Appendix J

Engineering & Design Criteria

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J1. Civil Engineering Criteria

J1.1 Introduction

This appendix summarizes the codes, standards, criteria, and practices that will be generally used in the design and construction of civil engineering systems for the Mojave Solar Project. More specific Project information will be developed during execution of the Project to support detail design, engineering, material procurement specification and construction specifications.

J1.2 Codes and Standards

The design of civil engineering systems for the Project will be in accordance with the laws and regulations of the federal government, the State of California, County of San Bernardino ordinances, and industry standards. The current issue or edition of the documents at the time of filing this Application for Certification (AFC) will apply, unless otherwise noted. In case where conflicts between the cited documents exist, requirements of the more conservative document will be used.

J1.2.1 Civil Engineering Codes and Standards

The following codes and standards have been identified as applicable, in whole or in part, to civil engineering design and construction of power plants.

- American Association of State Highway and Transportation Officials (AASHTO) – Standards and Specifications
- American Concrete Institute (ACI) – ACI 318 Building Code Requirements for Structural Concrete, Standards and Recommended Practices. ACI 530/ASCE 5/TMS 402 Building Code Requirements for Masonry Structures.
- American Institute of Steel Construction (AISC) – AISC 360 and 341 Provisions for Structural Steel Buildings, Standards and Specifications
- American National Standards Institute (ANSI) – Standards
- American Society of Testing and Materials (ASTM) – Standards, Specifications, and Recommended Practices
- American Water Works Association (AWWA) – Standards and Specifications
- American Welding Society (AWS) – Codes and Standards
- Asphalt Institute (AI) – Asphalt Handbook
- State of California Department of Transportation (CALTRANS) Standard Specification
- California Energy Commission – Recommended Seismic Design Criteria for Non-Nuclear Generating Facilities in California, 1989

- Concrete Reinforcing Steel Institute (CRSI) – Standards
- Factory Mutual (FM) – Standards
- National Fire Protection Association (NFPA) – Standards
- California Code of Regulations, Title 24, 2007 California Building Code (CBC), Based on 2006 International Building Code (IBC), Based on
- Steel Structures Painting Council (SSPC) – Standards and Specifications

J1.2.2 Engineering Geology Codes, Standards, and Certifications

Engineering geology activities will conform to the applicable federal, state and local laws, regulations, ordinance and industry codes and standards.

J1.2.2.13 Federal

None are applicable.

J1.2.2.14 State

The Warren-Alquist Act, PRC, Section 25000 et seq. and the California Energy Commission (CEC) Code of Regulations (CCR), Siting Regulations, Title 20 CCR, Chapter 2, require that an AFC addresses the geologic and seismic aspect of the site.

The California Environmental Quality Act (CEQA), PRC 21000 et seq. and the CEQA Guidelines require that potential significant effects, including geological hazards, be identified and a determination made as to whether they can be substantially reduced.

J1.2.2.15 Local

California State Planning Law, Government Code Section 65302, require each city and county to adopt a general plan, consisting of nine mandatory elements, to guide its physical development. Section 65302(g) requires that a seismic safety element be included in the general plan.

The site development activities will require certification by a Professional Civil Engineer during and following construction, in accordance with the California Building Code (CBC), Chapter 18, 33 and Appendix J (of the CBC). The Professional Civil Engineer will certify the placement of earthen fills and the adequacy of the site for structural improvement.

Special inspection, Special Testing and structural observation shall be performed for the following CBC code sections:

- Site and foundation soils 1704.7
- Pile foundations 1704.8
- Pier foundations 1704.9

Additionally, the Professional Engineering Geologist will present findings and conclusions pursuant to PRC, Section 25523 (a) and (c); and 20 CCR, Section 1752 (b) and (c).

J 1.2.2.16 Storm Drainage Codes, Standards and Certifications

Storm drainage design activities will conform to the applicable federal, state and local laws, regulations, ordinances, and industry codes and standards. The design of all storm drainage will be performed by, or under the direct supervision of, a licensed civil engineer.

J 1.2.2.16.1 Federal

All finish floors shall be higher than the 100-year flood plain elevation as established by the Federal Emergency Management Agency.

J 1.2.2.16.2 State

None are applicable

J 1.2.2.16.3 Local

Storm Water Pollution Prevention Plan and NPDES permit. The plan will be in accordance with the Federal Clean Water Act (CWA) as implemented by the State of California. Compliance will be verified by the County of San Bernardino in conjunction with improvement plan approvals.

J2. Structural Engineering Design Criteria

J2.1 Introduction

This appendix summarizes the codes, standards, criteria, and practices that will be generally used in the design and construction of structural engineering systems for the Mojave Solar Project. More specific Project information will be developed during execution of the Project to support detail design, engineering, material procurement specification and construction specifications.

J2.2 Codes and Standards

The design of structural engineering systems for the Project will be in accordance with the laws and regulations of the federal government, the State of California, County of San Bernardino ordinances, and the industry standards. The current issue or edition of the documents at the time of filing of this Application for Certification (AFC) will apply, unless otherwise noted. In cases where conflicts between the cited documents exist, requirements of the more conservative document will be used.

The following codes and standards have been identified as applicable, in whole or in part, to structural engineering design and construction of power plants.

- California Building Code (CBC), 2007 Edition
- American Institute of Steel Construction (AISC):
  - Manual of Steel Construction –Latest Edition
  - Specification for Structural Steel Buildings AISC 360
  - Seismic Provisions for Structural Steel Buildings AISC 341
  - Specifications for Structural Joints using ASTM A325 or A490 Bolts
  - Code of Standard Practice for Steel Buildings and Bridges
- American Concrete Institute (ACI):
  - ACI 318, Building Code Requirements for Structural Concrete
  - ACI 301, Specifications for Structural Concrete for Buildings
  - ACI 543R, Design, Manufacture, and Installation of Concrete Piles
  - ACI 530 Building Code Requirements for Masonry Structures
- American Society of Civil Engineers (ASCE):
  - ASCE 7, Minimum Design Loads for Buildings and Other Structures
- American Welding Society (AWS):
  - D1.1 – Structural Welding Code – Steel
  - D1.3 – Structural Welding Code – Sheet Steel

- Code of Federal Regulations, Title 29 – Labor, Chapter XVII, Occupational Safety and Health Administration (OSHA).
  - Part 1910 – Occupational Safety and Health Standards
  - Part 1926 – Construction and Safety Health Regulations
- National Association of Architectural Metal Manufacturers (NAAMM) – Metal Bar Grating Manual.
- Hoist Manufacturers Institute (HMI), Standards Specifications for Electric Wire Rope Hoists (HMI 100).
- National Electric Safety Code (NESC)
- National Fire Protection Association (NFPA Standards).
  - NEPA 850 Fire Protection for Electric Generating Plants.
- OSHA Williams-Steiger Occupational Safety and Health Act of 1970.
- Steel Deck Institute (SDI) – Design Manual for Floor Decks and Roof Decks.

