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SECTION ACRONYMS/ABBREVIATIONS

ACRONYM/ ABBREVIATION	DEFINITION
AQIA	Air Quality Impact Analysis
AFY	Acre-Feet Per Year
CCR	California Code of Regulations
CEMS	Continuous Emission Monitoring System
CFC	Chlorofluorocarbons
CO	Carbon Monoxide
CO2	Carbon Dioxide
CTG	Combustion Turbine Generator
CUPA	Certified Unified Program Agency
DPLU	Department of Planning and Land Use
EDI	Electro Deionization
HHV	Higher Heating Value
IES	Illuminating Engineering Society of North America
LHV	Lower Heating Value
LORS	Laws, Ordinances, Regulations, and Standards
MMBtu/hr	Million British Thermal Units Per Hour
NAAQS	National Ambient Air Quality Standards
NFPA	National Fire Protection Association
NOx	Nitrogen Oxides
NPDES	National Pollutant Discharge Elimination System
O2	Oxygen
PCS	Plant Control System
PM10	Particulate Matter of 10 µm or Less in Diameter
PPE	Personal Protective Equipment
ppmvd	Parts Per Million Volume Dry
Project	Subject of this SPPE Application, Orange Grove Project
Property	202-acres owned by SDG&E intended to be used as the Project Site
RFO	Request for Offers
RMP	Risk Management Plan
RMWD	Rainbow Municipal Water District
RO	Reverse Osmosis
SCR	Selective Catalytic Reduction
SDAPCD	San Diego Air Pollution Control District
SDG&E	San Diego Gas & Electric

ACRONYM/ ABBREVIATION	DEFINITION
SOx	Sulfur Oxides
SPCC	Spill Prevention, Control and Countermeasures
SPPE	Small Power Plant Exemption
SWPPP	Storm Water Pollution Prevention Plan
VOC	Volatile Organic Compounds

2.0 PROJECT AND FACILITY DESCRIPTION

2.1 INTRODUCTION

This Small Power Plant Exemption (SPPE) Application is for construction and operation of the Orange Grove Project (Project) described in this Section. The Project will supply San Diego Gas and Electric Company (SDG&E) with new generating capacity to support reliability within the service territory. Orange Grove Energy, L.P. (Orange Grove Energy) will be responsible for construction of the power plant and the electric transmission line interconnection between the power plant and the substation boundary. Orange Grove Energy will operate the plant, which will employ up to 6 full-time site positions.

The natural gas line lateral will be constructed, owned and operated by SDG&E between the existing gas transmission pipeline and an onsite metering station. Natural gas fuel will be supplied by SDG&E, and electric power generated will be supplied to SDG&E under a tolling agreement. The water line lateral will be constructed, owned and operated by Rainbow Municipal Water District (RMWD) between the existing water main and the Site boundary.

The Orange Grove Project objective is to respond to the SDG&E request for offers (RFO) for new local electric capacity in an environmentally responsible and economically feasible manner. The purpose of this Project is to assure reliable electric power for the public as described in Section 1.2.

The Project is described in detail in the following sections:

- Section 2.2 - Site Location and Layout
- Section 2.3 - Process Description
- Section 2.4 - Operations and Emissions
- Section 2.5 - Fuel Requirements and System
- Section 2.6 - Water Supply and Use
- Section 2.7 - Wastewater and Storm Water
- Section 2.8 - Hazardous Materials Management
- Section 2.9 - Plant Auxiliaries
- Section 2.10 - Reliability and Safety Systems
- Section 2.11 - Electrical Systems and Interconnection
- Section 2.12 - Plant Controls
- Section 2.13 - Project Construction
- Section 2.14 - Project Design and Construction LORS
- Section 2.15 - Permits

2.2 SITE LOCATION AND LAYOUT

The power plant Site is located in north San Diego County, approximately 3.5 (air) miles northeast of I-15 on SR-76, approximately two miles west of the community of Pala (Figures 2.2-1 and 2.2-2). The approximately 8.5 acre Site is situated within an approximately 202-acre property (Property) owned by SDG&E (Figure 2.2-3). The Site is located off of Pala Del Norte Road, a private road accessed from SR-76.

The Site occurs on an alluvial fan surface that slopes southward at an average grade of approximately 10 percent. The Project will be constructed on lands that have already been disturbed by agriculture. The Site was used as a citrus grove, but the grove has not been maintained in at least five years. Linear facilities for the Project will also be located in areas that are already disturbed, so the Project will result in no new ground disturbance.

The existing SDG&E Pala Substation is located on a contiguous SDG&E parcel south of the Site.

The maximum (construction) Project disturbance is identified in Table 2.2-1. As shown, Project construction will disturb a total of approximately 15.8 acres; 8.5 acres onsite and 7.3 acres adjacent to the Site. These acreages do not include areas where linear facilities will be trenched in existing roads or other urban surfacing. Native planting will occur following construction so that the long-term disturbance for the Project will be only approximately 5 acres and there will be a net increase in native habitat area. Additional details are provided in the following sections.

Table 2.2-1 - Estimated Construction Footprint

FACILITY/ITEM	ESTIMATED CONSTRUCTION DISTURBANCE FOOTPRINT
Onsite Facilities	8.5 Acres
Project Driveways (2)	1.2 Acres
Linear Facilities	0.3 Acres
Construction Laydown Area	5.8
TOTAL	15.8 Acres

2.2.1 Site Arrangement

The preliminary Site layout is shown in Figure 2.2-4. Elevation views are provided in Figures 2.2-5 and 2.2-6. The plant design includes two GE LM6000 PC SPRINT combustion turbine generators (CTG) with integrated combustion inlet air chiller package, exhaust ducting, oxidation and selective catalytic reduction (SCR) emission control systems, continuous emission monitoring system (CEMS), fuel gas compression equipment, black-start generator, and water storage and treatment facilities. A gas metering station will be located in the eastern portion of the Site, where gas will be supplied by SDG&E via the proposed gas pipeline lateral to be constructed for the Project. A 69-kV take-off structure will be installed near the western end of

the Site and power will be delivered from the Project to the existing Pala Substation via underground cabling.

The Project will connect to the 69-kV bus at the existing Pala Substation located on a contiguous parcel to the south. Additional switches serving the Project will be installed in the Pala Substation and will connect to the Project main transformers via approximately 0.2 mile of underground transmission cable and conduit routed as shown in Figure 2.2-7.

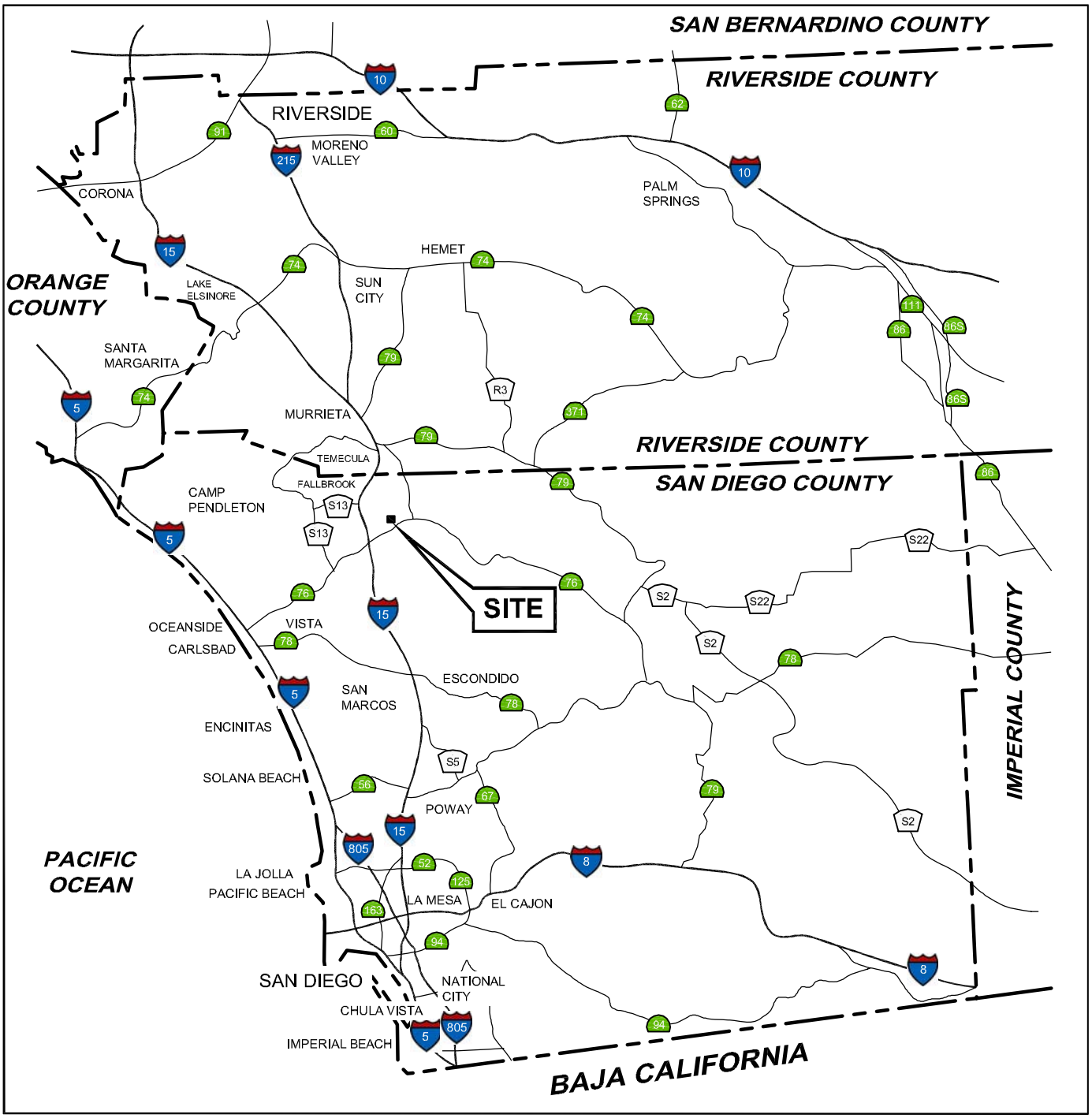
2.2.2 Site Elevation, Grading, and Drainage

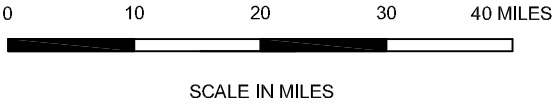
The preliminary Site Landscaping Plan and preliminary Site Grading and Drainage Plan are shown in Figures 2.2-8 and 2.2-9, respectively. Cut and fill earthwork will occur to grade a building pad for the power plant. Earth will be borrowed from the higher, northern side of the Site and placed on the lower, southern side. Earthwork volumes will balance so that fill will not be required from an off-site location, and so that soil will not need to be trucked off site. The final grade elevation for the plant will be approximately 410 feet above sea level. The areas inside the security fence will be graded to direct drainage away from equipment and buildings at slopes of approximately 0.5% to 1.0% or nearly level.

The Site is situated on a gentle slope with diverging sheet flow and a small up gradient watershed area, so there will be minimal run-on to the Site area. A diversion ditch sized for the 100-year, 24-hour storm will be constructed at the north edge of the plant to control drainage from off site and minimize run-on. Flow will be directed around the west side of the plant. The plant area is surfaced with crushed rock for reasons concerning electrical safety, but it also improves the drainage characteristics of the property by slowing the run-off flow velocity. Plant drainage will be directed to area inlets and piped to a storm water retention/detention basin. Unless otherwise dictated by the County, project drainage conveyance systems will be designed for the 25-year, 24-hour storm event in the pipe, with a 100-year storm overflow.

Storm water controls will be constructed to comply with County standards and specifications as described in detail in Section 6.5, Water Resources. The storm water retention/detention basin will be located on the south, downhill side of the Site. The basin will be sized to retain runoff from the 50-year storm event or as otherwise required by the County. Hydrology and hydraulics evaluations for final design will include analysis of the 100-year storm to assure that runoff is controlled and will meet County performance criteria (See Section 6.5). During detailed design, soil percolation rates will be investigated to determine if the size of the storm water basin can be reduced to account for infiltration.

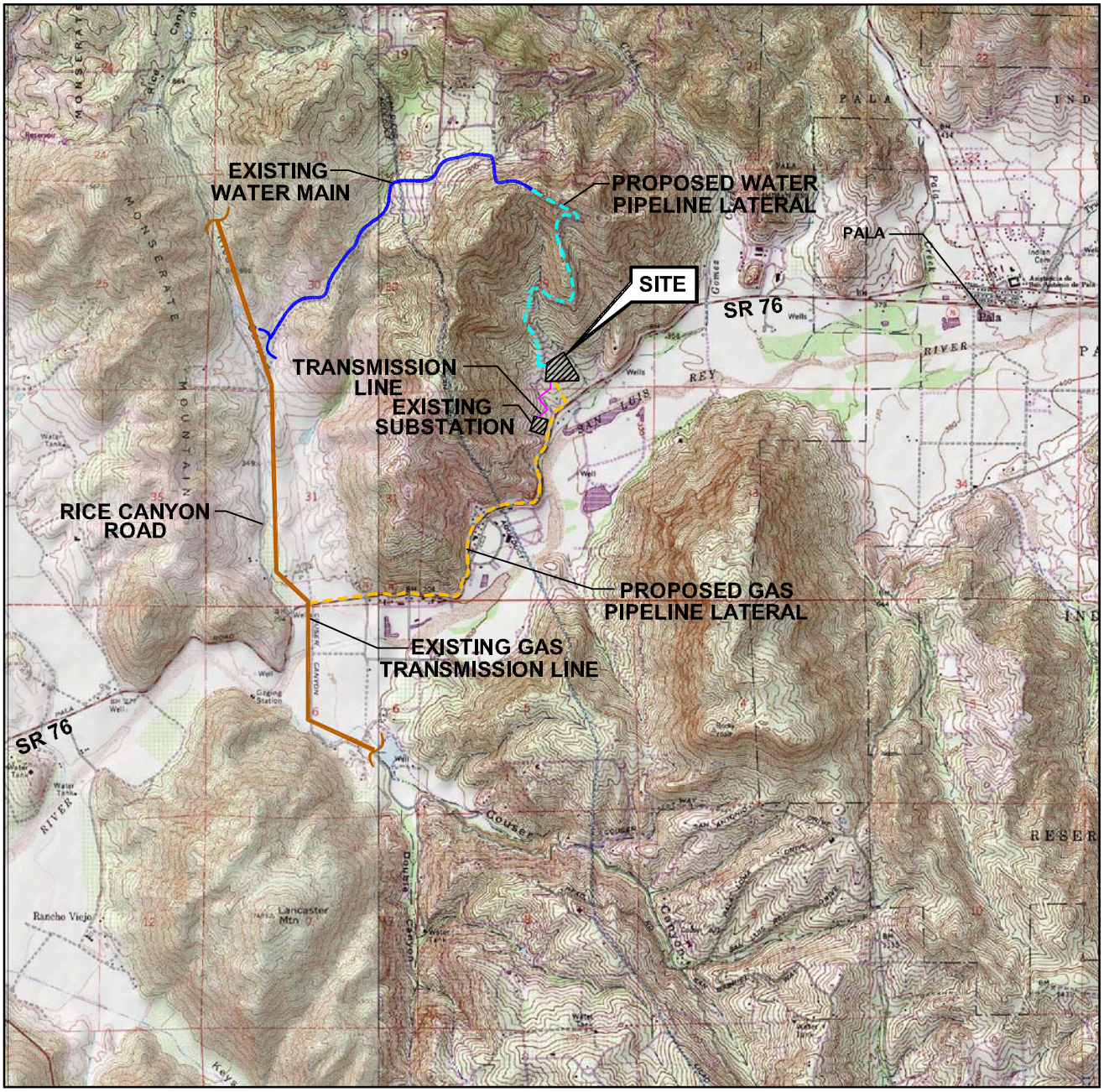
A Drainage Area Map, C400, is shown in Figure 2.2-10. It outlines the proposed runoff coefficients and acreages. In addition, it details pre-development flows and proposed post-development flows for selected stormwater structures and preliminary volumes for the proposed retention/detention basin.





