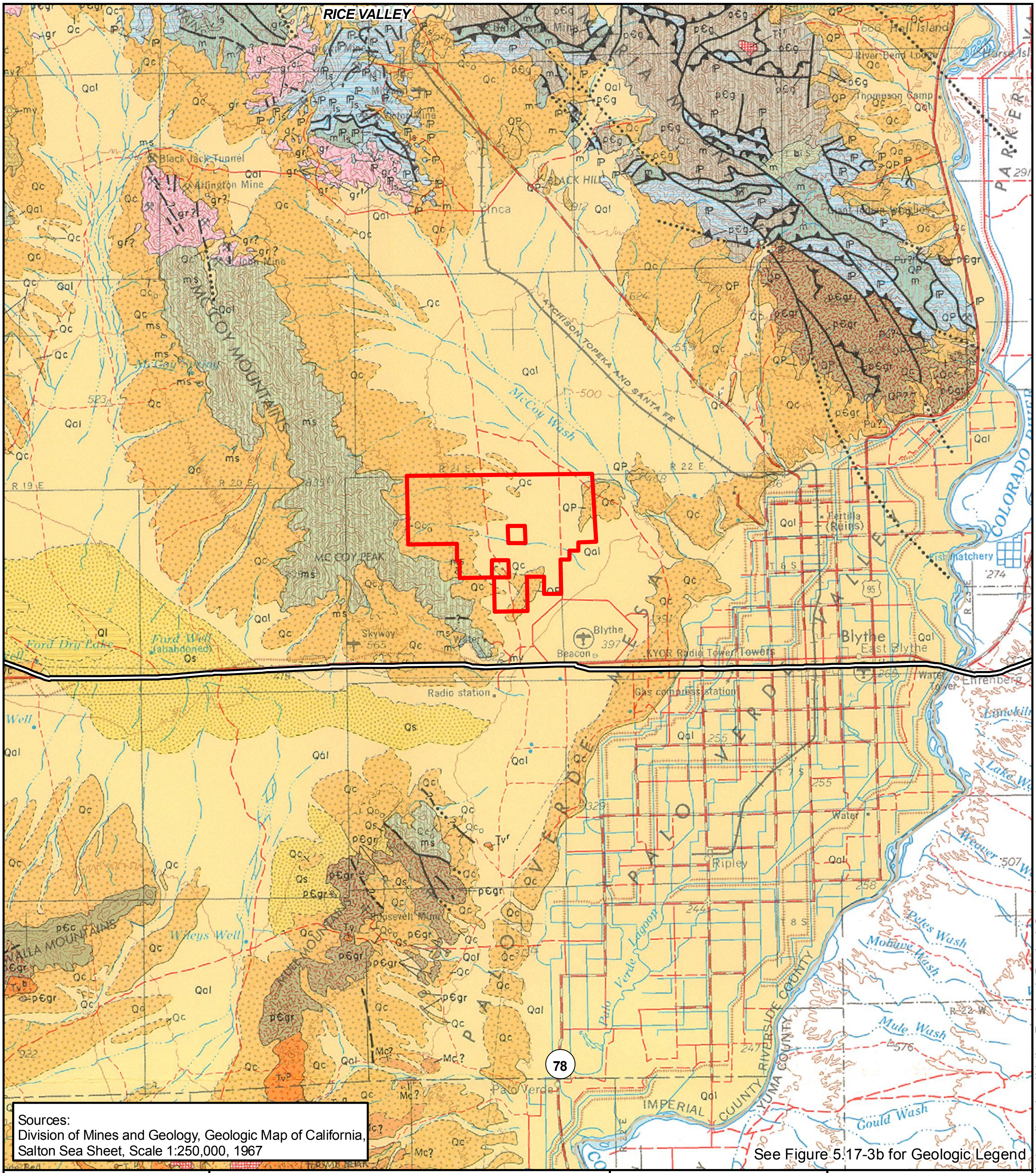

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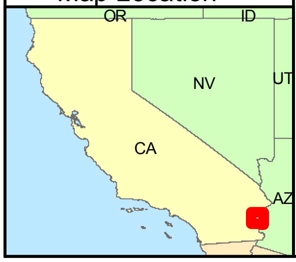
Map Location