Special inspection, Special Testing and structural observation shall be performed for the following CBC code sections:

- Concrete Construction 1704.4
- Steel Construction 1704.3
- Masonry Construction 1704.5
- Sprayed fire resistant materials 1704.10

J2.2.1 CEC Special Requirements

Prior to the start of any increment of construction, the proposed lateral-force procedures for Project structures and the applicable designs, plans, and drawings for Project structures will be submitted for approval.

Proposed lateral-force procedures, designs, plans, and drawings shall be those for:

- Major Project structures
- Major foundations, equipment supports, and anchorage
- Large, field-fabricated tanks
- Switchyard structures
- Turbine Generator Pedestal/Foundation

J2.3 Structural Design Criteria

J2.3.1 Datum

Site topographic elevations will be based on an elevation survey conducted using known elevation benchmarks.

J2.3.2 Frost Penetration

This site is located in an area free of frost penetration. Bottom elevation of all foundations for structures and equipment, however, will be maintained at a minimum of 12 inches below the finished grade.

J2.3.3 Temperatures

The design basis temperatures for civil and structural engineering systems will be as follows:

Maximum	106°F
Minimum	13°F

J2.3.4 Design Loads

J2.3.4.1 General

Design load for structures and foundations will comply with all applicable building code requirements.

J2.3.4.2 Dead Loads

Dead loads will consist of weights of structure and all equipment of a permanent or semi-permanent nature. This includes tanks, bins, wall panels, partitions, roofing, drains, piping, cable trays, bus ducts, and the content of tanks and bins measured at full operating capacity. The contents of the tanks and bins, however, will not be considered as effective in resisting structure uplift during wind forces, but will be considered as effective for seismic forces.

J2.3.4.3 Live Loads

Live load will consist of uniform floor live loads and equipment live loads. Uniform live loads are assumed equivalent unit loads that are considered sufficient to provide for movable and transitory loads, such as the weights of people, portable equipment and tools, small equipment or parts, which maybe moved over or placed on the floors during maintenance operations, and planking. The uniform live loads will not be applied to floor areas that will be permanently occupied by equipment.

Lateral earth pressures, hydrostatic pressures, and wheel loads from trucks will be considered as live loads.

Uniform live loads will be in accordance with ASCE standard 7, but will not be less than the following:

- Roofs — 20 pounds per square foot (psf)
- Floors and Platforms (steel grating and checkered plates) — 50 psf

In addition, a uniform load of 50 psf will be used to account for piping and cable trays, except that where the piping and cable loads exceed 50 psf, the actual loads will be used.

Furthermore, a concentrated load of 5 kips will be applied concurrently to the supporting beams of the floors to maximize stress in the members, but the reactions from the concentrated loads will not be carried to the columns.

- Floors (elevated concrete floors) — 100 psf

In addition, elevated concrete slabs will be designed to support an alternative concentrated load of 20 kips in lieu of the uniform loads, which governs. The concentrated load will be treated as a uniformly-distributed load acting over an area of 2.5 square feet, and will be located in a manner to produce the maximum stress conditions in the slabs.

- Control Room Floors — 75 psf
- Stairs, Landings, and Walkways — 100 psf

In addition, a concentrated load of 2 kips will be applied concurrently to the supporting beams for the walkways to maximize the stress in the members, but the reactions from the concentrated loads will not be carried to the columns.

- Pipe Racks — 50 psf

Where the piping and cable tray loads exceed the design uniform load, the actual loads will be used. In addition, a concentrated load of 8 kips will be applied concurrently to the supporting beams for the walkways to maximize the stress in the members, but the reactions from the concentrated load will not be carried to the columns.

- Hand Railings

Hand railings will be designed for either a uniform horizontal force of 50 pounds per linear foot (plf) applied simultaneously with a 100 plf uniform vertical live load, or a 200-pound concentrated load applied at any point and in any direction, whichever governs.

- Slabs on Grade — 250 psf
- Truck Loading Surcharge Adjacent to Structures — 250 psf
- Truck Support Structures — AASHTO-HS-20-44
- Special Loading Conditions — Actual loadings

Laydown loads for equipment components during maintenance and floor areas where trucks, forklifts or other transport have access, will be considered in the design of live loads.

Live loads may be reduced in accordance with the provisions of CBC Section 1607.

Posting of the floor load capacity signs for all roofs, elevated floors, platforms and walkways will be in compliance with OSHA Occupational Safety and Health Standard, Walking and Working Surfaces, Subpart D. Floor load capacity for slabs on grade will not be posted.

J2.3.4.4 Earth Pressures

Earth pressures will be in accordance with the recommendations contained in the Project-specific Geotechnical Evaluation, Appendix B.

J2.3.4.5 Groundwater Pressures

Hydrostatic pressures due to ground water or temporary water loads will be considered.

J2.3.4.6 Wind Loads

The wind forces will be calculated in accordance with CBC 2007 Section 1609

J2.3.4.7 Seismic Loads

Structures will be designed and constructed to resist the effects of earthquake loads as determined in CBC 2007, Section 1613. The site specific ground motion analysis includes probabilistic and deterministic methods in conformance with American Society of Civil Engineers (ASCE) 7-05 guidelines. All seismic parameters will be obtained from the geotechnical evaluation for MSP prepared by Ninyo and Moore dated May 15, 2009.

J2.3.4.8 Snow Loads

Snow loads will not be considered.

J2.3.4.9 Turbine-Generator Loads

The combustion turbine-generator loads for pedestal and foundation design will be furnished by the equipment manufacturers, and will be applied in accordance with the equipment manufacturers' specifications, criteria, and recommendations.

J2.3.4.10 Special Considerations for Steel Stacks

Steel stacks will be designed to withstand the normal and abnormal operating conditions in combination with wind loads and seismic loads, and will include the along-wind and across-wind effects on the stacks. The design will meet the requirements of ASME/ANSI STS-1-2006, "Steel Stacks," using allowable stress design method, except that increased allowable stress for wind loads as permitted by AISC will not be used.