TRC	PROJECT: 29031902	SITE LOCATION MAP
	FACILITY: ORANGE GROVE PROJECT SAN DIEGO COUNTY, CALIFORNIA	FIGURE 2.2-1

MS=1:1 L:\Graphics\ProjectsByNumber\29-xxxx\29-0319\290319 Location.dwg Jul 16, 2007 - 10:47am RCollins



N

0 1/2 1 1 1/2 2 MILES

SCALE 1:48,000

SOURCE:

United States Geological Survey
7.5 Minute Topographic Map, 2000:
Pala, Bonsall, Temecula,
and Pechanga Quadrangles

TRC

PROJECT: 29031902

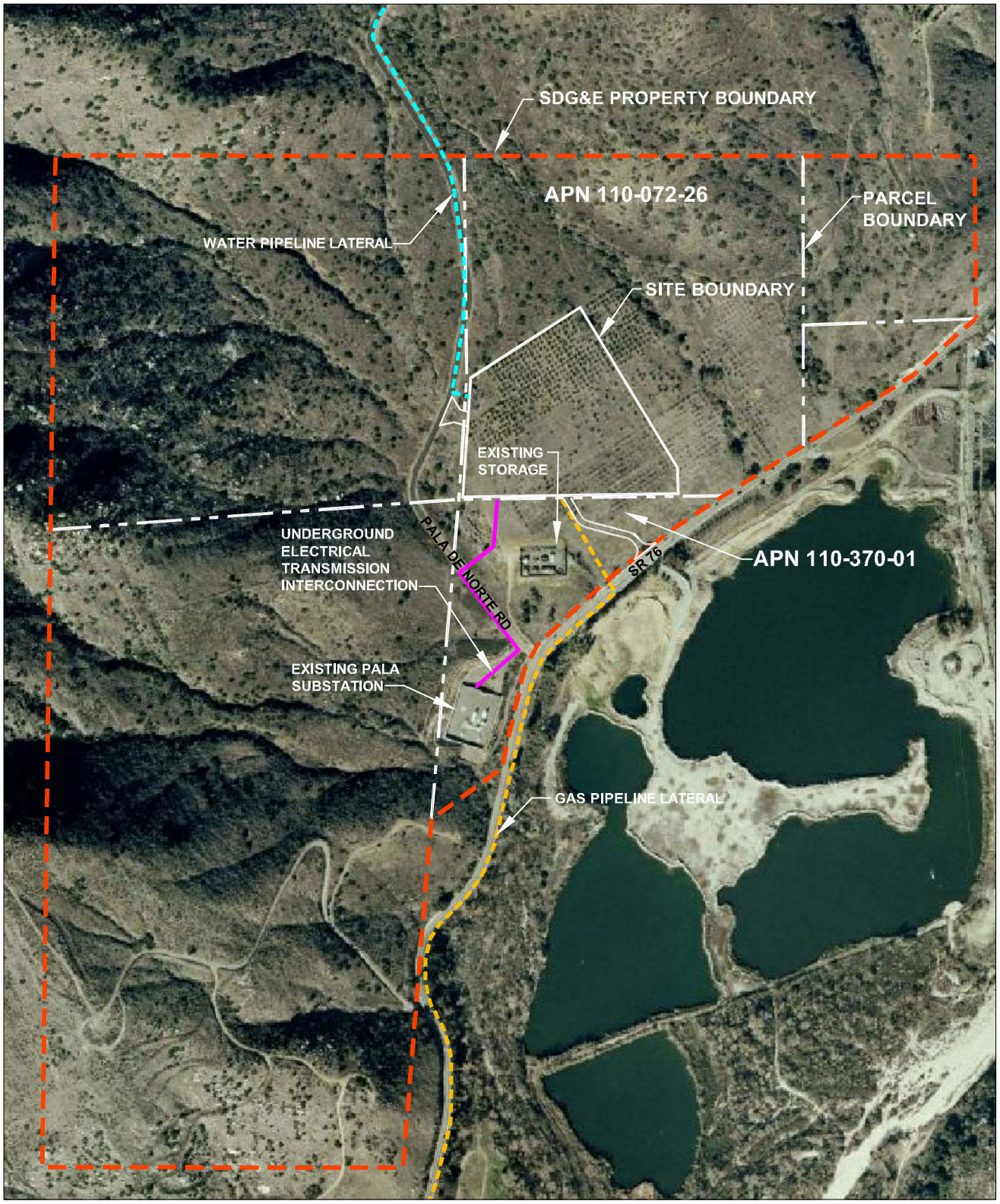
FACILITY:

ORANGE GROVE PROJECT
SAN DIEGO COUNTY, CALIFORNIA

PROJECT VICINITY MAP

FIGURE 2.2-2

PS=1:1 L:\Graphics\ProjectsByNumber\29-xxxx\29-03191\2903 19 Vicinity.dwg Jun 29, 2007 - 4:03pm RCollins



SOURCE:

Virtual Earth, 2006.

APPROXIMATE SCALE (FEET)

0 600 1200

TRC	PROJECT: 125158	SITE AND PROPERTY BOUNDARY
	FACILITY: ORANGE GROVE PROJECT SAN DIEGO COUNTY, CALIFORNIA	FIGURE 2.2-3

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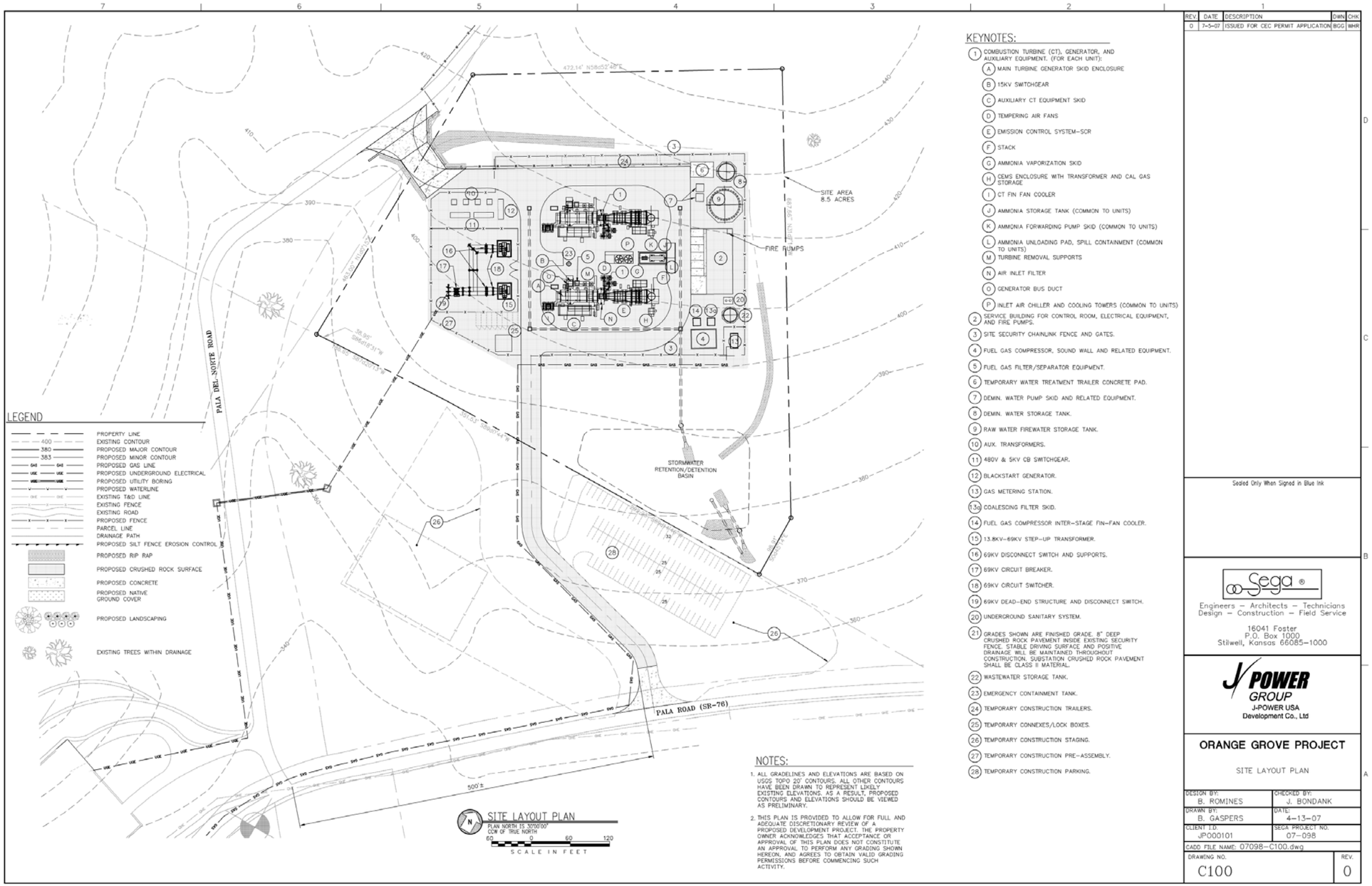
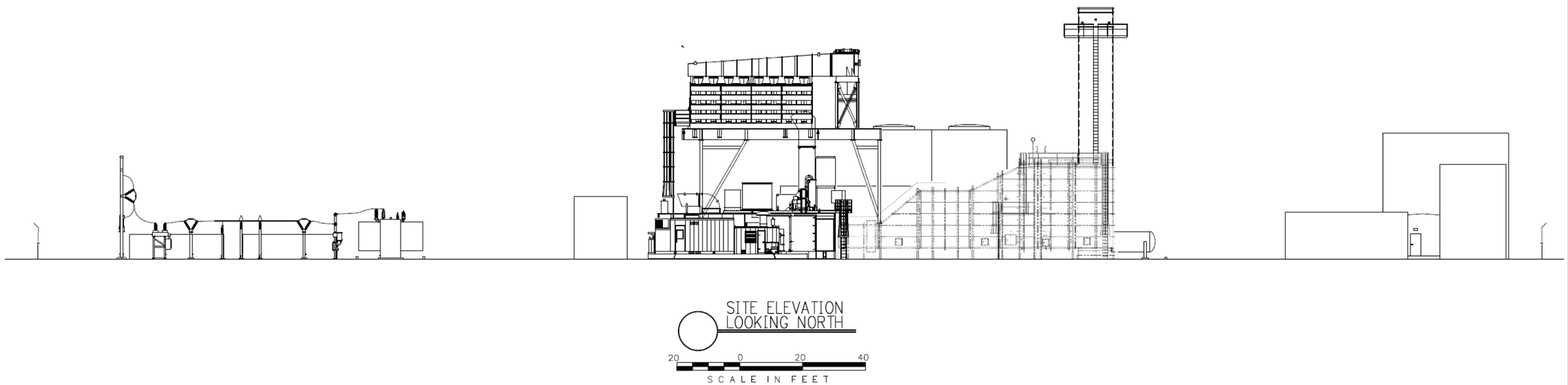
Figure 2.2-4 – Site Layout Plan (C100)



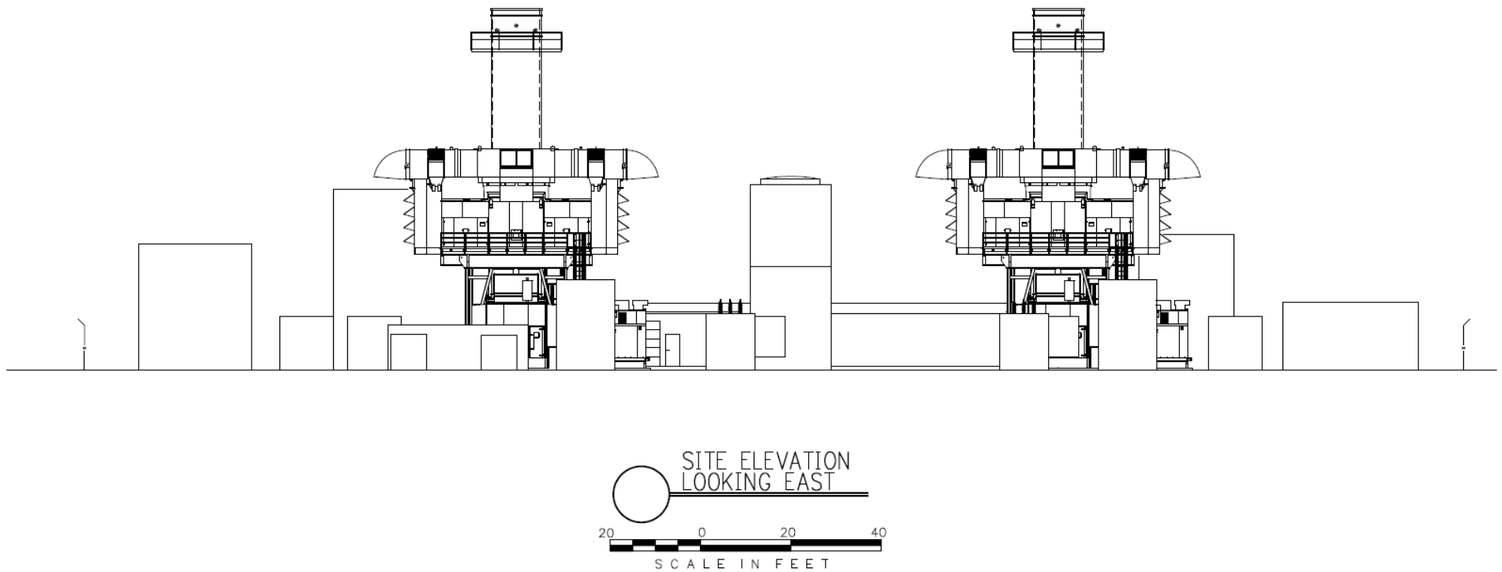
Source: Sega, Inc. – Drawing C100, June 18, 2007

Figure 2.2-5 – Facility Elevation View (GA100 - Looking North)



