EXHIBIT D
SUPPLEMENTAL INFORMATION FOR FOUNDATIONS, FACILITY STRUCTURES, AND MAJOR MECHANICAL AND ELECTRICAL EQUIPMENT

Exhibit D
Supplemental Information for Foundations, Facility Structures, and Major Mechanical and Electrical Equipment

There will be three types of foundations utilized on the site, they include reinforced concrete mat foundations, reinforced concrete spread footings, and pier foundations. Mat foundations will be utilized for all equipment, spread footings will be used for buildings, and pier foundations will be used to support sound walls and the bridge.

STRUCTURAL ENGINEERING DESIGN CRITERIA

Introduction

The following provides supplemental information related to the codes and standards and standard design criteria and practices that will be used in the design and construction of the structural engineering portions of the project. These criteria form the basis of the design for the structural components and systems of the project. More specific design information will be developed during detailed design to support equipment procurement and construction specifications.

Design Codes and Standards

The design and specification of work shall be in accordance with all applicable laws and regulations of the federal government, the state of California, and with the applicable local codes and ordinances. Codes and industry standards to be used in the design and construction include:

- California Building Code (CBC) 2007
- International Building Code (IBC) 2006
- American Society of Civil Engineers (ASCE) 7-05
- American Concrete Institute (ACI) 318-05
- American Concrete Institute (ACI) 301-05
- American Concrete Institute (ACI) 315-99
- American Institute of Steel Construction (AISC) Steel Construction Manual, 13th Addition
- American Society for Testing and Materials (ASTM)
- The American National Standards Institute (ANSI).
- Concrete Reinforcing Steel Institute (CRSI)
- American Welding Society (AWS)
- Steel Structures Painting Council (SSPC)
- Federal and California Occupational Safety and Health Administration (OSHA and CALOSHA).
- National Fire Protection Association Standards (NFPA).

Datum

The finished grade of the facility will be approximately 420 ft. above MSL.

Frost Penetration
The 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 2'-0" below the finished grade.

DESIGN LOADS

Design loads for all structures will be determined according to the criteria described below, unless the applicable building code requires more severe design conditions.

Dead Loads
Dead loads will consist of the weights of the structure and all equipment of a permanent or semi-permanent nature including tanks, bins, wall panels, partitions, roofing, piping, drains, electrical trays, bus ducts, and the contents of tanks and bins measured at full operating capacity.

Live Loads
Live loads will consist of uniform live loads and equipment live loads. Uniform live loads are assumed unit loads which are sufficient to provide for movable and transitory loads, such as the weight of people, portable equipment and tools, planking and small equipment. Equipment live loads are calculated loads based upon the actual weight and size of the Uniform live loads will be in accordance with CBC, but will not be less than the following:

a. Roofs 20 psf
   All roof areas will be designed for wind loads as indicated by the CBC. All roof areas will be designed for a minimum of 20 psf live load in addition to calculated dead loads.

b. Floors and Platforms (Steel grating) 100 psf
   In addition, a uniform load of 20 psf will be used to account for piping and cable tray.

c. Pipe Racks 100 psf
   Pipe racks are designed using the actual pipe loads.

g. Hand Railings
   Hand railings will be designed for 200 pound concentrated load applied at any point and in any direction, whichever governs.

h. Slabs on Grade 100 psf
   Ground floor slabs will not be subject to large equipment loads. Any equipment located on the ground floor will be supported by a separate foundation.

Wind Loads
The design wind speed will be 85 miles per hour based on CBC. This design wind speed will be used to determine wind loads for all structures.

Seismic Loads
The plant site is located in Site Class D, as determined from the Geotechnical Report dated December 17, 2007 by Professional Service Industries INC. Seismic loads will be determined in accordance with the requirements of the CBC.

Earth Pressures
Earth pressures will be in accordance with the recommendations contained in the project-specific "Final Geotechnical Investigation" prepared by Professional Service Industries Inc. dated December 17, 2007.

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

Load Combinations
Load combinations used in design are per the CBC and AISC.

CONCRETE

Concrete Materials
The materials described below will be specified and used as a basis for design.
• Reinforcing Steel.
Reinforcing steel shall meet the requirements of ASTM A615 Grade-60. Welded wire fabric for concrete will conform to ASTM A185.
• Cement.
Cement used in all concrete mixes will be Portland type V cement meeting the requirements of ASTM C150.
• Aggregates.
Fine aggregates will be clean natural sand. Coarse aggregates will be crushed gravel or stone. All aggregates shall meet the requirements of ASTM C33.
• Admixtures.
Plasticizers and retarders will be used to control setting time and to obtain optimum workability. Air entrainment of 5 to 7 percent by volume will be used in all concrete mixes.
• Water.
Clean water of potable quality shall be used in all concrete.