J2.3.4.11 Special Considerations for Structures and Loads during Construction

For temporary structures, or permanent structures left temporarily incomplete to facilitate equipment installations, or temporary loads imposed on permanent structures during construction, the allowable stress may be increased by 33 percent.

Structural backfill may be placed against the walls, retaining walls, and similar structures when the concrete strength attains 80 percent of the design compressive strength (f'_c), as determined by sample cylinder tests. Restrictions on structural backfill, if any, will be shown on the engineering design drawings.

Design restrictions imposed on construction shoring removal that are different from normal practices recommended by the ACI Codes will be shown on engineering design drawings.

Metal decking used as forms for elevated concrete slabs will be evaluated to adequately support the weight of concrete plus a uniform construction load of 50 psf, without increase in allowable stresses.

J2.4 Design Bases

J2.4.1 General

Reinforced concrete structures will be designed by the strength design method, in accordance with the California Building Code and the ACI 318, "Building code Requirements for Structural Concrete."

Steel structures will be designed by the working stress method, in accordance with the California Building code and the AISC Specification for the Design, Fabrication and Erection of Structural Steel for Buildings.

Allowable soil bearing pressures for foundation design will be in accordance with the geotechnical evaluation prepared by Ninyo and Moore dated May 15, 2009 for the Facility.

J2.4.2 Factors of Safety

The factor of safety for all structures, tanks, and equipment supports will be as follows:

Against Overturning	1.50
Against Sliding	1.50 for Wind Loads
	1.10 for Seismic Load
Against Uplift Due to Wind	1.50
Against Buoyancy	1.25

J2.4.3 Allowable Stresses

Calculated Stresses from the governing load combinations for structures and equipment supports will not exceed the allowable limits permitted by Chapter 16 of the 2007 CBC.

J2.4.4 Load Factors and Load Combinations

Buildings, structures, and parts thereof shall be designed and constructed in accordance with the "General Design Requirements", Section 1604 of the 2007 CBC.

J2.5 Construction Materials

J2.5.1 Concrete and Grout

The design compressive strength (f'_c) of concrete and grout, as measured at 28 days, will be as follows:

Electrical ductbank encasement and lean concrete backfill (Class L-1)	1000 psi
Structural concrete (Class S-1)	3000 psi
Structural concrete (Class S-2)	4000 psi
Grout (Class G-1)	5000 psi

The classes of concrete and grout to be used will be shown on engineering design drawings or indicated in design specifications.

J2.5.2 Reinforcing Steel

Reinforcing steel bars for concrete will be deformed bars of billet steel, confirming to ASTM A 615, Grade 60.

Welded wire fabric for concrete will confirm to ASTM A 185.

J2.5.3 Structural and Miscellaneous Steel

Structural and miscellaneous steel will generally conform to ASTM A 36, ASTM A 572, or ASTM A 992 except in special situations where higher strength steel is required.

High strength structural bolts, including nuts and washers, will conform to ASTM A 325 or ASTM A 490.

Bolts other than high-strength structural bolts will conform to ASTM A307, Grade A.

J2.5.4 Concrete Masonry

Concrete Masonry shall conform to CBC Chapter 21. All concrete masonry units shall conform to ASTM C 90 for load-bearing concrete masonry units.

Mortar will conform to ASTM C 270, Type S.

Grout will conform to ASTM C 476.

J2.5.5 Other Materials

Other materials for construction, such as anchor bolts, shear connectors, concrete expansion anchors, embedded metal, etc., will conform to industrial standards and will be identified on engineering design drawings or specifications.

J3. Mechanical Engineering Design Criteria

J3.1 Introduction

This appendix summarizes the codes, standards, criteria, and practices that will be generally used in the design and construction of mechanical engineering systems for the Mojave Solar Project. More specific Project information will be developed during execution of the Project to support detailed design, engineering, material procurement specification, and construction specifications.

J3.2 Codes and Standards

The design of the mechanical systems and components will be in accordance with the laws and regulations of the federal government, state of California, County of San Bernardino ordinances, and industrial standards. The current issue or revision of the documents at the time of the filing of this Application for Certification (AFC) will apply, unless otherwise noted. If there are conflicts between cited documents, the more conservative requirements shall apply.

The following codes and standards are applicable to the mechanical aspects of the power facility.

- California Building Code, 2007
- California Mechanical Code 2007
- California Plumbing Code 2007
- American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code
- ASME/ANSI B31.1 Power Piping Code and ASME/ANSI B31.3 Process Piping
- ASME Performance Test Codes
- ASME Standard TDP-1
- American National Institute (ANSI) B16.5, B16.34, and B133.8
- American Boiler Manufacturers Association (ABMA)
- American Gear Manufacturers Association (AGMA)
- Air Moving and Conditioning Association (AMCA)
- American Society for Testing and Materials (ASTM)
- American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE)
- American Welding Society (AWS)
- Cooling Tower Institute (CTI)
- Heat Exchange Institute (HEI)

- Manufacturing Standardization Society (MSS) of the Valve and Fitting Industry
- National Fire Protection Association (NFPA)
- Hydraulic Institute Standards (HIS)
- Tubular Exchanger Manufacturer's Association (TEMA)

J3.3 Mechanical Engineering General Design Criteria

J3.3.1 General

The systems, equipment, materials, and their installation will be designed in accordance with the applicable codes; industry standards; and local, state, and federal regulations, as well as the design criteria, manufacturing processes and procedures; and material selection, testing, welding, and finishing procedures specified in this section.

Detailed equipment design will be performed by the equipment vendors in accordance with the performance and general design requirements to be specified later by the Project A/E firm. Equipment vendors will be responsible for using construction materials suited for the intended use.

J3.3.2 Materials – General

Asbestos will not be used in the material and equipment supplied. Where feasible, materials will be selected to withstand the design operating conditions, including expected ambient conditions, for the design life of the plant. It is anticipated that some materials will require placement during the life of the plant due to corrosion, erosion, etc.

J3.3.2.1 Pumps

Pumps will be sized in accordance with industry standards. Where feasible, pumps will be selected for maximum efficiency at the normal operation point. Pumps will be designed to be free from excessive vibration throughout the operating range.

J3.3.2.2 Tanks

Large outdoor storage tanks will not be insulated except where required to maintain appropriate process temperatures or for personnel protection.

Overflow connections and lines will be provided. Maintenance drain connections will be provided for complete tank drainage.