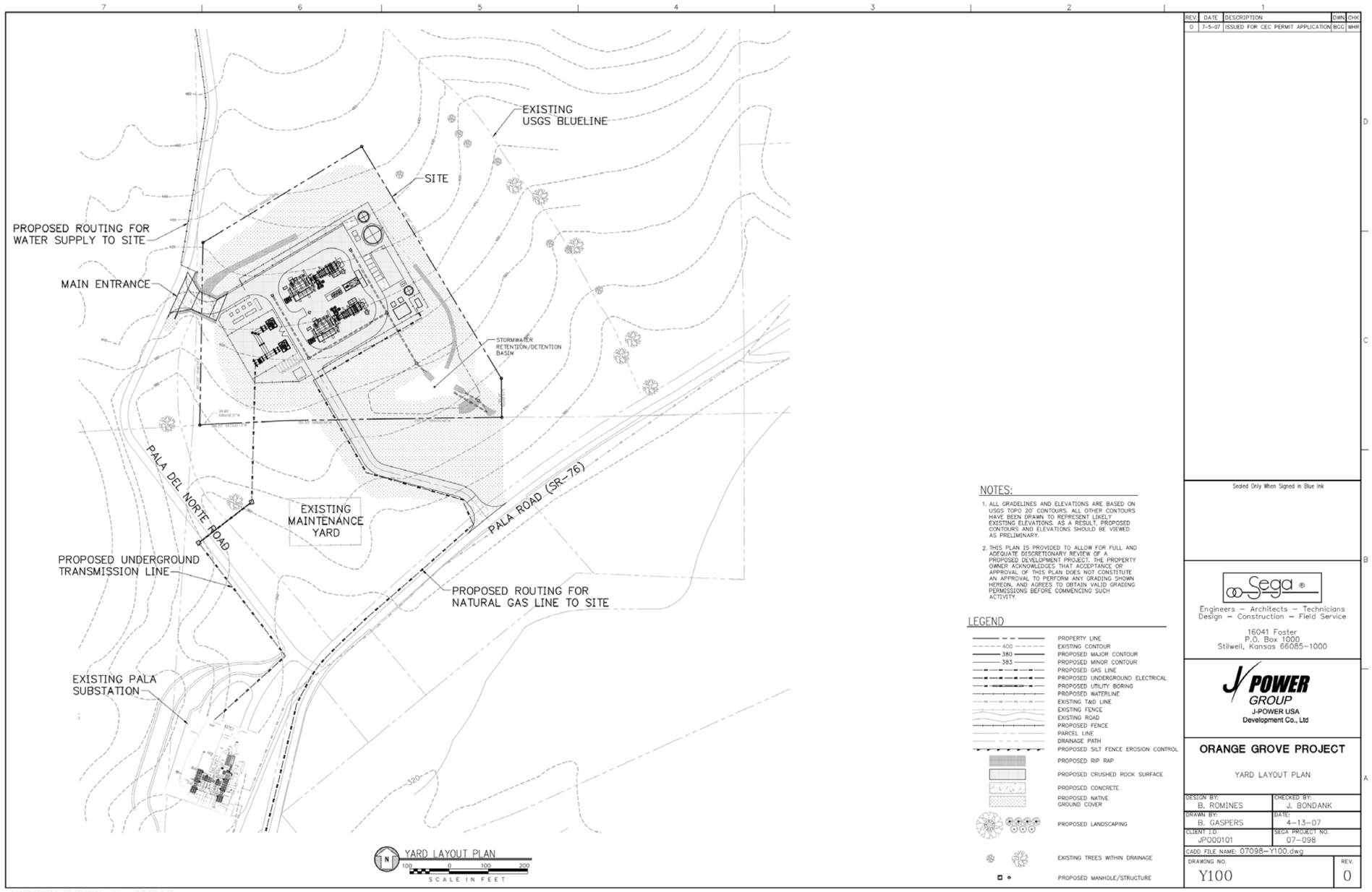
Source: Sega, Inc. – GA101, June 18, 2007

Figure 2.2-6 – Facility Elevation View (GA101 – Looking East)



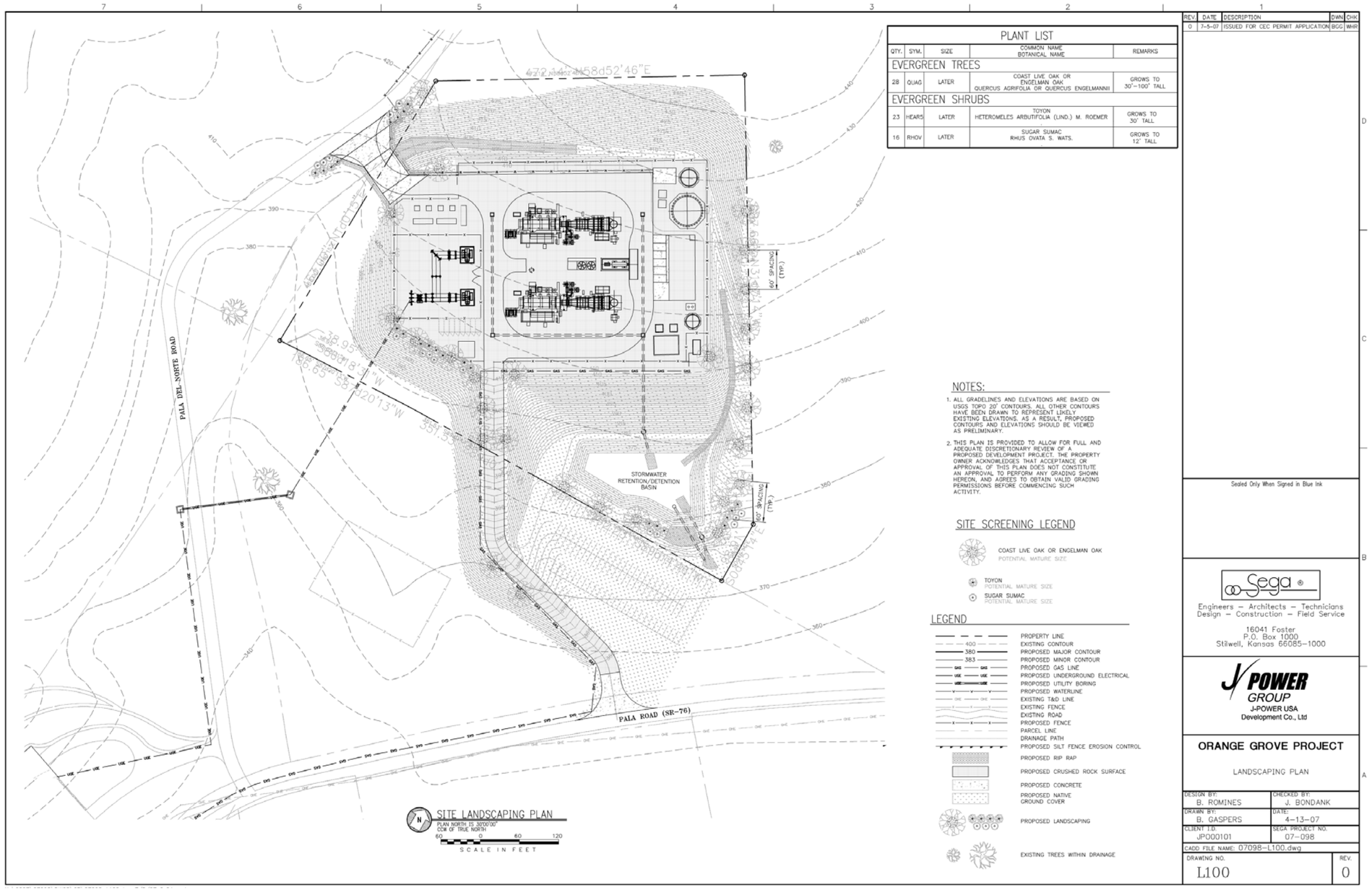
Source: Sega, Inc. – Drawing GA101, June 18, 2007

Figure 2.2-7 – Yard Layout Plan (Y100)



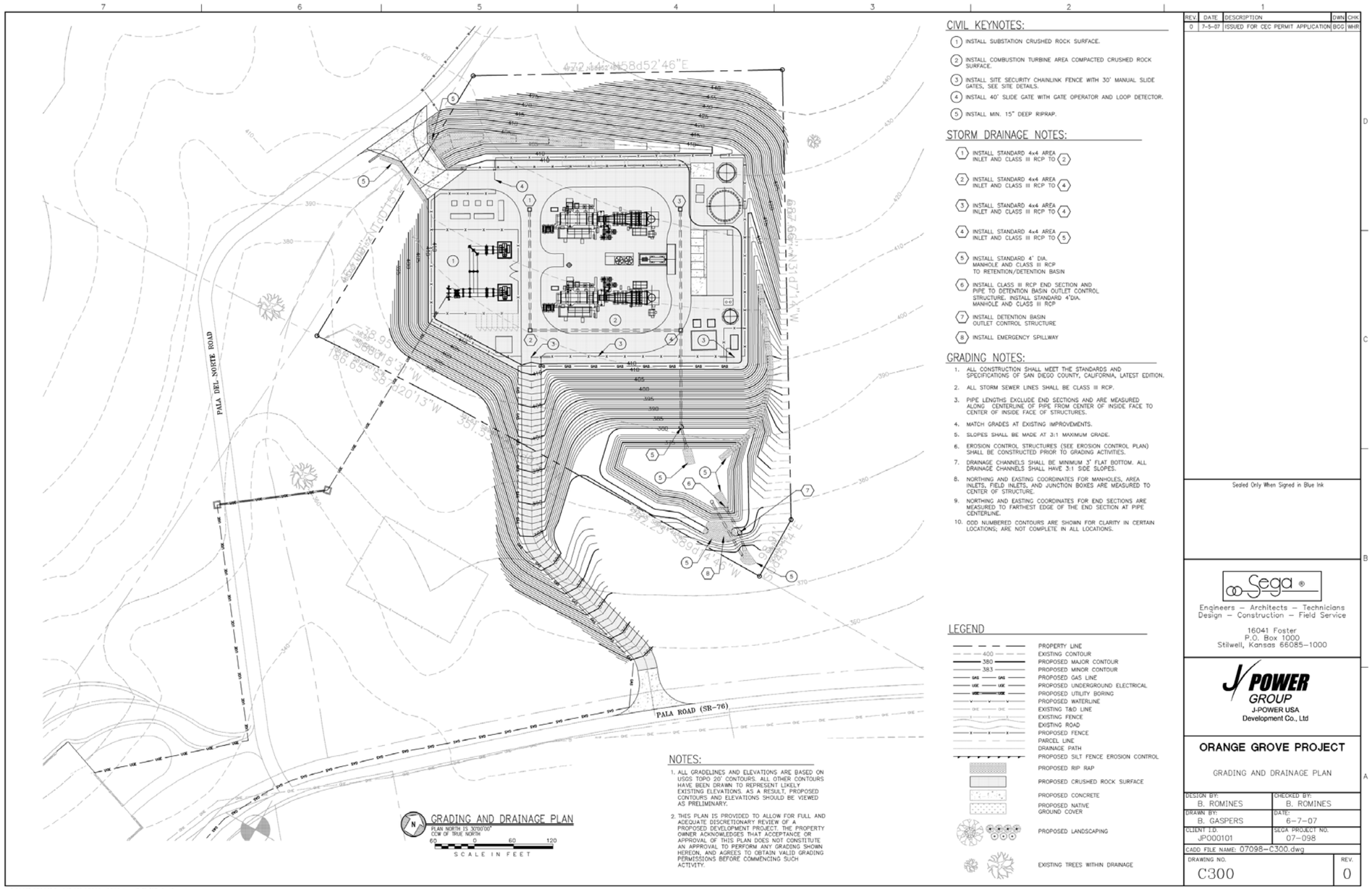
Source: Sega, Inc. – Drawing Y100, April 13, 2007

Figure 2.2-8 – Preliminary Landscape Plan (L100)



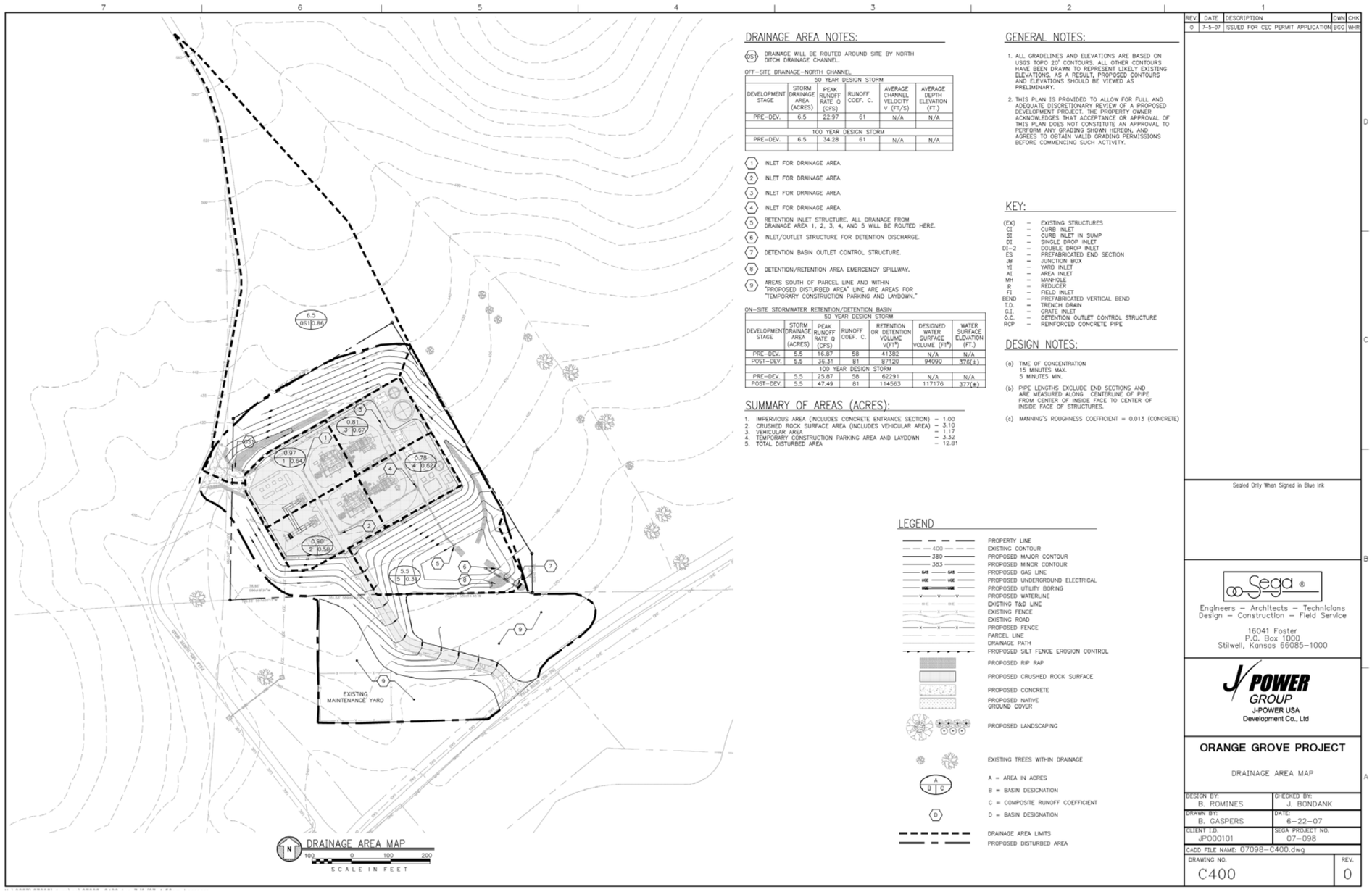
Source: Sega, Inc. – Drawing L100, April 13, 2007

Figure 2.2-9 – Preliminary Grading and Drainage Plan (C300)



Source: Sega, Inc. – Drawing C300, June 7, 2007

Figure 2.2-10 – Preliminary Drainage Area Map (C400)



Source: Sega, Inc. – Drawing C400, June 22, 2007

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2.2.3 Access, Roads and Fencing

The access to the Site will be via a driveway from Pala Del Norte Road. This access route is designed to enter the site where the normally dry drainage west of the site is narrow and rocky. A short segment of free-span bridge will be provided at this location to avoid disturbance to the drainage. A secondary driveway will be constructed from SR-76. The secondary driveway will be used for access during construction but will not normally be used during operations. It is provided for safety, so that the site has a back-up emergency ingress/egress route if needed. A 50-foot radius is utilized for access drive layout to facilitate emergency vehicle access.