Legend

- Project Right-of-Way
- Facility Footprint
- Freeway

1 in = 4 miles

0 4 8 Miles

N W E S

Blythe Solar Power Project

Figure 5.5-1a Regional Geologic Map

Solar Millennium

AECOM

Project: 12944-002
Date: August 2009

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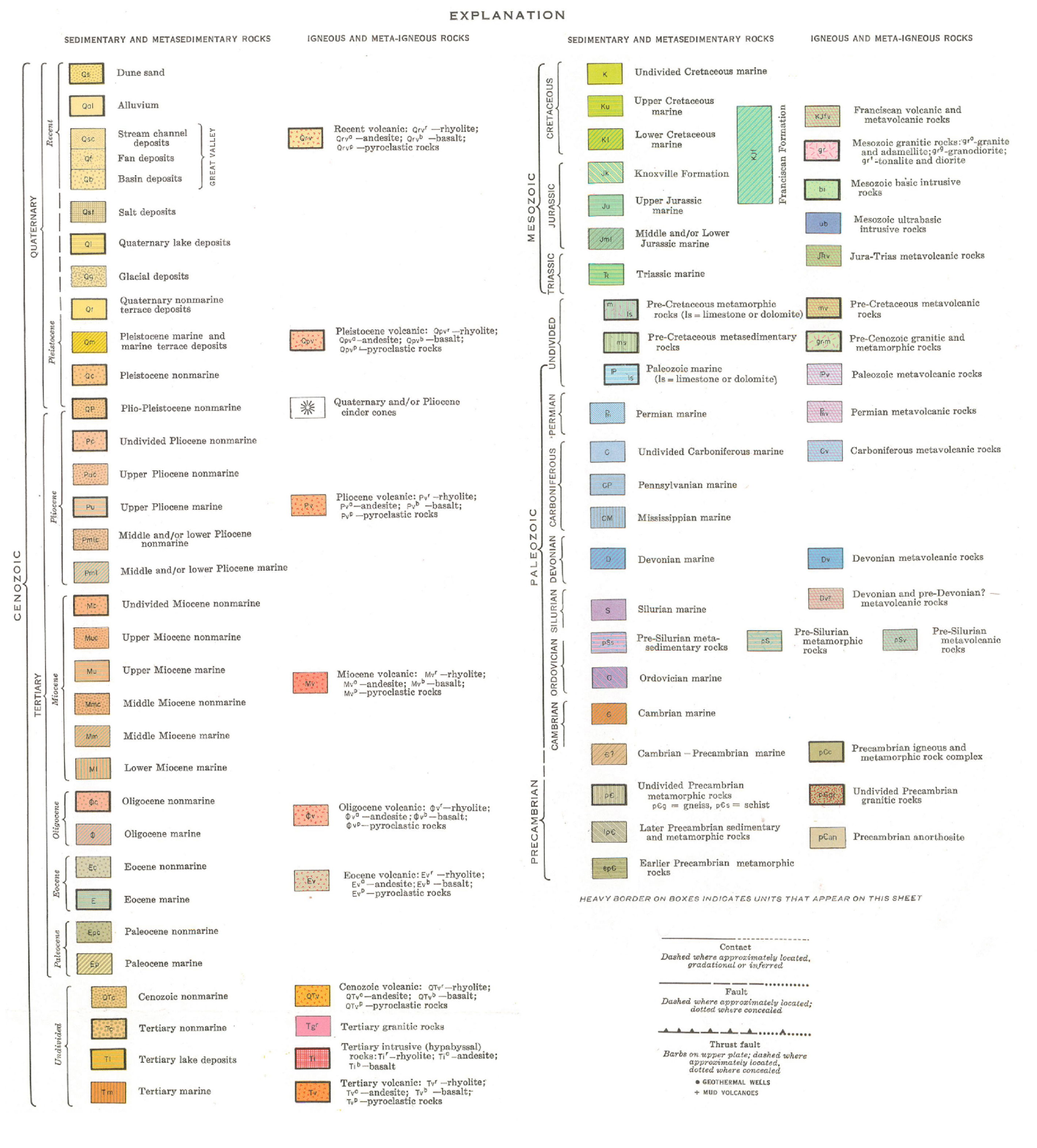

Map Location

Legend

Source: Geologic Map of California, Salton Sea Sheet, 1967

Blythe Solar Power Project

Figure 5.5-1b Regional Geologic Map Legend

Solar Millennium

AECOM

Project: 12944-002
Date: August 2009

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