Manholes, where provided, will be at least 24 inches in diameter and hinged to facilitate removal. Storage tanks will have ladders and cleanout doors as required to facilitate access/maintenance. Provision will be included for proper tank ventilation during external maintenance.

J3.3.2.3 Heat Exchangers

The surface condenser will be designed in accordance with Heath Exchange Institute (HEI) standards. Other heat exchangers will be provided as components of mechanical equipment packages and may be shell-and-tube or plate type. Heat exchangers will be designed in accordance with TEMA or manufacturer's standards. Fouling factors will be specified in accordance with TEMA.

J3.3.2.4 Pressure Vessels

Pressure vessels will include the following features/appurtenances:

- Process, vent, and drain connections for startup, operation, and maintenance.
- Materials compatible with the fluid being handled.
- A minimum of one manhole and one air ventilation opening (e.g., handhole) where required for maintenance or cleaning access.
- For vessel requiring insulation, shop-installed insulation clips spaced not greater than 18 inches on center.
- Relief valves in accordance with applicable codes.

J3.3.2.5 Piping and Piping Supports

Stainless steel pipe may be Schedule 10S where design pressure permits. Underground piping may be high-density polyethylene (HDPE) or polyvinyl chloride (PVC) where permitted by code, operating conditions, and fluid properties. In general, water systems piping will be HDPE or PVC where embedded or underground and carbon steel where above ground. Appropriately lined and coated carbon steel pipe may alternatively be used for buried water piping.

Threaded joint will not normally be used in piping used for lubrication oil, and natural gas service. Natural gas piping components will not use synthetic lubricants. Victaulic, or equal, coupling may be used for low-energy aboveground piping, where feasible.

Piping systems will have high-point vents and low-point drains. Drains with restricting orifices or steam traps with startup and blowdown drains and strainers will be installed in low points of steam lines where condensate can collect during normal operations.

Steam piping systems and steam drain lines in the plant will typically be sloped in the direction of steam flow. Condensate collection in piping systems will be avoided by installing automatic drain devices and manual devices as appropriate.

Steam lines fitted with restricting devices, such as orifices in the process runs, will include adequate drainage upstream of the device to prevent condensate from collecting in lines.

Hose and process tubing connections to portable components and systems will be compatible with the respective equipment suppliers' standard connection for each service.

Stainless steel piping will be used for portions of the lubricating oil system downstream of the filters. Carbon steel piping may be used elsewhere.

J3.3.2.6 Valves

J3.3.2.6.9 General Requirements

Valves will be arranged for convenience operation from floor level where possible and, if required, will have extensions spindles, chain operators, or gearing. Hand-actuated valves will be operable by one person. Gear operators will be provided on manual valves 8 inches or larger.

Valves will be arranged to close when the handwheel is rotated in a clockwise direction when looking at the handwheel from the operating position. The direction of rotation to close the valve will be clearly marked on the face of each handwheel.

The stops that limit the travel of each valve in the open or closed position will be arranged on the exterior of the valve body. Valves will be fitted with an indicator to show whether they are open or closed; however, only critical valves will be remotely monitored for position.

Valve materials will be suitable for operation at the maximum working pressure and temperature of the piping to which they are connected. Steel valves will have cast or forged steel spindles. Seat and faces will be of low-friction, wear-resistant materials. Valves in throttling services will be selected with design characteristics and of materials that will resist erosion of the valve seats when valves are operated partly closed.

Valves operating at less than atmospheric pressure will include means to prevent air in-leakage. No provision will be made to repack valve glands under pressure.

J3.3.2.6.10 Drain and Vent Valves and Traps

Drains and vents in 600-pound class or higher piping and 900°F or higher service will be double-valved.

Drain traps will include air cock and easing mechanism. Internal parts will be constructed from corrosion-resistant materials and will be renewable.

Trap bodies and covers will be cast or forged steel and will be suitable for operating at the maximum working pressure and temperature of the piping to which they are connected. Traps will be piped to drain collection tank or sumps and returned to the cycle if convenient.

J3.3.2.6.11 Low Pressure Water Valves

Low pressure water valves will be the butterfly type of cast iron construction. Ductile iron valve will have ductile iron bodies, covers, gates (discs), and bridges; the spindles, seats, and faces will be bronze. Fire protection valve will be Underwriter Laboratories (UL)-approved butterfly valves meeting NFPA requirements.

J3.3.2.6.12 Instrument Air Valves

Instrument air valves will be the ball type of bronze construction, with valve face and seat of approved wear-resistant alloy.

J3.3.2.6.13 Nonreturn Valves

Nonreturn valves for steam services will be in accordance with ANSI standards and properly drained. Non return valves in vertical positions will have bypass and drain valves. Bodies will have removable access covers to enable the internal parts to be examined or renewed without removing the valve from the pipeline.

J3.3.2.6.14 Motor-Actuated Valves

Electric motor actuators will be designed specifically for the operating speeds, differential and static pressures, process line flowrates, operating environment, and frequency of operations for the application. Electric actuators will have self-locking features. A handwheel and declutching mechanism will be provided to allow handwheel engagement at any time except when motor is energized. Actuators will automatically revert back to motor operation, disengaging the handwheel, upon energizing the motor. The motor actuator will be placed in a position relative to the valve that prevents leakage of liquid, steam, or corrosive gas from valve joints onto the motor or control equipment.

J3.3.2.6.15 Safety and Relief Valves

Safety valves and/or relief valves will be provided as required by code for pressure vessels, heaters, and boilers. Safety and relief valves will be installed vertically. Piping systems that can be over-pressurized by a higher-pressure source will also be protected by pressure-relief valves. Equipment or parts of equipment that can be over-pressurized by thermal expansions of the contained liquid will have thermal relief valves.

J3.3.2.6.16 Instrument Root Valves

Instrument root valves will be specified for operation at the working pressure and temperature of the piping to which they are connected. Test points and sample lines in systems that are 600-pound class or higher service will be double-valved.

J3.3.2.7 Heating, Ventilating, and Air Conditioning (HVAC)

HVAC system design will be based on site ambient conditions.

Except for the HVAC systems serving the control room, maintenance shop, lab areas, and administration areas, the system will not be designed to provide comfort levels for extended human occupancy.

Air conditioning will include both heating and cooling of the inlet-filtered air. Air velocities in ducts from louvers and grills will be low enough not to cause unacceptable noise level in areas where personnel are normally located.

Fans and motors will be mounted on anti-vibration bases to isolate the units from the building structure. Exposed fan outlets and inlets will be fitted with guards. Wire guards will be specified for belt-driven fans and arranged to enclose the pulleys and belts.