Unpaved surfaces in and around equipment will be covered with crushed stone or gravel. An 8-foot tall metal fabric security fence with barbed wire or razor wire on top will enclose the Site. Access will be by security-controlled gates.

2.2.4 Landscaping

Areas inside the plant security fencing that are not occupied by structures or paved roads will be surfaced with crushed rock. Outside the security fence, surfaces disturbed by construction will be seeded with native grasses and planted with trees and shrubs. Trees and shrubs will be planted in locations where they will not interfere with existing or proposed improvements and so they will screen the plant from the public, mainly along the southern boundary. This is done in two ways: densely branched trees will **block** the observer's sight of the equipment and colorful shrubs will **distract** the observer's sight of the equipment. A landscaping plan is provided in Figure 2.2-8. Native vegetation will be planted at the following locations on site:

- The southern Site perimeter will be planted with native grass, shrubs and trees to screen views of the perimeter fencing and other plant facilities to the extent practical.
- Cut and fill slopes constructed during grading will be planted with native grass and scrub species to stabilize soils and minimize erosion.
- Small areas of native plants will occur at the entrances to the site driveways and outside the plant administration building for aesthetic purposes.

The preliminary landscaping plan includes use of Coast Live Oak, Engelmann Oak, Sugar Sumac, and other shrubs to be planted for visual screening landscape. Appendix 2-A provides a list of native species that may be used in the final landscaping plan to be developed in consultation with the Department of Planning and Land Use (DPLU) for the Major Use Permit. Drip watering systems will be provided for planted trees and shrubs. The native species to be used and their placement will be finalized once the Fire Protection Plan for the Project is completed in accordance with County requirements.

2.3 PROCESS DESCRIPTION

The Project is designed as a peaking facility to supply electric power locally, primarily during times of high demand, which generally occur during daylight hours, and most frequently during the summer months. While the plant will be capable of 24/7 operations, typical operation will be

for 12 to 16 hours per day. The plant will be permitted with the San Diego Air Pollution Control District (SDAPCD) to operate either one or two units up to 6,400 total hours (or each unit up to 3,200 hours) with 500 total starts annually. Additionally, the plant will be limited to six (6) total starts for both turbines each day. The plant is expected to operate at an annual capacity factor between 23% and 46%. A process flow diagram is provided in Appendix 2-B.

The stack nitrogen oxides (NO_X) emissions will be controlled to 2.5 ppm by volume dry (ppmvd) corrected to 15% oxygen (O_2) by a combination of water injection in the CTG and by the SCR systems downstream of the exhaust ducts. Ammonia will be the reducing agent for NO_X in the exhaust gas stream and ammonia slip from the SCR will be controlled to less than 10 ppmvd corrected to 15% O_2. Carbon monoxide (CO) will be controlled to 6 ppmvd at 15% O_2 using an oxidation catalyst system upstream of the SCR system. Both the CO catalyst and SCR system will be installed downstream of the CTG exhausts.

Fuel for the CTG will be pipeline-quality natural gas. The plant will have black-start capability via a natural-gas-fired reciprocating engine and generator. Major equipment at the plant is described in Table 2.3-1. Expected power plant performance is described in Table 2.3-2. - Appendix 2-B provides a calculation of generating capacity.

Table 2.3-1 – Major Plant Equipment

EQUIPMENT	NOMINAL CAPACITY	DESCRIPTION
Combustion Turbine Generators (2)	Approximately 50 MW gross	GE LM6000PC SPRINT
Emission Control System (2)	System designed to reduce NOx emission to 2.5 ppm and CO to 6 ppm	System consisting of ammonia selective catalytic reduction (SCR) and oxidation catalyst.
Aqueous Ammonia Storage Tank (1)	10,000 gallons	19% aqueous ammonia.
Chiller (1)	One 2,535-ton chiller skid, with primary and secondary chilled water pumps.	Common chiller and cooling tower package.
Fuel Gas Compressors (3)	12 MSCFD; 700 psig; 600 hp	Three 50% capacity (one per CTG provides full capacity) reciprocating compressors with one standby.
Demineralized Water Treatment System (2, trailer mounted)	150 gpm each (treated water)	Demineralizer, regenerated off-site, with polishing, also regenerated off site.
Demineralized Water Storage Tank (1)	100,000 gallon	Field fabricated steel tank.
Raw Water/Firewater Storage Tank (1)	375,000 gallon	Field fabricated steel tank.
Wastewater Storage Tank	40,000 gallons	Field-fabricated steel tank.
Continuous Emissions Monitoring System	O_2, NOx, CO	40 CFR Part 60 compliant CEMS system.
Generator Step Up Transformer (2)	75 MVA each	13.8 kV to 69 kV; outdoor; oil-filled (non-PCB); three-phase, two-winding per transformer.

EQUIPMENT	NOMINAL CAPACITY	DESCRIPTION
Auxiliary Transformers (2)	--	13.8 kV to 4.16 kV; outdoor; oil-filled (non-PCB); three-phase.
Station Service Transformers (2)	--	13.8 kV to 480V; outdoor; oil-filled (non-PCB); three-phase.
Fire Water Pumps	Two, 1,000 gpm fire pumps; one, 24 gpm jockey pump	One 100%-capacity, electric motor driven; one 100%-capacity, diesel engine driven; one pressure maintenance electric motor driven (jockey) pump.
Black-Start Generator (1)	600 kW/750 kVA; 480 V	Four-cycle natural gas fueled engine and generator package.
Containment Tank (1)	1,000 gallons	Normally empty tank provided for containment of upset drainage from CTG systems.

Table 2.3-2 – Expected Plant Performance

PARAMETER	UNITS	PROJECT VALUE
Gross Power Output	KW	100,757
Net Power Output	KW	96,020
Fuel Consumption	MMBtu/hr HHV	953.8
Net Heat Rate	Btu/kWh HHV	9,938
Annual Operating Hours	Total between the two CTG	6,400

2.3.1 Combustion Turbine Generation Equipment

The power plant will generate electricity using two GE LM6000 PC SPRINT combustion turbine generators. The LM6000 turbine is based on the GE CF6-80C2 flight engine, which powers current-generation wide-body aircraft, and consists of: a five-stage low-pressure compressor; a 14-stage high-pressure compressor with six variable-geometry stages; an annular combustor with 30 fuel nozzles; a two-stage air-cooled high-pressure turbine; and a five-stage low-pressure turbine with active clearance control for improved efficiency. There are over 600 LM6000 power generation packages in service, which have accumulated more than 10 million hours of operation with a 97.7% availability factor.

The CTG will be equipped with GE's SPRay-INTercooled (SPRINT) power boost technology to increase output from the plant during warm or hot ambient conditions. Demineralized, finely atomized water is injected into the compressor section of the engines, which reduces the heat of compression, leading to increased mass flow, and thus power output. Water may be introduced into either the low-pressure compressor or high-pressure compressor depending on ambient conditions and other factors.

The CTG combustion air flows through an air inlet filter system and chilled water cooling coils and associated inlet ductwork. The air is then compressed to an approximately 2:1 compression

ratio in the gas turbine low-pressure compressor section before entering the high-pressure compressor, where it is compressed to an approximately 15:1 compression ratio. Overall compression ratio is approximately 30:1, greatly aiding efficiency. The compressed air then flows to the CTG combustor. High-pressure natural gas fuel is injected into the combustor section and ignited. The thermal energy produced by combustion is converted into mechanical energy in the turbine section of the unit; the high-pressure turbine drives the high-pressure compressor while the low-pressure turbine drives the low-pressure compressor and the generator. Power is transmitted from the low-pressure turbine to the low-pressure compressor via a shaft that runs through the hollow high-pressure turbine and high-pressure compressor assemblies. The generator is connected via a shaft to the low-pressure compressor. Demineralized water is injected into the combustion zone in order to modulate combustion temperatures and reduce the formation of NO_X to approximately 25 ppmvd, corrected to 15 percent O_2.

The air inlet filter system will protect the combustion turbines, generators, and equipment compartments from the effects of airborne dirt and foreign objects damage. The air inlet housing for each CTG will be equipped with a three-stage inlet filtering system, which provides capture efficiency exceeding 99.9% of particles 5.0 microns and above, and a chilled water coil section sized to provide 46 degree F inlet air to the low-pressure compressor section on the design summer day of 86 degrees F and 70.5 degrees wet bulb (WB).

The CTG's inlet air filter systems will be equipped with a common chilled water system package for the two units. The chilled water package consists of equipment necessary to cool the inlet air to the combustion turbines and maintain the desired output during hot-day conditions. The packaged chilled water system will include one 2,535 ton chiller skid. The chiller skid will have a chilled water pump system for delivery of 38 degree F water to the inlet air coils for each of the CTG units. Chiller condensers are water cooled using a circulating water system and two package cooling towers to provide for the best combination of power generation, heat rate (fuel efficiency), and low-noise emissions during operation in warm or hot ambient conditions. The chiller system will be housed in a building to control noise and to provide for maintenance access. The chiller refrigerant will be non-toxic and CFC-free.

The nominal net generating capacity of both units will be approximately 96,020 MW at 86.0 degrees F.

2.3.2 Emission Control Equipment

The uncontrolled CO emission from the LM6000PC SPRINT is expected to be 25 ppm over the range of 50% to 100% load at the design summer day of 86 degrees F. At the same time, this CTG unit will achieve its low NO_x level of 25 parts per million (ppm) with water injection. In addition, each CTG unit will be equipped with a CO oxidation catalyst that will reduce the CO emission to 6.0 ppm, as well as an aqueous ammonia (19% wt) SCR system that will further reduce the NO_x emissions to 2.5 ppm. All concentrations are expressed on a 15% O_2 basis.

2.4 OPERATIONS AND EMISSIONS

The plant is expected to provide a total of up to 6,400 hours of operation to the contracted utility (SDG&E). The facility is, however, capable of operating continually (24 hours per day, seven days per week). For permitting and impact analyses, the following operating limits were evaluated.

2.4.1 Startup and Operating Limits

The proposed startup and operating limits for the Project are outlined as follows:

1. One-time startup and commissioning - 400 hours total:

- 50 hours of uncontrolled emissions for startup and commissioning of each CTG.
- 200 hours per unit with emissions controlled at the turbine only (approximately 25 ppmvd NO_X and 25 ppmvd CO, both corrected to 15% O_2), for startup and commissioning of the SCR and oxidation catalyst systems.

2. Annual operation (two turbines combined) - 6,400 hours total:

- 5,960 hours of fully controlled emissions.
- 40 hours of emissions controlled at the CTGs only for annual maintenance and testing.
- 500 combined startups composed of 10 minutes of uncontrolled emissions (water injected CTG only; no additional reduction via catalyst) and 30 minutes of linearly decreasing controlled emissions as the CO and NOx catalyst become effective.
- 500 combined shutdowns composed of 8 minutes of uncontrolled emissions (water-injected CTG only).

3. Emergency equipment testing emissions:

- Diesel-driven fire pump tested weekly for 30 minutes.
- Black-start generator tested monthly for one (1) hour.
- Each CTG, to the extent not operated in the previous two weeks, will be started approximately once per month and operated for one hour.

2.4.2 Best Available Control Technology

The expected BACT emission levels for the various pollutants are summarized below:

- NO_X: 2.5 ppm dry volume (ppmvd) at 15% O_2, three-hour average.
- CO: 6.0 ppmvd at 15% O_2, three-hour average.
- Volatile Organic Compounds (VOC): Use of oxidation catalyst for CO control (estimated at 2.0 ppmvd).
- Particulate Matter of 10 µm or Less in Diameter (PM_{10}): Pipeline-quality natural gas only.

- Sulfur Compounds (SO_X): Natural gas shall not contain more than 0.75 grains of total sulfur compounds per 100 SCF.
- Ammonia: Slip 10.0 ppmvd at 15% O_2, three-hour average.

These BACT standards have been discussed and agreed upon with the SDAPCD.

2.4.3 Emission Reduction Credits

San Diego County has achieved attainment for all national ambient air quality standards (NAAQS) except for the 8-hour ozone standard. The offset thresholds for criteria pollutants are based on annual emissions and are provided in the table below. Based on the application of BACT and the lowest achievable emission rates (LAER) specified above, and the operating capacity at which this project will be permitted, the maximum annual emissions estimated and provided below appear to be well below the offset thresholds.

Table 2.4-1 – Offsets Requirement

POLLUTANT	OFFSET THRESHOLD	OFFSET RATIO	PROJECT EMISSIONS TPY	OFFSET REQUIRED
NOX	50 TPY	1.2 : 1.0	16.69	No
CO	100 TPY	1.0 : 1.0	22.00	No
VOC	50 TPY	1.2 : 1.0	4.08	No
PM10	100 TPY	1.0 : 1.0	9.68	No
SO2	100 TPY	1.0 : 1.0	2.66	No

2.4.4 Air Quality Impact Analysis

SDAPCD rules and regulations require each project to demonstrate that it does not contribute significantly to existing ambient air quality standards. For this requirement, SDAPCD has published the air quality impact analysis (AQIA) thresholds for evaluation of projects. As presented below, the maximum worst-case emission rates at each specified interval (hourly, daily, and annually) for this project are all below these AQIA thresholds. This project is therefore not expected to contribute significantly to air quality impacts.

Table 2.4-2- AQIA Emission Thresholds

AIR CONTAMINANT	EMISSION THRESHOLDS			PROJECT EMISSION RATES		
	lb/hr	lb/day	ton/yr	lb/hr	lb/day	ton/yr
CO	100	550	100	30	259	22.0
NOx	25	250	40	19.2	205	16.7
PM10	N/A	100	15	NA	98	9.7
SOx	25	250	40	1.65	26.5	2.66
Source: SDAPCD Rule 20.3, Table 20.3-1.						

2.5 FUEL REQUIREMENTS AND SYSTEM

2.5.1 Fuel Gas Requirements

The CTG are designed to burn pipeline-quality natural gas only. The natural gas requirement at an ambient condition of 86 degrees F is approximately 477.9 million British thermal units per hour (MMBtu/hr), per unit, on a higher heating value (HHV) basis. A gas pressure of approximately 690 psig is required at the combustion turbine connection.

