Appendix 2G
Geologic and Foundation Design Criteria

APPENDIX 2G

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2G.1 Introduction

This appendix contains a description of the site conditions and preliminary foundation-related subsurface conditions for the Hidden Hills Solar Electric Generating System. Soil-related hazards addressed include soil liquefaction, hydrocompaction (or collapsible soils), and expansive soils. Preliminary foundation and earthwork considerations are addressed based on the results of general published information available for the project area and collected for the AFC, and established geotechnical engineering practices.

Information contained in this appendix reflects the codes, standards, criteria, and practices that will be used in the design and construction of site and foundation engineering systems for the facility. More specific project information will be developed during execution of the project to support detailed design, engineering, material procurement specification and construction specifications. This information will be included in a geotechnical engineering study, which, if requested, will be provided to the CEC upon completion.

2G.2 Site Conditions

The proposed BrightSource project site will cover approximately 3,277 acres and is located in the southern portion of Pahrump Valley in Inyo County, California, along the California-Nevada border. The high elevation of the site is approximately 2,737 feet above mean sea level on the east side and the low elevation is approximately 2,583 feet on the west side of the property.

2G.3 Site Subsurface Conditions

2G.3.1 Stratigraphy

Generalized descriptions of the materials encountered are given in the project geotechnical study based on the review of background documents, field exploration, and laboratory testing. Exploratory borings and test pits were used to determine subsurface conditions. The values and findings of these efforts will be explained and defined in the final geotechnical report provided by the project geotechnical engineer.

2G.3.2 Seismicity/Ground-Shaking

The project site lies within a seismically active region. The proximity of the nearest active fault and fault zones along with their direction, earthquake potential and peak ground accelerations will be explained and defined in the final geotechnical report provided by the project geotechnical engineer.

2G.3.3 Ground Rupture

The site reconnaissance by the geotechnical group produced numerous observations of ground surface lineations. The proximity of these features along with their direction, width, length, associated fissures and their related faults will be explained and defined in the final geotechnical report provided by the project geotechnical engineer. Depending on siting of proposed structures and other considerations, the lineations may need to be further evaluated in a subsequent phase of study.

2G.3.4 Groundwater

The depth to groundwater at the project site is relatively deep. The geotechnical study notes that groundwater was not encountered in exploratory borings, which were drilled to depths of up to approximately 20 feet. However, observations and monitoring of four abandoned water wells at the subject site did establish that the depth of the groundwater exceeded 100 feet in those locations. Further information regarding groundwater elevations at the subject site will be explained and defined in the groundwater report provided by the project hydrogeologist.

2G.4 Assessment of Soil-Related Hazards

2G.4.1 Liquefaction

Soil liquefaction is a process by which loose, saturated, granular deposits lose a significant portion of their shear strength due to pore water pressure buildup resulting from cyclic loading, such as that caused by an earthquake. Soil liquefaction can lead to foundation bearing failures and excessive settlements. The level of liquefaction potential at the site will be explained and defined in the final geotechnical report provided by the project geotechnical engineer.

2G.4.2 Expansive Soils

Expansive soils shrink and swell with wetting and drying. The shrink-swell capacity of expansive soils can result in differential movement beneath foundations. Laboratory test results for representative soil samples below grade were tested by the geotechnical engineer to determine overall soil expansiveness. The level of expansive soil and possible corrective techniques will be explained and defined in the final geotechnical report provided by the project geotechnical engineer.

2G.4.3 Collapsible Soils

Soil collapse (hydrocompaction) is a phenomenon that results in relatively rapid settlement of soil deposits due to addition of water. The level of collapsible soil and possible corrective techniques will be explained and defined in the final geotechnical report provided by the project geotechnical engineer.

2G.5 Preliminary Foundation Considerations

2G.5.1 General Foundation Design Criteria

For satisfactory performance, the foundation of any structure or equipment must satisfy two independent design criteria. First, each system must exhibit sufficient capacity as either a shallow or deep foundation under maximum design loads in conformance with established and code-compliant safety factors. Second, settlements during the life of the structure must not be of a magnitude that will cause structural damage, endanger piping connections or impair the operational efficiency of the facility. Selection of the foundation type to satisfy these criteria depends on the nature and magnitude of dead and live loads, the base area of the structure and the settlement tolerances. Where more than one foundation type satisfies these criteria, then cost, scheduling, material availability and local practice will probably influence or determine the final selection of the type of foundation.