Air filters will be housed in a manner that facilitates removal. The filter frames will be specified to pass the air being handled through the filter without leakage.

Ductwork, filter frames, and fan casing will be constructed of mild steel sheets stiffened with mild steel flanges and galvanized. Ductwork will be the sectional bolted type and will be adequately supported. Duct joints will be leak-tight.

Grills and louvers will be of adjustable metal construction.

J3.3.2.8 Thermal Insulation and Cladding

Parts of the facility requiring insulation to reduce heat loss or afford personnel safety will be thermally insulated. Minimum insulation thickness for hot surfaces near personnel will be designed to limit the outside lagging surface temperature to a maximum of 140°F.

The thermal insulation will have as its main constituent calcium silicate, foam glass, fiber glass, or mineral wool, and will consist of pre-formed slabs or blankets where feasible. Asbestos-containing materials are prohibited. An aluminum jacket or suitable coating will be provided on the outside surface of insulation. Insulation system materials, including jacketing, will have a flame spread rating of 25 or less when tested in accordance with ASTM E 84.

Insulation at valves, pipe joints, steam traps, or other points to which access may be required for maintenance will be specified to be removable with a minimum of disturbance to the pipe insulation. At each flanged joint, the molded material will terminate on the pipe at a distance from the flange equal to the overall length of the flange bolt to permit their removal without damaging the molded insulation. Outdoor aboveground insulated piping will be clad with textured aluminum of not less than 30 mil. thickness and frame-reinforced. At the joints, the sheets will be sufficiently overlapped and caulked to prevent moisture from penetrating the insulation. Steam trap stations will be "boxed" for ease of trap maintenance.

Design temperature limits for thermal insulation will be based on system operating temperature during normal operation.

Outdoor and underground insulation will be moisture-resistant.

J3.3.2.9 Testing

Hydrostatic testing, including pressure testing at 1.5 times the design pressure, or as required by the applicable code, will be specified and performed for pressure boundary components where an in-service test is not feasible or permitted by code.

J3.3.2.10 Welding

Welders and welding procedures will be certified in accordance with the requirements of the applicable codes and standards before performing any welding. Records of welder qualifications and weld procedures will be maintained.

J3.3.2.11 Painting

Except as otherwise specified, equipment will receive the respective manufacturer's standard shop finish. Finish colors will be selected from among the paint manufacturer's standard colors.

Finish painting of uninsulated piping will be limited to that required by OSHA for safety or protection from the elements.

Piping to be insulated will not be finish-painted.

J3.3.2.12 Lubrication

The types of lubrication specified for facility equipment will be suited to the operating conditions and will comply with the recommendations of the equipment manufacturers.

The initial startup charge of flushing oil will be the equipment manufacturer's standard lubricant for the intended service. Subsequently, such flushing oil will be sampled and analyzed to determine whether it can also be used for normal operation or must be replaced in accordance with the equipment supplier's recommendations.

Rotating equipment will be lubricated as designed by the individual equipment manufacturers. Oil cups will be specified. Where automatic lubricators are fitted to equipment, provision for emergency hand lubrication will also be specified. Where applicable, equipment will be designed to be manually lubricated while in operation without the removal of protective guards. Lubrication filling and drain points will be readily accessible.

J4. Electrical Engineering Design Criteria

J4.3 Introduction

This appendix summarizes the codes, standards, criteria, and practices that will be generally used in the design and construction of electrical engineering systems for the Mojave Solar Project. More specific Project information will be developed during execution of the Project to support detailed design, engineering, material procurement specification, and construction specifications.

J4.4 Codes and Standards

The design of the electrical systems and components will be in accordance with the laws and regulations of the federal government and the State of California, local ordinances, and industry standards. The Current issue or revision of the document at the time of filing this Application for Certification will apply, unless otherwise noted. If there are conflicts between the cited documents, the more conservative requirement will apply.

The following codes and standards are applicable o the electrical aspect of the power facility:

- American National Standards Institute (ANSI)
- American Society for Testing and Materials (ASTM)
- Anti-Friction Bearing manufacturers Association (AFBMA)
- California Building Code 2007
- California Electrical Code 2007
- Insulated Cable Engineers Association (ICEA)
- Institute of Electrical and Electronics Engineers (IEEE)
- Illuminating Engineering Society (IES)
- National Association of Corrosion Engineers (NACE)
- National Electrical Code (NEC)
- National Electrical Manufacturers Association (NEMA)
- National Electrical Safety Code (NESC)
- National Fire Protection Association (NFPA)
- Underwriters Laboratories, Inc. (UL)

J4.5 Switchyard and Transformers

J4.5.1 Switchyards

The MSP consist of two independent plants. Both plants tie into the new 230kV interconnection substation (SCE owned). Each site has a steam turbine generator that will connect to the switchyard via a generator step-up transformer.

The switchyard will consist of circuit breakers for the transformers and lines to the grid, with disconnect switches one each side of the breakers. Each line will be equipped with the appropriate instrument transformers for protection and metering. Instrument transformers will also be used for generator synchronizing. Surge arresters will be provided for the outgoing lines in the area of the takeoff towers.

The switchyard will be located near the main step-up transformers and will require an overhead span for the connection.

The breakers will be of the dead tank design with current transformers on each bushing. Disconnect switches will be located on each side of the breakers to isolate the breaker, and one switch will be located at each line termination or transformer connection for isolation of the lines or transformer for maintenance. Tubular bus used on the bus will be aluminum alloy. Cable connections between the tube bus and equipment will be ACSR, AAAC, or AAC cable. Tube and cables will meet all electrical and mechanical design requirements. Instrument transformers (current and capacitive voltage transformers) will be included for protection and synchronization.

A grounding grid will be provided to control step and touch potentials in accordance with IEEE Standard 80, Safety in Substation Grounding. Metallic equipment, structures, and fencing will be connected to the grounding grid of buried conductors and ground rods, as required for personnel safety. The substation ground grid will be tied to the plant ground grid.

Lightning protection will be provided by shield wires or lightning masts. The lightning protection system will be designed in accordance with IEEE 998 guidelines.

All faults will be detected, isolated, and cleared in a safe and coordinated manner as soon as practical to ensure the safety of equipment, personnel, and the public. Protective relaying will meet IEEE requirements and will be coordinated with the utility.

Revenue metering will be provided on to record net power to or from the switchyard. Meters and a metering panel will be provided.