Mixes
The design compressive strength (f'c) of concrete and grout, as measured at 28 days, will be as follows:
Structural concrete and nonstructural concrete 4500 psi
Grout 5000 psi

Concrete Tests
Quality control testing of concrete will be performed by an independent laboratory and will consist of the following.

• Preliminary Review. Before concrete mixes are designed, the source and quality of materials will be determined and the following reports will be submitted.
− The type, brand, manufacturer, composition, and method of handling (sack or bulk) of cement.
− The type, source, and composition of fly ash.
− The classification, brand, manufacturer, and active chemical ingredients of all admixtures.
− The source of coarse aggregates and test reports to verify compliance with ASTM C33.
− The source of fine aggregates and test reports to verify compliance with ASTM C33.
− The results of tests to determine compliance of admixtures with appropriate ASTM requirements.
• Design Mix Tests.
Concrete will be proportioned to provide an average compressive strength as prescribed in the CBC. Documentation that proposed concrete proportions will produce an average compressive strength equal to or greater than required average compressive strength will be established based on trial mixtures in accordance with CBC.
• Field Control Tests.
Field control tests will include the following.
− Aggregate gradation. Each 500 tons of fine aggregate and each 1,000 tons of coarse aggregate will be sampled and tested in accordance with ASTM D75 and C136.
− Slump.
A slump test will be made from each of the first three batches mixed each day. An additional test will be made for each 50 cubic yards placed in any one day.
− Air content. An air content test will be made from one of the first three batches mixed each day and from each batch of concrete from which compression test cylinders are made. Air content tests will be in accordance with ASTM C231.
− Compression tests. One set of four concrete test cylinders will be made each day. Additional sets will be made depending on the amount of concrete placed each day. For each additional 100 cubic yards of each class, or major fraction thereof, placed in any one day, four additional sets of cylinders will be made. One cylinder of each set will be tested at an age of seven days, two cylinders of each set will be tested at 28 days, and one cylinder shall be stored until otherwise directed. Compression tests will be in accordance with ASTMC39.

Reinforcing Steel Test
Mill test reports certifying that reinforcing steel is in accordance with ASTM and project specifications will be required.

STRUCTURAL STEEL

Steel framed structures will be designed in accordance with the CBC and the AISC Steel Constructions Manual. In addition, steel framed structures will be designed in accordance with the criteria discussed in the following subsections.

Steel Materials
Structural steel shapes, plates, and appurtenances for general use will conform to ASTM A36 or A992 grade 50. Connection bolts will conform to ASTM A325. Connections will conform to AISC. Welding electrodes will be as specified by the AWS. All structural steel will be shop primed after fabrication. Exterior structural steel may be hot dipped galvanized in lieu of prime painted.

Tests
Mill test reports or reports of tests made by the fabricator will be required certifying that all material is in conformance with the applicable ASTM specification. In addition, the fabricator will provide an affidavit stating that all steel specified has been provided at yield stresses in accordance with the drawings and the specification.

Design
All steel framed structures will be designed as “rigid frame” or “simple” space frames, utilizing single span beam systems, vertical diagonal bracing at main column lines, and horizontal bracing at the roof and major floor levels. Connections will be in accordance with AISC. Connections will be designed with bolts for bearing type joints with threads in shear plane except where connections are required to be slip-critical.
Larger diameter bolts may be used to develop larger capacity connections or elsewhere as determined by the engineer.

Seismic Design Criteria
This section provides the general criteria and procedures that will be used for seismic design of structures, equipment, and components.
The project site is located in Site Class D according to the CBC. The seismic performance objectives for this facility are as follows.
• Resist minor levels of earthquake ground motion without damage.
• Resist moderate levels of earthquake ground motion without structural damage, but possibly experience some nonstructural damage.
• Resist major levels of earthquake ground motion without collapse, but possibly with some structural as well as nonstructural damage. To achieve these objectives and to meet the requirements of the CEC and local codes, the facility will be designed in accordance with the CBC. All structures, equipment internals, and components will be separated from adjoining structures.

Buildings and Structures
The seismic class used for this site will be Class D as determined from the CBC using an Importance Factor of 1.25.

STRUCTURAL DESIGN METHODOLOGY

This section describes the structural aspects of the design of the proposed facility.
Each major structural component of the plant is addressed by defining the design criteria and analytical techniques that will be employed.

Combustion Turbine Foundations
The combustion turbine foundations will be designed to support the turbine and generator components. The foundation will be designed to resist the loadings furnished by the manufacturer and will be constructed of reinforced concrete.