Based on the information collected from the preliminary geotechnical report no adverse foundation-related subsurface and groundwater conditions would be encountered that would preclude the construction and operation of the proposed structures. The site can be considered suitable for development of the proposed structures, pursuant to completion of a geotechnical investigation, and the preliminary foundation and earthwork considerations discussed in this appendix.

2G.5.2 Shallow Foundations

Completion of the geotechnical investigation will determine if the proposed structures can be supported directly on the native soils. Shallow foundation construction, along with its associated earthwork measures, allowable bearing pressures, minimum dimensions, minimum embedment, frost depth and settlement potential will be explained and defined in the final geotechnical report provided by the project geotechnical engineer.

2G.5.3 Deep Foundations

Completion of the geotechnical investigation will determine if the proposed structures will require deep foundations. Deep foundation construction, along with its associated length, size, allowable bearing, uplift, and lateral capacity will be explained and defined in the final geotechnical report provided by the project geotechnical engineer.

2G.5.4 Corrosion Potential and Ground Aggressiveness

Through the results of resistivity tests conducted by the geotechnical group there is an indication the onsite soils are potentially very severely corrosive to steel. Corrosion reduction methods are recommended for steel in contact with onsite soils. In addition, sulfate content tests indicated that some of the onsite soils were moderately deleterious to normal strength concrete. The level of corrosion potential, as well as, sulfate content and the possible corrective techniques for both will be explained and defined in the final geotechnical report provided by the project geotechnical engineer.

2G.6 Preliminary Earthwork Considerations

2G.6.1 Site Preparation and Grading

The subgrade preparation would include limited areas where the complete removal of all vegetation and topsoil will be done. The proper preparation and grading techniques will be explained and defined in the final geotechnical report provided by the project geotechnical engineer.

2G.6.2 Temporary Excavations

All excavations should be sloped in accordance with Occupational Safety and Health Act (OSHA) requirements. The need for internal supports in the excavation will be determined based on the final depth of the excavation. Any excavation below the water table should be dewatered using well points or other suitable system installed prior to the start of excavation. The proper excavation, shoring and dewatering techniques will be explained and defined in the final geotechnical report provided by the project geotechnical engineer.

2G.6.3 Permanent Slopes

The proper construction of permanent slopes will be explained and defined in the final geotechnical report provided by the project geotechnical engineer.

2G.6.4 Backfill Requirements

The proper backfill requirements including fill material, compaction and moisture content will be explained and defined in the final geotechnical report provided by the project geotechnical engineer.

2G.7 Inspection and Monitoring

A California-registered Geotechnical Engineer or Engineering Geologist will monitor geotechnical aspects of foundation construction and/or installation and fill placement. At a minimum the Geotechnical Engineer/Engineering Geologist will monitor all the activities recommended in the building code and the final geotechnical report provided by the project geotechnical engineer.

2G.8 Foundation Design Criteria

2G.8.1 General

Reinforced concrete structures (spread footings, mats, and deep foundations) will be designed consistent with Appendix 2B, Structural Engineering Design Criteria.

Design criteria for either shallow or deep foundations will be in accordance with final detailed geotechnical investigation for the site.

2G.8.2 Groundwater Pressures

Hydrostatic pressures due to groundwater or temporary water loads will be considered, if required.

2G.8.3 Factors of Safety

The factor of safety for structures, tanks and equipment supports with respect to overturning, sliding, and uplift due to wind and buoyancy will be as defined in Appendix 2B, Structural Engineering Design Criteria.

2G.8.4 Load Factors and Load Combinations

For reinforced concrete structures and equipment supports, using the strength method, the load factors and load combinations will be in accordance with Appendix 2B, Structural Engineering Design Criteria.

2G.9 References

California Building Code. 2010.

Ninyo & Moore (March 17, 2011), "Preliminary Geotechnical Evaluation, Hidden Hills Solar Facility, Old Spanish Trail Highway and Gold Street, Inyo County, California", Project No. 303200001 (see Appendix 5.4A)