J4.5.2 Transformers

The generators will be connected to the 230-kV switchyards through main step-up transformers. The step-up transformers will be designed in accordance with ANSI standards C57.12.00, C57.12.90, and C57.91. The neutral point of high-voltage winding will be solidly grounded. Each main step-up transformer will have metal oxide surge arrestors connected to the high-voltage terminals and will have manual de-energized ("no-load") tap changers located in high-voltage windings.

Plant backfeed power will be provided by through step-down transformers on each site. It will be connected to a feeder breaker in the switchyard and will be metered separately.

J5. Control Engineering Design Criteria

J5.1 Introduction

This appendix summarizes the codes, standards, criteria, and practices that will be generally used in the design and installation of instrumentation and controls for the Mojave Solar Project. More specific Project information will be developed during execution of the Project to support detailed design, engineering, material procurement specification and construction specifications.

J5.2 Codes and Standards

The design specification of all work will be in accordance with the laws and regulations of the federal government, the state of California, and local codes and ordinances. A summary of general codes and industry standards applicable to design and control aspects of the power facility follows.

- American National Standards Institute (ANSI)
- American Society of Mechanical Engineers (ASME)
- The Institute of electrical and Electronics Engineers (IEEE)
- Instrumentation, Systems, and Automation Society (ISA)
- National Electrical Manufacturers Association (NEMA)
- National Electrical Safety Code (NESC)
- National Fire Protection Association (NFPA)
- American Society for Testing and Materials (ASTM)

J5.3 Control Systems Design Criteria

J5.3.1 General Requirements

Electronic signal levels, where used, will be 4 to 20 milliamps (mA) for analog transmitter outputs, controller inputs, electric-to-pneumatic converter inputs, and valve positioned inputs.

The switched sensor full-scale signal level will be between 0 volt (V) and 125 volt (V).

J5.3.2 Pressure Instruments

In general, pressure instruments will have linear scales with units of measurements in pounds per square inch, gauge (psig).

Pressure gauges will have either a blowout disc or a blowout back and an acrylic or shatterproof glass face.

Pressure gauges on process piping will be resistant to plant atmospheres.

Siphons will be installed on pressure gauges in steam service as required by the system design. Steam pressure-sensing transmitters or gauges mounted above the steam line will be protected by a loop seal.

Pressure test points will have isolation valves and caps or plugs. Pressure devices on pulsating services will have pulsation dampers.

J5.3.3 Temperature Instruments

In general, temperature instruments will have scales with temperature units in degrees Fahrenheit. Exceptions to this are electrical machinery resistant temperature detectors (RTDs) and the transformer winding temperatures, which are in degrees Celsius.

Bi-metal actuated dial thermometers will have 4.5- or 5-inch-diameter (minimum) dials and white faces with black scale markings and will consist of every angle-type. Dial thermometers will be resistant to plant atmospheres.

Temperature elements and dial thermometers will be protected by thermowells except when measuring gas or air temperature at atmospheric pressure. Temperature test points will have thermowells and caps or plugs.

RTDs will be 100-ohm platinum, 3-wire type. The element will be spring-loaded, mounted in a thermowell, and connected to a cast-iron head assembly.

Thermocouples will be Type J or K dual-element, grounded, spring-loaded, for general service. Materials of construction will be dictated by service temperatures. Thermocouple heads will be the cast type with an internal grounding screw.

J5.3.4 Level Instruments

Reflex glass or magnetic level gauges will be used. Level gauges for high-pressure service will have suitable personnel protection.

Gauge glasses used in conjunction with level instruments will cover a range that includes the highest and lowest trip/alarm set points.

J5.3.5 Flow Instruments

Flow transmitters will typically be the differential pressure-type with the range similar to that of the primary element. In general, linear scales will be used for flow indication and recording.

Magnetic flow transmitters may be used for liquid flow measurement below 200 degrees F.

J5.3.6 Control Valves

Control valves in throttling service will generally be the globe-body cage type with body materials, pressure rating, and valve trims suitable for the service involved. Other style valve bodies (e.g., butterfly, eccentric disk) may be used when suitable for the intended service.

Valves will be designed to fail in a safe position.

Control valve body size will not be more than two sizes smaller than line size, unless the smaller size is specifically reviewed for stress in the piping.

Control valves in 600-Class service and below will be flanged where economical. Where flanged valves are used, minimum flange rating will be ANSI 300 Class.

Critical service valves will be defined as ANSI 900 Class and higher in valves of sizes larger than 2 inches.

Severe service valves will be defined as valves requiring anticavitation trim, low noise trim, or flashing service, with differential pressures greater than 100 pounds per square inch (psi).

In general, control valves will be specified for a noise level no greater than 90 decibel A-rated (dBA) when measured 3 feet downstream and 3 feet away from the pipe surface.

Valve actuators will use positioners and the highest pressure, smallest size actuator, and will be the pneumatic-spring diaphragm or piston type. Actuators will be sized to shutoff against at least 110 percent of the maximum shutoff pressure and designed to function with instrument air pressure ranging from 80 to 125 psig.

Handwheels will be furnished only on those valves that can be manually set and controlled during system operation (to maintain plant operation) and do not have manual bypasses.

Control valve accessories, excluding controllers, will be mounted on the valve actuator unless severe vibration is expected.

Solenoid valves supplied with the control valves will have Class H coils. The coil enclosure will normally be a minimum of NEMA 4 but will be suitable for the area of installation. Terminations will typically be by pigtail wires.

Valve position feedback (with input to the DCS for display) will be provided for all control valves.

J5.3.7 Instrument Tubing and Installation

Tubing used to connect instruments to the process line will be stainless steel for primary instruments and sampling systems.

Instrument tubing fittings will be the compression type. One manufacturer will be selected for use and will be standardized as much as practical throughout the plant.

Differential pressure (flow) instruments will be fitted with three-valve manifolds; two-valve manifolds will be specified for other instruments as appropriate.

Instrument installation will be designed to correctly sense the process variable. Taps on process lines will be located so that sensing lines do not trap air in liquid service or liquid in gas service. Taps on process lines will be fitted with a shutoff (root or gauge valve) close to the process line. Root and gauge valves will be main-line class valves.

Instrument tubing will be supported in both horizontal and vertical runs as necessary. Expansion loops will be provided in tubing runs subject to high temperatures. The instrument tubing support design will allow for movement of the main process line.

J5.3.8 Pressure and Temperature Switches

Field-mounted pressure and temperature switches will have either NEMA Type 4 housings or housings suitable for the environment.