Foundation loads will be furnished by the combustion turbine manufacturer and will be superimposed with loads for the foundation itself. Typical loading data supplied by the manufacturer include the following.
• Dead loads
• Live loads
• Wind loads from project specific criteria
• Seismic loads from project specific criteria
• Temperature and pressure loads
• Dynamic operating loads
• Emergency loads such as turbine accident loads
The combustion turbine and associated equipment will be securely anchored to the foundation using cast-in-place steel anchor bolts or sleeved through-bolts designed to resist the equipment forces. The foundation will be designed and constructed as a monolithic reinforced concrete mat. The foundation design will address the following considerations:
• Soil bearing capacities and earth pressures
• Allowable settlements
• Equipment, structure, and environmental loads
• Natural frequencies of rotating equipment
• Access and maintenance
• Equipment performance criteria
• Dynamic effects of the rotating machinery

Exhaust Duct and SCR Foundation
The exhaust duct and SCR foundation will be designed to support the exhaust duct and SCR catalyst structures and associated equipment. The foundation will be designed to resist the loadings furnished by the manufacturer and will be constructed of reinforced concrete.

Foundation loads will be furnished by the exhaust duct manufacturer and will be superimposed with loads for the foundation itself. Typical loading data supplied by the manufacturer include the following:
• Dead loads
• Live loads
• Wind loads
• Seismic loads
• Temperature and pressure loads

The exhaust duct and SCR and associated equipment will be securely anchored to the foundation using cast-in-place steel anchor bolts designed to resist the equipment forces. The foundation will be designed and constructed as separate reinforced concrete mat foundations for each component of the exhaust duct and SCR. The foundation design will address the following considerations:

- Soil bearing capacities and earth pressures
- Allowable settlements
- Equipment, structure, and environmental loads
- Access and maintenance
- Equipment performance criteria

Stack and Foundation

The stacks will be carbon steel stacks supported on a reinforced concrete mat foundation. The height of the stacks will be approximately 80 feet and each will be approximately 12 feet in diameter.

Foundation loads will be determined using project specific design criteria.
The design of the stack and foundation will include the following loads:

- Dead loads
- Live loads
- Wind loads
- Seismic loads
- Temperature and pressure loads

The stack will be securely anchored to the foundation using cast-in-place steel anchor bolts designed to resist the foundation and stack induced forces. The steel stack will resist lateral loading as a fixed base cantilevered structure. The foundation will be designed and constructed as a monolithic reinforced concrete mat. The foundation design will address the following considerations.

- Soil bearing capacities and earth pressures
- Allowable settlements
- Structure and environmental loads

Buildings

The various plant site buildings will provide support, enclosure, protection, and access to the systems contained within its boundaries. Prefabricated metal buildings (packaged to include exterior doors, windows, and related enclosure components) will be furnished for building enclosures.

Building enclosures will be of manufacturer's standard modular rigid frame construction with tapered or uniform depth rafters rigidly connected at ends to pinned-base tapered or uniform depth columns. Purlins and girts will be cold-formed "C" or "Z" sections conforming to "Specifications for Design of Cold-Formed Steel Structural Members" of American Iron and Steel Institute. All primary structural steel shall be fabricated from 50 ksi steel, all other members will be of ASTM A36 hot rolled shapes. Roof slopes will be

approximately 1-inch rise per 12 inches of run. Metal roof coverings will be of prefinished standing seam panels of 26-gauge.
Building foundation loads will be determined from the analysis and design of the superstructure and from the support of the equipment contained within the structure. The following loads will be considered.
• Dead loads
• Live loads
• Equipment and piping loads
• Wind loads
• Seismic loads

Each building and associated major equipment will be securely anchored to the foundation using cast-in-place steel anchor bolts designed to resist any induced forces. The foundation system will likely be comprised of spread footings at the column locations with grade beams around the perimeter of the building. The foundation design will address the following considerations.
• Soil bearing capacities and earth pressures
• Allowable settlements
• Equipment, structure, and environmental loads
• Access and maintenance
• Equipment performance criteria

Gas Compressor Foundations
The gas compressor foundations will be designed to support the gas compressor and its components. The foundation will be designed to resist the loadings furnished by the manufacturer and will be constructed of reinforced concrete.