2.5.2 Fuel Supply

Natural gas will be supplied to the project from an existing SDG&E 16-inch gas transmission line that passes approximately 1.3 (air) miles west of the Site (Figure 2.2-2). An approximately 2.0-mile gas pipeline lateral will be constructed for the Project to convey natural gas to the Site from the existing transmission line. The gas pipeline lateral will be installed underground along SR 76 and the preliminary design is for a 10-inch diameter lateral that will deliver approximately 960 MMBtu/hr (HHV) of fuel gas to the Site at 340 psig. The metering station will be located on site and the gas pipeline lateral will be constructed, owned and operated by SDG&E. The gas will flow through an onsite metering station, gas scrubber/filtering equipment, gas compressors, and a gas pressure control station prior to entering the CTG. Stainless steel piping is incorporated from downstream of the filters to the CTG to minimize the potential for contamination of fuel to the units. Two 50%-capacity electric motor-driven gas compressors, one per CTG, will be used to boost the fuel supply pressure to the pressure required for the combustion turbines. A third (50%-capacity) compressor will be provided for backup. The gas compressor design capacity will be based on the fuel flow requirements of one CTG. The compressors will be located within an acoustically treated building to limit noise emissions.

Historical fuel quality data for the SDG&E T-1600 pipeline that will supply the Project indicate that natural gas is suitable for use in the LM6000 combustion turbine. The gas pressure on the T-1600 line historically is also adequate, varying from approximately 474 psig to 782 psig over the period October 2005 through October 2006. This is well within the expected capabilities of the fuel forwarding equipment engineered for the facility.

Natural gas supply will be contracted with and supplied by SDG&E. The characteristics of the gas supply will be as follows.

Table 2.5-1 – Natural Gas Quality

GAS PARAMETERS	VALUES
Low Heating Value	915 BTU/ft3
High Heating Value	1,015 BTU/ft3
Moisture	< 7 lb/MMSCF
Hydrogen Sulfide	< 0.25 grain/100 SCF
Mercaptan Sulfur	< 0.30 grain/100 SCF
Total Sulfur	< 0.75 grain/100 SCF

GAS PARAMETERS	VALUES
Carbon Dioxide (CO2)	< 3% (v/v)
Oxygen (O2)	< 0.2% (v/v)
Inerts	< 4% (v/v)
Hydrocarbons Dew Point	< 45 °F at below 400 psig

2.6 WATER SUPPLY AND USE

2.6.1 Water Use Requirements

The annual, average, and maximum water requirements for plant operations are identified in Table 2.6-1.

Table 2.6-1 – Plant Operations Water Requirements

SERVICE	AVERAGE USE RATE (1)	MAXIMUM USE RATE (2)	ANNUAL USE(3)
Average Design Case (4)			
Demineralizer Systems treated water used for SPRINT Power Augmentation/ NOx Control	41.6 gpm (raw water)	--	67.2 AFY
Air Inlet Chiller Cooling System Makeup	27.4 gpm (raw water)	--	44.2 AFY
Sanitary and wash down	2.3 gpm (raw water)	--	3.6 AFY
Landscape Drip	1.4 gpm (raw water)	--	2.3 AFY
Total	**72.7 gpm (raw water**	**--**	**117.3 AFY**
Maximum Design Case (5)			
Demineralizer Systems treated water used for SPRINT Power Augmentation/ NOx Control	--	150 gpm (raw water)	70.5 AFY
Air Inlet Chiller Cooling System Makeup	--	88 gpm (raw water)	51.9 AFY
Sanitary and wash down	--	40 gpm (raw water)	6.6 AFY
Landscape Drip	--	20 gpm (raw water)	5.9 AFY
Total	**--**	**298 gpm (raw water)**	**134.9 AFY**

(1) Annual Use converted to gallons per minute.
(2) Instantaneous use rate with ongoing operations at the summer design condition.
(3) Annual use based on 3,200 hours of two CTGs and common Chiller System operations at the summer design condition.
(4) Average Design Case based on both units operating at full load at summer design condition.
(5) Maximum Design Case based on both units operating at full load on a 102 degree design day, concurrent with operation of the truck-mounted demineralizer system.

Water balances in Appendix 2-C provides additional details of the plant water demand.

2.6.2 Water Supply and Treatment Systems

Water for the Project will be provided by the RMWD via a proposed pipeline lateral to be constructed along Pala Del Norte Road. District staff have indicated that they will provide water to the Project and have the capacity to do so. The water main north of the Site (Figure 2.2-2) has an available capacity of 3,000 gpm and ample storage for Project needs. Orange Grove Energy will obtain a signed DPLU Form 399W from RMWD documenting the availability of the water supply.

Raw water will be stored on site in a 375,000-gallon water storage tank. If the water supply is interrupted, this tank will provide water for two days of operation of two CTG at 12 hours per day for the full load design condition without inlet chilling, plus fire water storage reserve.

Demineralized water is required for injection into the turbines for power augmentation and NO_x emissions control. Minor quantities will also be required for CTG compressor wash. Demineralized water will be produced by twin trailer-mounted demineralizer systems, one in operation and one in standby, which will be regenerated off site. Resin bead (zeolite) polishers will also be incorporated and will also be regenerated off site. Demineralized water will be stored in a 100,000-gallon demineralized water storage tank which will provide capacity for up to 14 hours of operation of two CTG at the full load design condition.

Water for use in the CTG for NOx emissions control and power augmentation must be of very high purity or turbine blade damage will result. On-line water condition monitors will be installed and the plant operators will conduct frequent tests to ensure that water purity remains within manufacturer specifications.

The natural gas fuel compressors will be air cooled, as will the CTG lubricating oil systems. Use of this technology will reduce plant water consumption to only that necessary for production of demineralized water for turbine injection and for chiller system cooling tower makeup.

The packaged cooling towers that are part of the CTG combustion inlet air chiller system will require make-up water. Water-cooling is the selected technology for the air inlet chiller system instead of air-cooled technology because of a critical need to preserve power output and plant efficiency during hot days, as well as the need to reduce noise output from the facility. Section 5.0 describes the alternatives to water cooling that were evaluated, and the reasons those alternatives were not selected for the Project.

2.7 WASTEWATER AND STORM WATER

Water effluents from the plant will include process wastewater, sanitary wastewater, and storm water. These are described in the following sections.

2.7.1 Process Wastewater

Process wastewater streams are identified in Table 2.7-1.

Table 2.7-1 – Plant Operations Process Wastewater Streams

SOURCE	AVERAGE VOLUME (1)	SHORT-TERM PEAK VOLUME (2)
Water Treatment System Blowdown	None (regeneration of demineralizer vessels performed off site).	None
Air Inlet Chiller Cooling System Blowdown	6.2 gpm	17 gpm
General Plant Drains (Intermittent): Miscellaneous Non-Oily Water Drains to Emergency Containment Tank Turbine and Compressor Washdown	 Negligible Negligible Negligible	 Negligible Negligible Negligible
Facility Washdown Drains (Intermittent)	2.1 gpm	35 gpm
Total	**8.3 gpm**	**52 gpm**

(1) Based on annual average use rate for 3,200 hours of two CTGs & common Chiller System operation.
(2) Based on instantaneous use rate with two CTGs & common Chiller System in operation at the summer design condition.

Blowdown water from the chiller system cooling towers will be pumped directly to the general plant drains will be collected in the water treatment and pumping areas, gas compressors area, and from facility equipment area wash down, and directed to a common collection sump to be pumped into the wastewater storage tank. Water from these areas will be collected by means of a system of floor drains, hub drains, sumps, and piping routed to the wastewater storage tank. The collected water stored in the wastewater storage tank will be intermittently pumped out into tanker trucks and hauled offsite for processing and reuse as appropriate.

Drains from areas that potentially could contain oil or grease, such as the combustion turbine compartments, will be routed to the emergency containment tank for pump-out and will be hauled offsite. In the event of an oil leak or spill, the contaminated water will be contained and removed immediately using approved containment and removal methods. The contaminated water will be hauled offsite for processing to remove and dispose of all contaminates as required.

2.7.2 Sanitary Waste

An on-site septic tank and leach field is proposed for sink drains, toilets, and other sanitary facilities. The sanitary system will be gravity flow and will be designed and constructed in accordance with San Diego County requirements. A permit from the County will be obtained. The preliminary location is shown in Figure 2.2-4. Soil percolation testing will be performed for final facility design. If soil conditions prohibit adequate infiltration, the septic tank and leach field will be replaced with a sanitary pump-out tank and sanitary waste will be periodically trucked off site by a licensed hauler.

2.7.3 Storm Water Management

Construction storm water management will occur in accordance with the State general National Pollutant Discharge Elimination System (NPDES) permit for storm water discharges from

construction sites (State Water Resources Control Board Order No. 99-08-DWQ). A Notice of Intent to comply with the State general NPDES permit will be submitted. Compliance with the State general permit will require preparation of a detailed Storm Water Pollution Prevention Plan (SWPPP) identifying Best Management Practices, soil stabilization measures, sediment controls, responsible persons, and training to assure that SWPPP measures are effectively implemented. Existing vegetation will be protected around the improved area to act as a buffer. Constructed slopes will be protected with temporary silt fences and cross barriers until they are stabilized with native grasses. Inside the plant, inlets will be protected temporarily until the final grade is surfaced with crushed rock. Outside the plant area, temporary silt fencing will be placed at the perimeter of disturbance until final grades are stabilized. An Erosion Control Plan for construction is provided in Appendix 2-D. Erosion control and protection devices will be inspected and maintained regularly during construction. Storm water protection measures will be subject to review and approval by the County as part of the Major Use Permit process and final grading plan review.

Storm water management for operations will comply with applicable laws, ordinances, regulations and standards (LORS). The drainage plan and storm water quality protection measures for operations will be subject to review and approval by the County. The Project design includes engineering measures for Site drainage as described in Section 2.2.3.

A Spill Prevention, Control and Countermeasures (SPCC) Plan will be prepared for Site operations to protect surface waters from the potential for an oil spill. Containment areas exposed to storm water, like secondary containment curbing at the generator step-up transformer, will be sized for the required oil storage volume plus a minimum freeboard capacity for precipitation from the 25-year, 24-hour storm. Storm water from areas with oil-filled or lubricated equipment will be collected and will not be released until inspected to confirm that there is no oily sheen present. Should there be an oil leak, the oil and impacted water would be removed, packaged, and shipped off site by a licensed hauler. Under normal conditions, where no leakage is present, the contained storm water will be released, following inspection, to the retention/detention basin to evaporate and infiltrate.

Additional details of water quality protection measures and LORS are provided in Section 6.5, Water Resources.

2.8 HAZARDOUS MATERIAL MANAGEMENT

Project operations will require the use of hazardous materials. Hazardous materials usage will occur in accordance with applicable LORS. Bulk materials will be stored in appropriate tanks and containers that are designed for that use and compatible with the materials. Hazardous material storage and use areas will be designed to contain potential leaks and spills. Containment provided will be adequate for the contents of the largest single container or tank in the area, plus a minimum freeboard equal to the 25-year, 24-hour storm for exposed areas. The hazardous materials anticipated to be required for plant operations are identified in Table 2.8-1.

Safety showers and eye washes will be provided in chemical storage and use areas. Personal protective equipment (PPE) will be provided for handling and cleanup of hazardous materials.

Appropriate personnel will be properly trained in the handling, use, and cleanup of hazardous materials used, and procedures to follow for a leak, spill, or other hazardous material upset condition. Adequate supplies will be maintained on site to respond to foreseeable spills. A Hazardous Materials Business Plan will be prepared and submitted to the Certified Unified Program Agency (CUPA) for hazardous material use and storage on site.

Ammonia required for the SCR will be an aqueous 19% solution. Secondary containment will be provided at the tank and truck unloading area; detailed procedures will be implemented to preclude and manage spills. A California Accidental Release Prevention (CalARP) Risk Management Plan (RMP) will be required for the proposed use of aqueous ammonia. An RMP will be prepared in accordance with California Code of Regulations (CCR) Title 19 regulations and submitted to the CUPA. Because the concentration of aqueous ammonia will be only 19%, an RMP is not required under Federal regulations. Additional details of ammonia handling are provided in Section 6.15, Hazardous Materials Handling.

Used lubricating oil and other materials classified as hazardous waste under CCR Title 22 will be generated by Project operations. Anticipated hazardous waste generation streams are identified in Table 2.8-1. Hazardous waste will be managed in accordance with CCR Title 22 Division 4.5 and County requirements. The plant will be a small quantity generator for hazardous waste under 22 CCR Division 4.5.

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Table 2.8-1 – Operations Hazardous Materials

MATERIAL	USE SOURCE	QUANTITY OF PRODUCTS STORED OR WASTE GENERATED	TRANSPORT FREQUENCY	HAZARDS[1]
Products with Hazardous Properties				
Aqueous Ammonia, 19.0 wt percent	NO_X emissions control in SCR	10,000 gal	Bi-monthly	Acute and chronic toxicity
Mineral Insulating Oil (Non PCB)	Electrical transformers	45,000 gal	No routine transport (2)	Fire
Synthetic Lubricating Oil	CTG roller bearing lubrication and cooling	300 gal	No routine transport (3)	Fire
Hydraulic Oil	CTG start system	100 gal	No routine transport (2)	Fire
Propylene Glycol	Antifreeze for closed cooling water system and in inlet air chillers	55 gal	No routine transport (2)	Chronic toxicity
Mineral Lube oil	Generator sleeve bearing lubrication and cooling	1,000 gal	No routine transport (3)	Acute toxicity and corrosive
Mineral Lube Oil	Fuel gas reciprocating compressors bearing and cylinder lubrication and cooling	100 gal	165 gal/6 mos.	Acute and chronic toxicity, reactive and corrosive
Diesel No. 2	Fire pump and emergency generator	250 gal	No routine transport (4)	
Lead Acid Batteries (sealed)	Emergency fire pump, black-start generator engines; plant uninterruptible power supply		No routine transport (2)	Acute and chronic toxicity, reactive and corrosive
Carbon Dioxide	Fire suppression	100 cu ft	No routine transport (4)	Asphyxiant, pressure
Hazardous and Universal Waste				
Used Oil	Mechanical equipment	165 gal/6 mos.	Shipped twice per year.	Fire, toxicity
Other Non-RCRA and RCRA Hazardous Waste Liquids	Waste paint, used or off-spec petroleum products, spent solvent, water with hydrocarbons, spent or off-spec coolant	Small Quantity Generator(5)	Shipped twice per year.	Fire, toxicity, corrosivity

Non-RCRA and RCRA Hazardous Waste Solids	Petroleum wastes, sandblast residue, paint residue, oil filters, spent SCR catalyst	Small Quantity Generator(5)	Small quantities shipped twice per year. Partial SCR catalyst replacement every 3-5 years.	Fire, toxicity
Universal Waste	Used batteries, used lamps, cathode ray tubes, electronic equipment, aerosol cans	Small Quantity Handler(5)	Shipped at least once per year	Fire, toxicity

(1) Hazards and hazard categories for products are following 40 CFR Ch. 1, Section 370.2. Health hazards include acute (immediate) and chronic (delayed). Physical categories include air, sudden release of pressure, and reactive. For Hazardous and Universal Waste, Hazardous characteristics are from California Code of Regulations Title 22 Division 4.5.