In general, switches will be applied such that the actuation point is within the center one-third of the instrument range.

J5.3.9 Field-Mounted Instruments

Field-mounted instruments will be of a design suitable for the area in which they are located. They will be mounted in areas accessible for maintenance and relatively free of vibration and will not block walkways or prevent maintenance of other equipment.

Field-mounted instruments will be grouped on racks. Supports for individual instruments will be prefabricated, off-the-shelf, 2-inch pipe stand. Instrument racks and individual supports will be mounted to concrete floors, to platforms, or on support steel in locations not subject to excessive vibration.

Individual field instrument sensing lines will be sloped or pitched in such a manner and be of such length, routing, and configuration that signal response is not adversely affected.

Liquid level controllers will generally be the non-indicating, displacement-type with external cages.

J5.3.10 Instrument Air System

Branch headers will have a shutoff valve at the takeoff from the main header. The branch header will be sized for the air usage of the instrument served, but will be no smaller than 3/8 inch. Each instrument air user will have a shutoff valve, filter, outlet gauge, and regulator at the instrument.

J6. Chemical Engineering Design Criteria

J6.1 Introduction

The purpose of this appendix is to summarize the general chemical engineering design criteria for the Project. These criteria form the basis of the design for the chemical components and systems of the Project. More specific design information is developed during detailed design to support equipment and erection specifications. It is not the intent of this appendix to present the detailed design information for each component and system, but rather summarize the codes, standards, and general criteria that will be used.

Subsection 2F.2 summarizes the applicable codes and standards and Subsection 2F.3 includes the general criteria for design water quality, chemical conditioning, chemical storage, and wastewater treatment.

J6.2 Design Codes and Standards

The design and specification of all work will be in accordance with the laws and regulations of the federal government and the State of California and local codes and ordinances. Industry codes and standards partially unique chemical engineering design to be used in design and construction are summarized below.

- ASME/ANSI B31.1 Power Piping Code and ASME/ANSI B31.3 Process Piping
- ASME Performance Test Code 31, Ion Exchange Equipment
- American Society for Testing and Materials (ASTM)
- California Building Code, 2007 (CBC)
- Occupational Safety and Health Administration (OSHA)
- Steel Structures Painting Council Standards (SSPC)
- Underwriters Laboratories (UL)
- American Water Works Association (AWWA)

Other recognized standards will be used as required to serve as design, fabrication, and construction guidelines when not in conflict with the above-listed standards.

The codes and industry standards used for design, fabrication, and construction will be the codes and industry standards, including all addenda, in effect as stated in equipment and construction purchase or contract documents.

J6.3 General Criteria

J6.3.1 Design Water Quality

J6.3.1.1 Mojave Solar Project Power Plant Facility Wells

Each plant will have a well to supply all general water requirements such as a process needs for the steam turbines, and auxiliary equipment.

J6.3.1.2 Demineralized Water System

The high quality demineralized water will be used for mirror washing. The demineralized water will be the highest practical quality. Minimum quality requirements for mirror cleaning water will be as follows:

- Total dissolved solids – 0.1 milligram per liter (mg/L)
- Silica as SiO_2 – 0.005 mg/L
- Specific conductance – 0.1 microsiemen per centimeter (μS/cm)
- pH – 6.5 to 7.5

J6.3.1.3 Construction Water

Water for use during construction will be supplied by the new wells drilled for plant operations or by reconditioning existing wells on the site.

J6.3.1.4 Fire Protection Water

The source of water for fire protection will be site well. The fire protection water will be stored in a service/fire water tank. The tank will have a minimum capacity of 2 hours of firewater reserved in the bottom of the tank.

J6.3.2 Chemical Conditioning

J6.3.2.1 Circulating Water System Chemical Conditioning

Condensate-feedwater chemical conditioning will consist of an oxygen scavenger and a neutralizing amine for pH control.

Boiler chemical feed is expected to consist of a mixture of disodium and trisodium phosphates to control boiler water pH and to minimize scale formation and provide boiler water buffering capacity.

J6.3.3 Chemical Storage

J6.3.3.1 Storage Capacity

Chemical storage tanks will, in general, be sized to store a maximum of 10,000 gallons.

J6.3.3.2 Containment

Chemical storage tanks containing corrosive fluids will be surrounded by curbing. Curbing and drain-piping design will allow a full-tank capacity spill without overflowing the curbing. For multiple tanks located within the same curbed area, the largest single tank will be used to size the curbing and drain piping. For outdoor chemical containment areas, additional containment volume will be included for stormwater.

J6.3.3.3 Closed Drains

Waste piping for volatile liquids and wastes with offensive odors will use closed drains to control noxious fumes and vapors.

J6.3.3.4 Coatings

Tanks, piping, and curbing for chemical storage applications will be provided with a protective coating system. The specific requirement for selection of an appropriate coating will be identified prior to equipment and construction contract procurements.

J6.3.4 Wastewater Treatment

Boiler blowdown and other plant process wastewaters will be collected and treated prior to discharge to the evaporation ponds. The majority of the wastewater will be recycled for reuse within the plant.

Sewage is handled by sanitary septic system located on each power island.

J7. Geologic and Foundation Design Criteria

J7.1 Introduction

This appendix contains a description of the site conditions and preliminary foundation-related subsurface conditions. Soil-related hazards addressed include soil liquefaction, hydrocompaction (or collapsible soils) and expansive soils. Preliminary foundation and earthwork considerations are addressed based on the result 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 code, standards, criteria, and practices that will be used in the design and construction of site and foundation engineering systems for the facility. Specific Project information has been developed to support detail design, engineering, material procurement specification and construction specifications. This information, included in a geotechnical evaluation prepared by Ninyo & Moore dated May 15, 2009 is attached in Appendix B.

J7.2 Scope of Work

The scope of services for the preparation of this appendix included an assessment of soils-related hazards, a summary of preliminary foundation and earthwork considerations, and preliminary guidelines for inspection and monitoring of geotechnical aspects of construction based on data as analyzed in Appendix B, Geotechnical Evaluation.

J7.3 Site Conditions

The proposed Project site will cover approximately 1765 acres and is located in San Bernardino County, CA, immediately southwest of Harper Dry Lake. Elevation of the site is approximately 2025-2105 feet above mean sea level. Existing soil conditions are included in Section 5.12, Soils.

J7.4 Site Subsurface Conditions

J7.4.1 Stratigraphy

Initial borings were performed and results are contained in Appendix B, Geotechnical Evaluation. Additional borings will be performed at the Project site to verify the soil consistency and characteristics during final design and construction.