Foundation loads will be furnished by the gas compressor manufacturer and will be superimposed with loads for the foundation itself. Typical loading data supplied by the manufacturer include the following.
• Dead loads
• Live loads
• Wind loads from project specific criteria
• Seismic loads from project specific criteria
• Temperature and pressure loads
• Dynamic operating loads
• Emergency loads such as turbine accident loads
The gas compressor and associated equipment will be securely anchored to the foundation using cast-in-place steel anchor bolts designed to resist the equipment forces. The foundation will be designed and constructed as a monolithic reinforced concrete mat. The foundation design will address the following considerations:
• Soil bearing capacities and earth pressures
• Allowable settlements
• Equipment, structure, and environmental loads
• Natural frequencies of rotating equipment

• Access and maintenance
• Equipment performance criteria
• Dynamic effects of the rotating machinery

Vertical, Cylindrical Field Erected Water Storage Tanks
The vertical, cylindrical, field erected water storage tanks will generally be of carbon steel construction with a protective interior coating. The tank roof will be of the self-supported dome type. The tank bottom will be ground supported, flat bottomed. The tank will be provided with ladders, landing platforms, and handrails as required to provide access to all working areas. Vents, manholes, overflow piping, and grounding lugs will also be provided as necessary. The foundation will be designed to resist the loadings furnished by the manufacturer and will be constructed of reinforced concrete.

Foundation loads will be determined using project specific design criteria. The design of the tank and foundation will include the following loads:
• Dead loads
• Live loads
• Wind loads
The storage tanks will be securely anchored to the foundation using epoxy steel anchor bolts. The storage tanks will resist lateral loading through shear in the tank walls. Overturning will be resisted by anchor bolts connecting the tank wall to the foundation. The foundation will be designed and constructed as a monolithic reinforced concrete mat foundation. The foundation design will address the following considerations:
• Soil bearing capacities and earth pressures
• Allowable settlements
• Tank structure and environmental loads
• Access and maintenance

Horizontal, Cylindrical, Shop Fabricated Storage Tanks
Construction and material are yet to be determined. The foundation will be designed to resist the loadings furnished by the manufacturer and will be constructed of reinforced concrete.

Foundation loads will be furnished by the tank manufacturer and will be superimposed with loads for the foundation itself. Typical loadings supplied by the manufacturer include the following:
• Dead loads
• Live loads
• Wind loads
• Seismic loads
• Temperature and pressure loads
The tanks will be securely anchored to the foundation using cast-in-place steel anchor bolts designed to resist all induced forces. The foundation will be designed and constructed as a monolithic reinforced concrete mat. The foundation design will address the following considerations:
• Soil bearing capacities and earth pressures

• Allowable settlements
• Tank structure and environmental loads
• Access and maintenance

Transformers

The foundation will be designed to resist the loading furnished by the manufacturer and will be constructed of reinforced concrete.

Foundation loads will be furnished by the transformer manufacturer and will be superimposed with loads for the foundation itself. Typical loadings supplied by the manufacturer include the following.
• Dead loads
• Live loads
• Wind loads
• Seismic loads

Transformers will be securely anchored to the foundation using cast-in-place steel anchor bolts designed to resist all induced forces. The transformer will be regarded as a rigid body for foundation design purposes. The foundation will be designed and constructed as a monolithic reinforced concrete mat. The foundation design will address the following considerations:
• Soil bearing capacities and earth pressures
• Allowable settlements
• Tank structure and environmental loads
• Access and maintenance

The foundations will incorporate an interconnected integral containment basin capable of holding 125 percent of the transformer coolant contents.

Miscellaneous Equipment

Where possible, all miscellaneous equipment will be designed to project specific criteria. This miscellaneous equipment includes, but is not limited to, motor control centers, batteries, low voltage power and lighting systems, isolated bus ducts, pumps, lube oil cooling units, fire detection and protection systems, and switchgear. Standardized components such as motors, pumps, small fans, and other similar products that represent manufacturers' standard stock items will not be designed to meet project specific seismic loading criteria. Miscellaneous equipment will meet all applicable codes and standards as well as the individual manufacturer's standards. All equipment foundations and supports will be designed to resist project specific loading and the loading furnished by the equipment manufacturer.

Foundation loads will be furnished by the equipment manufacturers and will be superimposed with loads for the foundation itself. Typical loadings supplied by the manufacturer include the following.
• Dead loads
• Live loads
• Wind loads

• Seismic loads
• Temperature and pressure loads (as applicable)

All miscellaneous equipment will utilize steel anchor bolts, fasteners, welds, and other equipment anchorage devices to resist equipment induced forces. Each individual piece of equipment will have its own unique structural system, and it is the responsibility of each manufacturer to assure its adequacy. The foundation will be designed and constructed as a monolithic reinforced concrete mat. The foundation design will address the following considerations:

• Soil bearing capacities and earth pressures
• Allowable settlements
• Tank structure and environmental loads
• Access and maintenance