(1) Transport required for construction, and possibly on infrequent occasions during operations.

(2) Following initial fill during construction, routine consumption is very small (e.g., less than 2 drums per year.)

(4) Replenish as necessary as a result of actual use or weekly testing.

(5) Generator/Handler categories under 22 CCR Division 4.5 hazardous waste management regulations.

2.9 PLANT AUXILIARIES

2.9.1 Auxiliary Equipment Module

Each unit will have the following auxiliary equipment:

- For the combustion turbines: synthetic lube oil reservoir, duplex scavenge oil filters, and fin/fan oil-to-air heat exchangers.
- For the turbine-driven generators: mineral lube oil reservoir, duplex scavenge oil filters, and fin/fan oil-to-air heat exchangers.
- Electro-hydraulic start system.
- Carbon dioxide (CO_2) fire protection cylinders with sun shield.
- On-line/off-line water wash system (including instrument air filter).
- SPRINT water injection pump.
- NO_x emissions control water injection pump(s).
- At each CTG, this equipment will be mounted on an integrated auxiliary module base.

Each unit will have two separate lube oil systems: one synthetic turbine oil system for the combustion turbine and one mineral oil system for the generator. The lube oil reservoirs and piping are stainless steel. Each lube oil system has duplex filters, fin/fan oil-to-air coolers, and thermostatically controlled electric heaters. The coolers are located near the generator end of the CTG.

2.9.2 Project Lighting Systems

Indoor lighting systems will be provided within some of the packaged equipment enclosures and also inside the plant's Service Building. The lighting within packaged equipment will be provided by the equipment manufacturer where recommended to facilitate maintenance. The combustion turbine units and the inlet cooling chiller system are expected to be furnished with manufacturer-supplied lighting. The plant Service Building indoor lighting systems will be designed to foot-candle levels as recommended per Illuminating Engineering Society of North America (IES) and in accordance with the CCR - Title 24. Emergency lighting, egress lighting, and exit signs will be designed as part of the indoor lighting system. All indoor lighting systems are anticipated to be 120-volt equipment.

The exterior lighting systems will consist of surface-mounted fixtures on various plant components, equipment, or modules and pole-mounted lighting at various locations to facilitate maintenance, safe navigation within the plant, and site security. Exterior lighting will use downward directed high-pressure sodium lamps and will be either 120-volt or 240-volt. Some lighting will be provided by equipment manufacturers at doorway entrances to equipment. The taller equipment may be used for area lighting instead of poles. Lighting contactors and photocells will be used to control exterior lighting. Timers will be included if needed to mitigate

exterior lighting during overnight hours in accordance with County requirements. The exterior lighting plan will be subject to review and approval by DPLU

2.9.3 Fire System

The fire protection system will comply with requirements of the local Fire Marshall and the insurance underwriter's requirements.

The basic equipment packages for each CTG unit will be supplied with a factory-installed fire protection system complete with optical flame detection, hydrocarbon sensing and thermal detectors, piping, and nozzles in the generator and engine compartments of the unit. The CTG fire protection system includes cylinders containing CO_2 mounted on a separate module. Fuel gas compressor enclosures will also be equipped with CO_2 fire protection systems. A 24-volt dc battery and charger to power the fire protection and other emergency systems will be provided.

All alarms and shutdowns are annunciated at the unit control panel. An alarm sounds at the affected equipment if the gas detectors detect high gas levels or if the system is preparing to release the CO_2. When the fire protection system is activated, the equipment package shuts down, the primary CO_2 cylinders are discharged via multiple nozzles in the equipment enclosures and the ventilation dampers automatically close. After a time delay, and if required, the reserve supply of CO_2 is discharged.

The raw water tank will provide the fire water reserve for the Site, utilizing an internal standpipe to segregate the fire water storage volume from the raw water system. A dedicated underground fire water piping loop will be supplied by one electric motor-driven fire pump and one diesel-driven fire pump. Both the fire hydrants and any required fixed suppression systems will be supplied from the fire water piping loop. The system will meet National Fire Protection Agency (NFPA) and California Fire Code flow requirements. Estimated fire flow for the facility is 1,000 gpm for two hours, which is 120,000 gallons.

Fixed fire suppression systems will be installed at determined fire-risk areas. Sprinkler systems will also be installed in the Service Building as required by NFPA and local codes. The CTG and fuel gas compressor enclosures will be protected by a CO_2 fire protection system. Appropriately sized and rated hand-held fire extinguishers will be located in accordance with NFPA 10 throughout the facility.

Orange Grove Energy will prepare and implement a comprehensive Fire Protection Plan in accordance with DPLU requirements in conjunction with the Major Use Permit. If the Fire Protection Plan requires more stringent design requirements than described herein, then the more stringent requirements will be incorporated in the final plant design.

2.9.4 Cathodic Protection

A cathodic protection system may be required to control the electrochemical corrosion of underground metal piping systems. Soil resistivity data will be obtained as part of a geotechnical

report required prior to detailed design. Depending on the corrosion potential, a passive system or an impressed current system may be required.

2.9.5 Plant Grounding System

The plant electrical system and equipment are susceptible to ground faults, switching surges, and lightning occurrences that can impose hazardous voltage and current on plant equipment and structures. To protect against injury and equipment damage, the plant grounding system provides an adequate path-to-ground for dissipation of hazardous voltage and current under the most severe conditions. Bare conductor will be installed below grade in a grid pattern. Each junction will be bonded together by welding or a compression connection. Substantial foundations will have their rebar systems tied to the ground grid.

The project site grounding systems, including the CTG plant and the transmission line switchyard areas, will be designed in accordance with the latest National Electric Safety Code (NESC), Institute of Electrical and Electronics Engineers (IEEE), and National Electrical Code (NEC) standards pertaining to power plant grounding systems.

A station ground grid system of buried copper electrodes and conductor will be bonded to each metallic structure or stand-alone piece of equipment for safety and electrical continuity per the applicable standards. Equipment grounding conductors will be circuited with each power system circuit for additional safety. Plant protective relay systems will be designed to trip equipment off-line under certain ground fault conditions as required or recommended by the applicable standards.

2.10 RELIABILITY AND SAFETY SYSTEMS

The Project is designed with redundant systems where needed to assure reliability. With few exceptions (e.g., failure of the gas pipeline lateral, gas metering station, or the transmission line interconnection), there is no single point-of-failure that could disable both CTG.

The CTG are equipped with safety systems to reduce the potential for hazards to personnel and machinery:

- A high-rpm shutdown is fitted.
- A high-vibration shutdown is fitted.
- Package fire detection system with unit shutdown and fire suppression systems are fitted.
- Low lubricating oil supply and pressure shutdown is fitted.
- Fire-eye detectors which confirm the presence of proper combustion in the CTG and secures the unit if not detected are fitted.
- Prior to a CTG start, the exhaust ducting, including the SCR and catalyst housing, is purged of any combustible gasses which may have accumulated.

- Seismic isolation system is installed on the natural gas supply system, which will automatically secure the CTG in the event of a substantial seismic event.
- Numerous safety devices are fitted to the medium- and high-voltage electrical systems to protect personnel, the Project, and the SDG&E system.

2.11 ELECTRICAL SYSTEMS AND INTERCONNECTION

Each CTG generates electricity at 13,800 volts. This site is planned for two identical GE LM6000 CTG units. Each CTG has auxiliary systems with power requirements at the following alternating current (ac) voltages: 4,160-volt; 480-volt; and 120-volt. Direct current (dc) systems, or battery systems, will also be required on each unit for critical power, typically 125-volt dc. Auxiliary transformers will be supplied to derive the higher auxiliary voltages, and small step-down transformers to derive the 120-volt systems. The outdoor auxiliary transformers will be oil-filled (non-PCB) and will have spill containment and separation from non-fire-rated assemblies as recommended by industry standards.

The electrical output from each generator is transformed to a transmission voltage of 69,000-volts through a generator step-up transformer (GSU) to a plant 69,000-volt bus common to both units. The 69,000-volt common bus system at the plant will consist of circuit switchers, disconnect switches, buswork, bus supports, metering, and take-off structure designed per industry and SDG&E standards. From the plant 69,000-volt bus, a single underground 69,000-volt transmission circuit will be installed and interconnected to an open position at the existing SDG&E Pala Substation. Additional details of the interconnection design and system impacts are described in Section 3.0 of this Application.

2.12 PLANT CONTROLS

The CTG packages will each be supplied with a local control panel. The plant control system (PCS) will interface the Service Building Control Room with the control systems furnished by the CTG supplier to provide control capabilities at the control room as well as data acquisition, annunciation, and historical storage of turbine and generator operating information. The PCS system will provide modulating control, digital control, monitoring, and indicating functions for the plant power block systems. The following will be provided:

- Controlling for the CTG.
- Controlling for the balance-of-plant systems in response to plant demands.
- Monitoring controlled plant equipment and process parameters and delivery of monitoring information to plant operators.
- Monitoring the stack CEM units to collect data and deliver critical alarms.
- Providing control displays (e.g., printed logs, operator interface) for signals generated within the system or received from input/output.
- Providing consolidated plant process status information.

- Providing alarms for out-of-limit parameters or trends, displaying on operator interface units, and recording on an alarm log printer.

The Control Room will be located in the Service Building near the north corner of the Site (Figure 2.2-4). Control will typically be accomplished from the Control Room; local operations from the control module/motor control center on the CTG packages will generally only occur during testing.

The PCS system will have redundancy where needed to preclude a single device failure from significantly affecting overall plant control and operation. This will also allow critical control and safety systems to have redundancy of controls, as well as an uninterruptible power source.

A staff of six full-time personnel is anticipated for routine operations and maintenance, including a plant manager, four operations and maintenance technicians cross-trained in operations and maintenance duties, and an administrative assistant. Third-party vendors will be used to perform major equipment maintenance.

2.13 PROJECT CONSTRUCTION

The construction period is expected to last approximately six months beginning in January 2008. Construction will typically occur between 7 a.m. and 6 p.m. Monday through Friday. Some activities during construction are continuous in nature, such as concrete pours or performance and emissions testing, and will require extension of work hours based on inherent process requirements or material-driven characteristics. Additional construction may also occur on weekends or during nighttime hours, if needed, for critical work to advance the progress of the Project to meet the required schedule. If construction occurs during nighttime hours, it would be limited to quiet work.

The workforce is expected to average 70 construction workers, peaking at approximately 105 workers during Month 5. The workforce is expected to commute daily, primarily from within San Diego and Riverside Counties.

Water needs during construction will be the responsibility of the contractor. The primary construction water needs to include water dust control, soil moisture conditioning for compaction, and hydraulic testing of fire and other water systems. The proposed water pipeline lateral will be constructed as an initial part of construction work. Until water is available from the water pipeline lateral, the contractor will need to truck water to the Site for construction use.

Sanitary facilities will be provided for the construction workforce using self-contained portable facilities. Bottled water will be provided for drinking. Construction materials and supplies such as equipment modules, concrete, structural steel, pipe, wire, cable, fuel, lubricant, paint, adhesives, tools, water and consumables will be delivered by truck. Deliveries will arrive via I-15 and SR 76 between I-15 and the Site. An average of approximately 7 and a peak of approximately 15 deliveries will occur each weekday during the construction period to bring equipment, materials, and supplies to the Site. These deliveries will be distributed throughout the work day.

Acreages of disturbance that will occur during construction are identified in Table 2.2-1. The estimated construction workforce by month is provided in Table 2.13-1. The Site will be fenced during construction and 24-hour security will be provided.

Table 2.13-1 – Construction Workers by Job Class by Month

JOB CATEGORY	MONTHS OF CONSTRUCTION					
	1	**2**	**3**	**4**	**5**	**6**
Boiler Maker				4	8	
Carpenter	2	8	8	6	2	1
Cement Mason		6	6	4		
Electrician	2	8	12	21	21	21
Iron Worker		6	6	6		
Laborer	10	12	14	12	10	6
Millwright				4	6	4
Operator	10	10	13	8	8	2
Painter						4
Pipe Fitter	2	7	12	12	12	5
Insulator					2	4
Lineman					18	
Total Craft Labor	26	57	71	77	87	47
Field Start-up				4	10	10
Field Non-Manual	3	3	5	5	8	8
Total On-Site Labor	**29**	**60**	**76**	**86**	**105**	**65**
Average On-Site Labor	**70**					

2.13.1 Plant Construction

Laydown, office trailers and parking for plant construction will occur within the Site boundaries and a contiguous approximately 8 acre area to the south. Portable office trailers will be provided for construction management.

The Site will be graded to provide pads for Project facilities while minimizing earthwork requirements to the extent practical. On-site construction activities will include clearing of agricultural vegetation; grading; hauling and laydown of equipment, materials, and supplies; facility construction; and testing. The preliminary grading plan indicates that the maximum cut will be approximately 20 feet into the existing grade and the maximum fill will be approximately 15 feet above the existing grade. The total volume of soil excavation will be less than 50,000 cubic yards (cy), i.e., there will be less than 50,000 cy cut and less then 50,000 cy fill). Actual quantities will be estimated from final grading plans. Grading is designed to balance cut and fill

volumes so that there is no net import or export of common soil. The site access driveways and the storm water retention basin will be constructed as part of initial grading so these facilities will be in place shortly after construction is initiated.

A Notice of Intent to comply with the State general NPDES permit for storm water discharges from construction sites will be submitted to the State Water Resources Control Board, and construction will occur in compliance with the general permit, which requires a storm water pollution prevention plan as described in Section 2.7.3. Graded surfaces will be stabilized promptly as they are completed to control erosion and runoff when precipitation events occur during the construction period.

The CTG units and most ancillary equipment will be supplied as pre-fabricated modules, which will facilitate construction of the plant on site. Once rough grading is completed and underground systems are installed, foundations and footings will be poured and finished, plant modules will be set, and auxiliary systems will be constructed or installed. The service building and control room will be a steel building fabricated on site.

2.13.2 Transmission Line Interconnection Construction

Construction of the transmission line interconnection to the Pala Substation will occur within the limits of SDG&E's contiguous parcel. The transmission line interconnection will be installed in an underground raceway. Installation will require excavation of an approximately 2 foot wide trench 5 to 6 feet deep. A raceway of PVC conduit will be cast in concrete in the bottom of the trench to protect the conduit. The upper portion of the trench will be backfilled and compacted. Excess soil from the trench will be used as fill at the Site. The disturbance corridor for the transmission line interconnection will be approximately 20 feet wide. Orange Grove Energy will obtain a 20-foot wide easement from SDG&E for the interconnection.

Beneath the drainage west of the Site, the interconnection will be installed using a horizontal directional bore instead of trenching to avoid impacts to the drainage. Beneath Pala Del Norte Road, work will occur in a manner that will preserve continuous through access on this private road. Beneath the road, the interconnection will either be installed via horizontal boring, or if a trench is excavated, it will be limited to one side of the road at a time.

Some additional protective relaying and reconfiguration of existing relaying is expected to be required at the existing Pala Substation. Work at the Pala substation will be within the existing substation walls. SDG&E will perform all work inside the substation and short-term staging may occur in the existing graded area adjacent to the substation.