J7.4.2 Seismicity/Ground-Shaking

The Project site lies within a seismically active region. Large earthquake have occurred in the past and will occur in the future. The region is influenced by the San Andreas Fault system that separates the North American and Pacific plate boundaries. This boundary has been the site of numerous large-scale earthquakes. Details of the geological setting are included in Section 5.5, Geological Hazards and Resources and in detail in Appendix B, Geotechnical Evaluation.

J7.4.3 Ground Rupture

Ruptures along the surface trace of a fault tend to occur along lines of previous faulting. The Ground rupture is caused when an earthquake event along the fault creates rupture at the surface. Details of the potential for Ground Rupture are included in Section 5.5, Geological Hazards and Resources and in detail in Appendix B, Geotechnical Evaluation.

J7.4.4 Liquefaction Potential

During strong ground-shaking, loose, unsaturated, cohesionless soils can experience a temporary loss of shear strength. This phenomenon is known as liquefaction. Liquefaction is dependent on grain size distribution, relative density of the soils, degree of saturation, and intensity and duration of the earthquake. The potential hazard associated with liquefaction is seismically induced settlement. Details of the potential for Liquefaction are included in Section 5.5, Geological Hazards and Resources and in detail in Appendix B, Geotechnical Evaluation.

J7.4.5 Groundwater

The depth to groundwater at the Project site is approximately 150 feet.

J7.5 Preliminary Foundation Considerations

J7.5.1 General Foundation Design Criteria

For satisfactory performance, the foundation of any structure must satisfy two independent design criteria. First, it must have an acceptable factor of safety against bearing failure in the foundation soils under maximum design load. 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 Geotechnical Evaluation no adverse foundation related subsurface and groundwater conditions would be encountered that would preclude the construction and operation of the proposed structures. The site is considered suitable for development of the proposed structures, pursuant to completion of final design and additional geotechnical studies as needed.

J7.5.2 Shallow Foundations

Allowable bearing pressures for shallow footings will be per recommendations of the site-specific geotechnical evaluation included in Appendix B. Issues for lateral resistance, static settlement, and mat foundations are also addressed in this evaluation.

J7.5.3 Deep Foundations

Deep foundation recommendations have been provided in the geotechnical evaluation for use with the 85 – 90 foot high transmission poles.

J7.5.4 Corrosive Potential and Ground Aggressiveness

Corrosive tests to determine the site soil to be noncorrosive or corrosive for buried steel based on the chloride content and pH values was conducted and results included in Appendix B, Geotechnical Evaluation.

J7.6 Preliminary Earthwork Considerations

J7.6.1 Site Preparation and Grading

The site preparation would include the complete removal of all vegetation and topsoil. The majority of the vegetation on the site consists of weeds and grasses with a maximum root depth of less than a foot. Topsoil can be mixed with other soils during mass grading. Complete recommendations are provided in the geotechnical evaluation in Appendix B.

J7.6.2 Temporary Excavations

All excavations should be sloped in accordance with Occupational Safety and Health Act (OSHA) requirements. Sheet piling could also be used to support any excavation. 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.

J7.6.3 Permanent Slopes

Cut and fill slopes shall be 2h:1v (horizontal to vertical) maximum.

J7.6.4 Backfill Requirements

All fill materials will be free of organic matter, debris, or clay balls, with a maximum size not exceeding 6 inches. Structural fill will also have a Plastic Index of less than 15, an Liquid Limit of less than 30, and a maximum fine content (passing the 200 sieve) of 30 percent. Granular, uniformly graded material with a maximum aggregate size of 0.5 inch may be used for pipe bedding. Based on the available size grading, it is anticipated that fill material will be available onsite.

Structural fill will be compacted to at least 95 percent of the maximum dry density as determined by American Society for Testing and Materials (ASTM) D 1557 when used for raising the grade throughout the site, below footings or mats, or for rough grading. Fill placed behind retaining structures may be compacted to 90 percent of the maximum dry density as determined by ASTM D 1557. Initially, structural fill will be placed in lifts not exceeding 8-inches loose thickness. Thicker lifts may be used pursuant to approval based on results of field compaction performance. The moisture content of all compacted fill will fall within e percent points of the optimum moisture content measured by ASTM D 1557, except the top 12 inches of subgrade will be compacted to 95 percent of ASTM D 1557 maximum density.

Pipe bedding can be compacted in 12-inch lifts to 90 percent of the maximum dry density as determined by ASTM D 1557. Common fill to be placed in remote and/or unsurfaced areas may be compacted in 12-inch lifts to 85 percent of the maximum dry density as determined by ASTM D 1557.

J7.7 Inspection and Monitoring

A California-registered Geotechnical/Civil Engineer will monitor geotechnical aspects of foundation construction and/or installation and fill placement. At a minimum the Geotechnical/Civil Engineer will monitor the following activities:

- Surface to receive fill will be inspected prior to fill placement to verify that no pockets of loose/soft or otherwise unsuitable material were left in place and that the subgrade is suitable for structural fill placement.
- Fill placement operations will be monitored by an independent testing agency. Field compaction control testing will be performed regularly and in accordance with the applicable specification to be issued by the Geotechnical/Civil Engineer.
- The Geotechnical/Civil Engineer will witness drilled shaft installation if required.
- Settlement monitoring of significant foundations and equipment is recommended on at least a quarterly basis during construction and the first year of operation, and then semi-annually for the next 2 years.

J7.8 Site Design Criteria

J7.8.1 General

The proposed Project site will cover approximately 1765 acres and is located in San Bernardino County, CA, immediately southwest of Harper Dry Lake. Elevation of the site is approximately 2025-2105 feet above mean sea level. The site slopes from West to East and South to North, with a few permanent structures including abandoned homes and an abandoned general store. Overhead power-lines exist on the site in several locations; these are remnants from previous farming activities and are no longer in use. All existing structures onsite will be removed during construction. Overhead power-lines that exist in road right-of-ways to service the area will remain.

J7.8.2 Datum

The site grade ranges from approximately 2025-2105 feet, above mean sea level, based on site surveys.

J7.9 Foundation Design Criteria

J7.9.1 General

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

Allowable soil bearing pressures for foundation design will be in accordance with this appendix and the detailed geotechnical investigation for the site.

J7.9.2 Groundwater Pressures

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

J7.9.3 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 Structural Engineering Design Criteria.

J7.9.4 Load factors and Load Combinations

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