2.13.3 Water and Gas Pipeline Laterals Construction

Water pipeline lateral completion will be scheduled as an early activity during construction. The water pipeline lateral will be installed in the shoulders or beneath the pavement surface of Pala Del Norte Road. An encroachment agreement with the road owners will be required. Construction of the water pipeline lateral will occur over an approximately one (1) month period.

The water pipeline will be run along the Site driveway bridge across the drainage west of the Site, to avoid impacting the streambed.

Gas pipeline construction will be scheduled so that it is finished and operational when the plant is ready for testing near the end of the construction period. The gas pipeline lateral will be constructed, owned and operated by SDG&E. It will be installed within the existing limits of disturbance of SR 76, as far out of traffic lanes as practical. Construction of the gas pipeline lateral will occur over approximately a one (1) month period.

Pipeline construction will include: hauling and stringing of pipe along the pipeline route in advance of the moving area of installation; trenching for pipe installation; welding; radiographic inspection and coating of pipe welds; lowering the pipe into the trench, pressure testing; and backfilling of the trench.

During the installation of the gas line, the southbound lane will require closure to allow room for construction. Since there will be insufficient roadway width to allow two-way traffic, one-way traffic will be provided. To minimize construction traffic impacts, the gas line be installed in segments. Construction area safety will be achieved through the use of portable changeable message signs, construction signs, and speed reduction signs in advance of the work area. Cones and flagmen will also be provided at both ends of the work site to direct and control one-way traffic. All construction warning devices will adhere to the W.A.T.C.H. Manual and the California Manual of Uniform Traffic Control Devices for Streets and Highways (FHWA'S MUTCD 2003 Edition, as Amended for use in California) dated September 2006.

2.14 PROJECT DESIGN AND CONSTRUCTION LAWS, ORDINANCES, REGULATIONS AND STANDARDS

The LORS that are or may be applicable to the design and construction of the Project are listed in Tables 2.14-1, 2.14-2, 2.14-3, and 2.14-4. The design of structures and facilities will be based on the laws, ordinances, codes, specifications, industry standards and regulations, and other reference documents in effect at the time of design. Additional applicable LORS that are relevant to individual environmental resource topics are addressed in Section 6.0 - Environmental Information. Table 2.14-5 provides a listing of administrative agencies with jurisdiction to enforce identified LORS.

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Table 2.14-1 – Summary of Engineering and Construction LORS and Compliance

JURISDICTION	AUTHORITY	AGENCY	REQUIREMENT	COMPLIANCE
Federal	29 USC § 651 et seq., 29 CFR §§1901.1-1910, 1500; 29 CFR, Part 1926	OSHA; Cal-OSHA per 29 CFR §§1952.70-1952.175	Specific occupational safety and health standards.	Project will implement health and safety requirements to meet applicable standards and comply with OSHA worker safety regulations.
Federal/ State	National Fire Protection Association standards	County Fire Marshall	Project must meet standards to establish a reasonable level of safety and property protection from the hazards created by fire and explosion.	Project will be constructed to comply with applicable NFPA requirements.
State	Business and Professions Code §6700 et seq., §§ 6730, 6735 and 6736	Board for Professional Engineers and Land Surveyors	Requires state registration practice as a civil, structural or mechanical engineer in California and that all plans, specifications, reports, or documents must be prepared by or under the direction of a registered engineer.	Engineering design will use registered engineers as required.
State	Labor Code §6500 et seq.	Cal-OSHA	Requires a permit for construction of trenches or excavation 5 feet or deeper into which personnel have to descend. Project will obtain required permits.	Permits will be obtained before regulated trenching activities occur.
State	CBC (latest edition available)	County of San Diego	Sets building standards and requirements.	Project will be constructed to comply with the latest applicable CBC requirements.
State	Labor Code §6300 et seq., 8 CCR 1500 et seq., 2300 et seq., §3200 et seq.	Cal-OSHA	Prescribes construction safety orders, industrial safety orders and work safety requirements.	Project will meet applicable standards and will comply with OSHA work safety regulations.
Industry	Various Industry/ Association Codes	Various. See Table 2.14-2.	Industry codes and trade association standards, usually for equipment.	The Project design will conform to the industry codes in effect at the time of design.
Local	San Diego County Code Title 5, Buildings and Building Regulations	County DPLU	Sets building standards and requirements for building in unincorporated San Diego County.	The Project will be constructed to comply with local building standards.

Table 2.14-2 – Potentially Applicable Industry Codes and Standards

INDUSTRY/ASSOCIATION OR CODE	ACRONYM
American Association of State Highway Officials	AASHO
American Institute of Steel Construction Specifications	AISC
American National Standards Institute	ANSI
American Petroleum Institute	API
American Society for Testing and Materials	ASTM
American Society of Heating, Refrigeration, and Air Conditioning Engineers	ASHRAE
American Society of Nondestructive Testing	ASNT
American Standards for Mechanical Engineering	ASME
American Water Works Association	AWWA
American Welding Society	AWS
Asphalt Institute, Pacific Coast Division	--
California Building Code	CBC
California State Fire Marshall	CSFM
Hydraulic Institute Standards	--
Institute of Electrical and Electronic Engineers	IEEE
Instrument Society of America	ISA
International Brotherhood of Electrical Workers	IBEW
National Institute of Occupational Safety and Health	NIOSH
Steel Structures Painting Council Standards	SSPC
Underwriters Laboratories	UL
Uniform Building Code	UBC
Uniform Fire Code	UFC
Uniform Mechanical Code	UMC
Uniform Plumbing Code	UPC

Table 2.14-3 – Potentially Applicable National Fire Protection Association Standards

STANDARD	DESCRIPTION
NFPA 1	Fire Prevention Code
NFPA 10	Portable Fire Extinguishers
NFPA 12	Carbon Dioxide Extinguishing Systems
NFPA 13	Installation of Sprinkler Systems
NFPA 14	Installation of Standpipe and Hose Systems
NFPA 15	Water Spray Fixed Systems
NFPA 20	Centrifugal Fire Pumps
NFPA 22	Water Tanks for Private Fire Protection
NFPA 24	Private Fire Service Mains and Their Appurtenances
NFPA 30	Flammable and Combustible Liquids Code
NFPA 37	Combustion Engines and Gas Turbines
NFPA 55	Compressed Gases
NFPA 68	Explosion Venting
NFPA 69	Explosion Preventing
NFPA 70	National Electric Code
NFPA 72	National Fire Alarm Code
NFPA 291	Testing and Marking Hydrants
NFPA 496	Purged and Pressurized Enclosures for Electrical Equipment
NFPA 497	Flammable and Combustible Liquids Classification
NFPA 850	Recommended Practice for Fire Protection for Electric Generating Plants and High-Voltage Direct Current Converter Stations
NFPA 1961	Fire Hose
NFPA 1962	Care, Use, and Service Testing of Fire Hose, Including Couplings and Nozzles
NFPA 1963	Fire Hose Connections
NFPA 2001	Clean Agent Fire Extinguishing Systems

Table 2.14-4 – Potentially Applicable CCR Title 8 Occupational Safety and Health Topics

STANDARD	DESCRIPTION
Occupational Safety and Health Standards 401-428	Definitions Administration Variances Appeals Officers Hearing Board

STANDARD	DESCRIPTION
General Industry Safety Orders; Title 8, Sections 3200-6184	Employee/Employer Communications Injury and Illness Prevention Program Emergency Action Plan Fire Prevention Plan Hazardous Materials • Control of Hazardous Substances • Hazard Communication Hazard Communication Emergency Medical Procedures Personal Protective Equipment Airborne Contaminants Signs, Tags, Barriers Noise Levels Ventilation Flammable/Combustible Materials Handling and Storage Fire Protection Systems Machine Guarding Crane and Hoist Operation Heavy Equipment and Machine Operation Rigging Sanitary Facilities Traffic Safety Interface with other Contractors Miscellaneous Hazards, including hot pipes, compressed air system, relief valves, pipelines, loading docks
General Construction Safety Orders; Title 8, Sections 1500-1938	High-Voltage Electrical Safety Orders Construction Accident Prevention Plan Weekly Toolbox Meetings Traffic Accidents and Earth Moving Hoist Equipment Reinforcing Concrete Fall Protection and Scaffolding Electrical Installations Evacuation Plan and Procedures Fire Safety Airborne Contaminants Emergency Medical Procedures Personal Protective Equipment Hand and Power Tool Use Crane and Hoist Operation Pile Driving Illumination Housekeeping Excavations
Electrical Safety Orders Title 8, Sections 2299-2974	High-Voltage Installation, Operation and Maintenance Low-Voltage Hazards High-Voltage Hazards

Table 2.14-5 – Engineering Administrative Agency Contacts and Permitting/Approval Authorities

LOCAL AUTHORITY OVERSIGHT/ ENFORCEMENT AND AGENCY CONTACTS	AUTHORITY
California Energy Commission 1516 9th Street Sacramento, California 95814-5512 (800) 555- 7794	Compliance with power plant engineering requirements.
Judy Nickel California Independent System Operator 151 Blue Ravine Road Folsom, California 95630 (916) 608-7062 jnickel@caiso.com	Compliance with interconnection and maintenance requirements.
Jarrett Ramaiya County of San Diego Department of Planning and Land Use 5201 Ruffin Road, Suite B San Diego, CA 92123 (858) 694-2960	Compliance with engineering and building requirements.

2.15 PERMITS

A schedule for when permits are expected to be obtained is shown in **Figure 2.15-1**.

Figure 2.15-1 – Projected Permit Schedule

MONTHS	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10
SPPE Application/Negative Declaration	◈				❖	⊙				
Major Use Permit		◈			❖	⊙				
Air Pollution Control District		◈			❖	⊙				
Hazardous Materials Permit					◈	⊙				
Streambed Alteration Agreement			◈		❖	⊙				
Construction Storm Water NPDES					◈	⊙				
Caltrans Encroachment Permit		◈			❖	⊙				

◈ Application Filed ❖ Preliminary Decision ⊙ Final Decision

APPENDIX 2-A – NATIVE TREE & SHRUB SPECIES

Table 2.-A-1 – Native Tree and Shrub Species

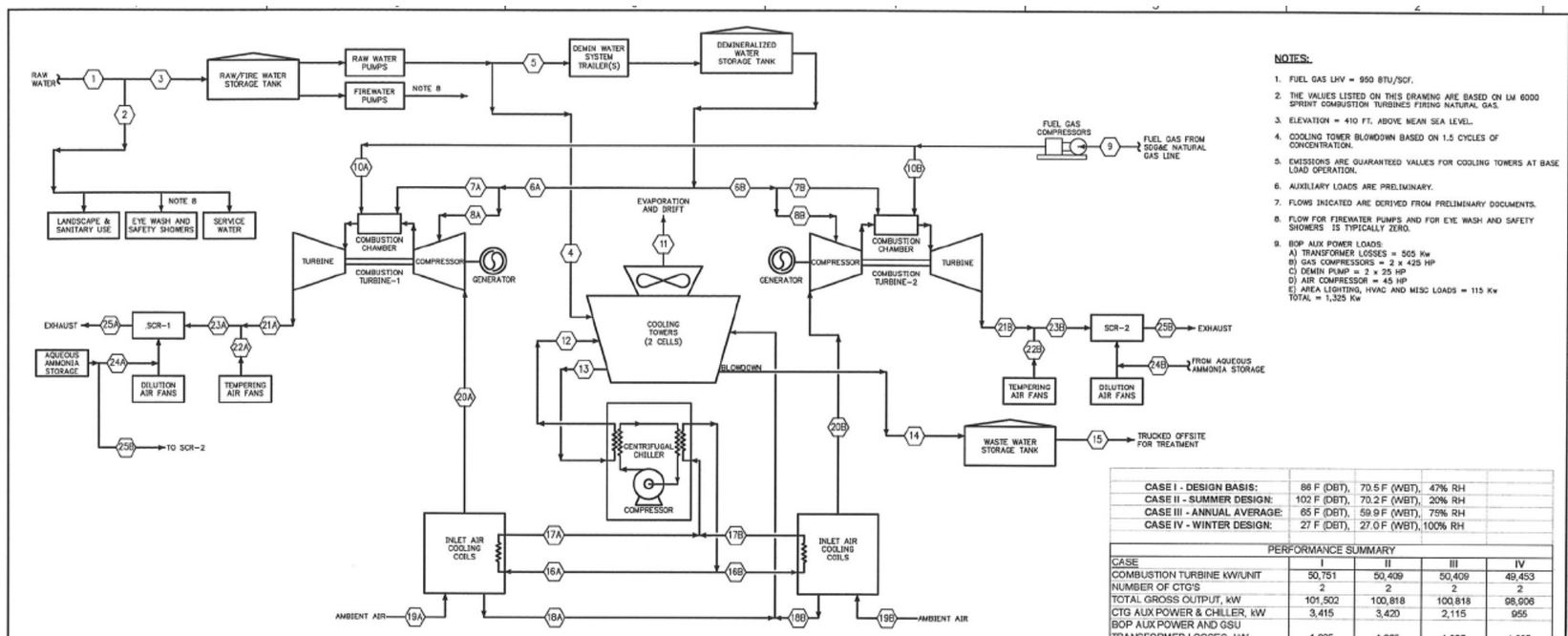
COMMON NAME	SCIENTIFIC NAME
Trees	
Engelmann oak	*Quercus engelmannii*
Coast live oak	*Quercus agrifolia*
Coastal Sage Scrub Seed Mix	
Black sage	*Salvia mellifera*
California broom	*Lotus scoparius*
Chaparral mallow	*Malacothamnus fasciculatus*
Coast monkeyflower	*Mimulus aurantiacus*
Golden-yarrow	*Eriophyllum confertiflorum*
Laurel sumac	*Malosma laurina*
Grasses	
Purple needlegrass	*Nassella pulchra*
Foothill needlegrass	*Nassella lepida*
Wildflower Seed Mix	
Arroyo lupine*	*Lupinus succulentus*
Blue-eyed grass	*Sisyrinchium bellum*
California poppy	*Eschscholzia californica*
Hoary California fuschia	*Epilobium* (*Zauschneria*) *canum* ssp. *canum*

Note: Native species selected for planting will be finalized in consultation with DPLU considering the Project Fire Protection Plan and County requirements.

2-B. B

APPENDIX 2-B – PROCESS DIAGRAM AND PERFORMANCE SUMMARY DATA

Figure 2-B-1 – Process Flow Diagram



NOTES:

1. FUEL GAS LHV = 950 BTU/SCF.
2. THE VALUES LISTED ON THIS DRAWING ARE BASED ON LM 6000 SPRINT COMBUSTION TURBINES FIRING NATURAL GAS.
3. ELEVATION = 410 FT. ABOVE MEAN SEA LEVEL.
4. COOLING TOWER BLOWDOWN BASED ON 1.5 CYCLES OF CONCENTRATION.
5. EMISSIONS ARE GUARANTEED VALUES FOR COOLING TOWERS AT BASE LOAD OPERATION.
6. AUXILIARY LOADS ARE PRELIMINARY.
7. FLOWS INDICATED ARE DERIVED FROM PRELIMINARY DOCUMENTS.
8. FLOW FOR FIREWATER PUMPS AND FOR EYE WASH AND SAFETY SHOWERS IS TYPICALLY ZERO.
9. BOP AUX POWER LOADS:
   A) TRANSFORMER LOSSES = 505 Kw
   B) GAS COMPRESSORS = 2 x 425 HP
   C) DEMIN PUMP = 2 x 25 HP
   D) AIR COMPRESSOR = 45 HP
   E) AREA LIGHTING, HVAC AND MISC LOADS = 115 Kw
   TOTAL = 1,325 Kw

CASE I - DESIGN BASIS:	86 F (DBT),	70.5 F (WBT),	47% RH	
CASE II - SUMMER DESIGN:	102 F (DBT),	70.2 F (WBT),	20% RH	
CASE III - ANNUAL AVERAGE:	65 F (DBT),	59.9 F (WBT),	75% RH	
CASE IV - WINTER DESIGN:	27 F (DBT),	27.0 F (WBT),	100% RH	

PERFORMANCE SUMMARY

CASE	I	II	III	IV
COMBUSTION TURBINE kW/UNIT	50,751	50,409	50,409	49,453
NUMBER OF CTG'S	2	2	2	2
TOTAL GROSS OUTPUT, kW	101,502	100,818	100,818	98,906
CTG AUX POWER & CHILLER, kW	3,415	3,420	2,115	955
BOP AUX POWER AND GSU TRANSFORMER LOSSES, kW	1,325	1,325	1,325	1,325
NET PLANT, kW	96,762	96,073	97,378	96,626
FUEL INPUT/UNIT MMBTU/HR (LHV)	433.0	430.1	430.1	418.8
TOTAL FUEL INPUT/MMBTU/HR (LHV)	866.0	860.2	860.2	837.6
NET PLANT HEAT RATE				
BTU/KWH (LHV)	8,532	8,533	8,533	8,466
BTU/KWH (HHV)	9,471	9,472	9,472	9,399

STREAM NO.	1				2				3				4			
CASE	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV
FLOW RATE (LB/HR)	142,700	149,209	122,672	95,133	30,042	30,042	30,042	20,028	112,658	119,167	92,630	75,105	37,553	44,062	17,525	0
FLOW RATE (GPM)	285	298	245	190	60	60	60	40	225	238	185	150	75	88	35	0
TEMP (F)	55	60	55	50	55	60	55	50	55	60	55	50	55	60	55	NA

STREAM NO.	5				6 A/B				7 A/B			
CASE	I	II	III	IV	I	II	III	IV	I	II	III	IV
FLOW RATE (LB/HR)	75,105	75,105	75,105	75,105	28,803	28,527	28,527	24,925	20,516	20,240	20,240	21,179
FLOW RATE (GPM)	150	150	150	150	57.53	56.97	56.97	49.78	40.97	40.42	40.42	42.30
TEMP (F)	70	75	70	65	70	75	70	65	100	100	100	100

STREAM NO.	8 A/B				9				10 A/B				11			
CASE	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV
FLOW RATE (LB/HR)	8,287	8,287	8,287	3,746	45,590	45,278	45,278	44,084	22,790	22,639	22,639	22,042	42,084	40,577	20,539	0
FLOW RATE (GPM)	16.55	16.55	16.55	7.48	-	-	-	-	-	-	-	-	84	81	41	0
TEMP (F)	100	100	100	100	77	77	77	77	151	151	151	151	-	-	-	-

STREAM NO.	12				13				14			
CASE	I	II	III	IV	I	II	III	IV	I	II	III	IV
FLOW RATE (LB/HR)	LATER	LATER	LATER	0	LATER	LATER	LATER	0	8,512	8,011	4,006	0
FLOW RATE (GPM)	LATER	LATER	LATER	0	LATER	LATER	LATER	0	17	16	8	0
TEMP (F)	LATER	LATER	LATER	NA	LATER	LATER	LATER	NA	LATER	LATER	LATER	NA

STREAM NO.	15				16 A/B				17 A/B				18 A/B			
CASE	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV
FLOW RATE (LB/HR)	8,512	8,011	4,006	0	2,254,151	2,189,561	1,144,100	0	2,254,151	2,189,561	1,144,100	0	6,509	2,253	3,755	0
FLOW RATE (GPM)	17	16	8	0	4502	4373	2285	0	4502	4373	2285	0	13	4.5	7.5	0
TEMP (F)	LATER	LATER	LATER	NA	46	46	46	NA	57	57	57	NA	70	70	60	NA

STREAM NO.	19 A/B				20 A/B			
CASE	I	II	III	IV	I	II	III	IV
FLOW RATE (LB/HR)	1,037,880	1,032,480	1,033,920	1,063,800	1,030,320	1,030,320	1,030,320	1,063,800
FLOW RATE (GPM)	-	-	-	-	-	-	-	-
TEMP (F)	85	102	65	27	46	46	46	27

STREAM NO.	21 A/B				22 A/B				23 A/B				24 A/B			
CASE	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV
FLOW RATE (LB/HR)	1,072,059	1,072,059	1,072,059	1,083,773	77,127	74,215	81,246	0	1,149,186	1,146,274	1,153,305	1,083,773	93	93	93	93
FLOW RATE (GPM)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TEMP (F)	840	840	840	837	91	107	70	32	787	790	783	837	-	-	-	-
EMISSIONS																
NOx, PPMVD, 15% O2	25	25	25	25					25	25	25	25				
NOx, PPH	44	43	43	42					44	43	43	42				
CO, PPMVD, 15% O2	20	20	20	41					20	20	20	41				
CO, PPH	21.3	21.2	21.2	41.8					21.3	21.2	21.2	41.8				
PM 10 PARTICULATES	-	-	-	-					-	-	-	-				
NH3 SLIP, LB/HR PPMVD 15% O2	-	-	-	-					-	-	-	-				

STREAM NO.	25 A/B			
CASE	I	II	III	IV
FLOW RATE (LB/HR)	LATER	LATER	LATER	LATER
FLOW RATE (GPM)	-	-	-	-
TEMP (F)	787	790	783	837
EMISSIONS				
NOx, PPMVD, 15% O2	2.5	2.5	2.5	2.5
NOx, PPH	4.34	4.34	4.34	4.36
CO, PPMVD, 15% O2	6.0	6.0	6.0	6.0
CO, PPH	6.34	6.34	6.34	6.36
PM 10 PARTICULATES	4.0	4.0	4.0	4.0
NH3 SLIP, LB/HR PPMVD 15% O2	5.0	5.0	5.0	5.0

REV.	DATE	DESCRIPTION	DWN	CHK
0	07-06-07	ISSUED – CEC PERMIT APPLICATION	SMG	LFB

Sealed Only When Signed in Blue Ink

Sega®
Engineers – Architects – Technicians
Design – Construction – Field Service
16041 Foster
P.O. Box 1000
Stilwell, Kansas 66085-1000

J-POWER GROUP
J-POWER USA Development Co., Ltd

ORANGE GROVE PROJECT

PROCESS FLOW DIAGRAM

DESIGN BY: L. BEIL	CHECKED BY: L. BEIL
DRAWN BY: S. GOETZ	DATE: 6-6-07
CLIENT I.D. JP000101	SEGA PROJECT NO. 07-098

CADD FILE NAME: 07098-P&ID-01.dwg

DRAWING NO. FIGURE 2B-1 REV. 0

N:\2007\07098\ENGR\ME\07098 Process Flow Diagram Rev 0.dwg 7/6/07 11:11am sgoetz

Source: Sega, Inc. – Drawing 2B-1, June 6, 2007

System Summary Report

GT PRO 17.0 admin
1282 05-17-2007 15:25:45 file=L:\Nate\Orange Grove\SANDEIGO Rev 051707.gtp
Plant Configuration: Simple Cycle Gas Turbine(s)
2 GE LM6000SPT Engines, GT PRO Type 0, Subtype 0
Steam Property Formulation: Thermoflow - STQUIK

SYSTEM SUMMARY

	Power Output kW		LHV Heat Rate BTU/kWh		Elect. Eff. LHV%	
	@ gen. term.	net	@ gen. term.	net	@ gen. term.	net
Gas Turbine(s)	100757		8532		39.99	
Steam Turbine(s)	0					
Plant Total	100757	96020	8532	8953	39.99	38.11

PLANT EFFICIENCIES

PURPA efficiency	CHP (Total) efficiency	Power gen. eff. on	Canadian Class 43
%	%	chargeable energy, %	Heat Rate, BTU/kWh
38.00	37.89	38.02	9467

GT fuel HHV/LHV ratio =	1.11			
DB fuel HHV/LHV ratio =	0			
Total plant fuel HHV heat input / LHV heat input =	1.11			
Fuel HHV chemical energy input =	953871	kBTU/hr	264964	BTU/s
Fuel LHV chemical energy input =	859642	kBTU/hr	238789	BTU/s
Total energy input (chemical LHV + ext. addn.) =	859642	kBTU/hr	238789	BTU/s
Energy chargeable to power (93.0% LHV alt. boiler) =	861758	kBTU/hr	239377	BTU/s

GAS TURBINE PERFORMANCE - GE LM6000SPT

	Gross power	Gross LHV	Gross LHV Heat Rate	Exh. flow	Exh. temp.
	output, kW	efficiency, %	BTU/kWh	lb/s	F
per unit	50378	39.99	8532	296	838
Total	100757			593	

Number of gas turbine unit(s) =	2			
Gas turbine load [%] =	100	%		
Fuel chemical HHV per gas turbine =	476935	kBTU/hr	132482	BTU/s
Fuel chemical LHV per gas turbine =	429821	kBTU/hr	119395	BTU/s

STEAM CYCLE PERFORMANCE

HRSG eff.	Gross power output	Internal gross	Overall	Net process heat output
%	kW	elect. eff., %	elect. eff., %	kBTU/hr
0.00	0	0.00	0.00	-1967.6

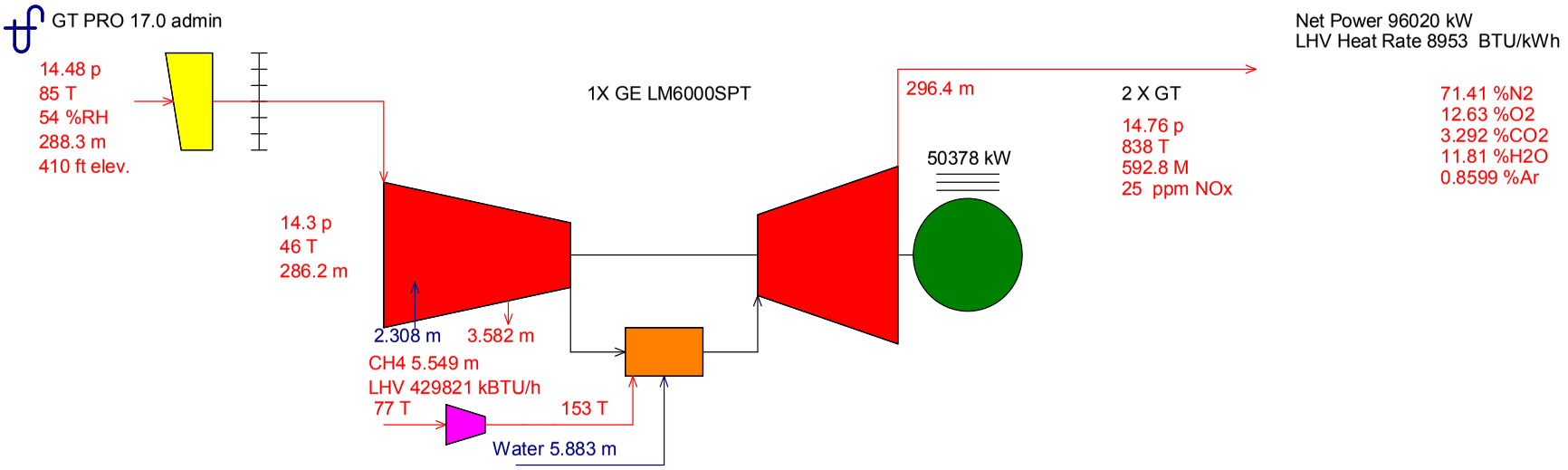
Fuel chemical HHV to duct burners =	0	kBTU/hr	0	BTU/s
Fuel chemical LHV to duct burners =	0	kBTU/hr	0	BTU/s
DB fuel chemical LHV + HRSG inlet sens. heat =	426030	kBTU/hr	118342	BTU/s
Net process heat output as % of total output =	-0.6041	%		

System Summary Report

ESTIMATED PLANT AUXILIARIES (kW)		
GT fuel compressor(s)*	730.4	kW
GT supercharging fan(s)*	0	kW
GT electric chiller(s)*	2372.3	kW
GT chiller/heater water pump(s)	56.34	kW
HRSG feedpumps*	0	kW
HRSG forced circulation pump(s)	0	kW
Cooling water pump(s)	0	kW
Air-cooled condenser fans	0	kW
Cooling tower fans	0	kW
HVAC	16	kW
Lights	25	kW
Aux. from PEACE running motor/load list	794.2	kW
Miscellaneous gas turbine auxiliaries	188.5	kW
Miscellaneous steam cycle auxiliaries	0	kW
Miscellaneous plant auxiliaries	50.38	kW
Gasification plant, ASU*	0	kW
Gasification plant, Coal mill	0	kW
Gasification plant, Other/misc	0	kW
Desalination plant auxiliaries	0	kW
Program estimated overall plant auxiliaries	4233	kW
Actual (user input) overall plant auxiliaries	4233	kW
Transformer losses	503.8	kW
Total auxiliaries & transformer losses	**4737**	**kW**
* Heat balance related auxiliaries		

System Summary Report

PLANT HEAT BALANCE				
Energy In	**282552**	**BTU/s**		
Ambient air sensible	7446	BTU/s		
Ambient air latent	8625	BTU/s		
Fuel enthalpy @ supply	265934	BTU/s		
External gas addition to combustor	0	BTU/s		
Steam and water	546.5	BTU/s		
Makeup and process return	0	BTU/s		
Energy Out	**282566**	**BTU/s**		
Net power output	91013	BTU/s		
Stack gas sensible	126402	BTU/s		
Stack gas latent	48498	BTU/s		
GT mechanical loss	740.3	BTU/s		
GT gear box loss	0	BTU/s		
GT generator loss	1733.4	BTU/s		
GT miscellaneous losses	132.2	BTU/s		
GT ancillary heat rejected	12393	BTU/s		
GT process air bleed	0	BTU/s		
Fuel compressor mech/elec loss	103.8	BTU/s		
Supercharging fan mech/elec loss	0	BTU/s		
Condenser	0	BTU/s		
Process steam	0	BTU/s		
Process water	0	BTU/s		
Blowdown	0	BTU/s		
Heat radiated from steam cycle	0	BTU/s		
ST/generator mech/elec/gear loss	0	BTU/s		
Non-heat balance related auxiliaries	1071.5	BTU/s		
Transformer loss	477.5	BTU/s		
Energy In - Energy Out	**-13.91**	**BTU/s**	**-0.0049**	**%**
Zero enthalpy: dry gases & liquid water @ 32 F (273.15 K)				



p[psia], T[F], M[lb/s], Steam Properties: Thermoflow - STQUIK

1282 05-17-2007 15:25:45 file=L:\Nate\Orange Grove\SANDEIGO Rev 051707.gtp

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APPENDIX 2-C – SYSTEM WATER BALANCE

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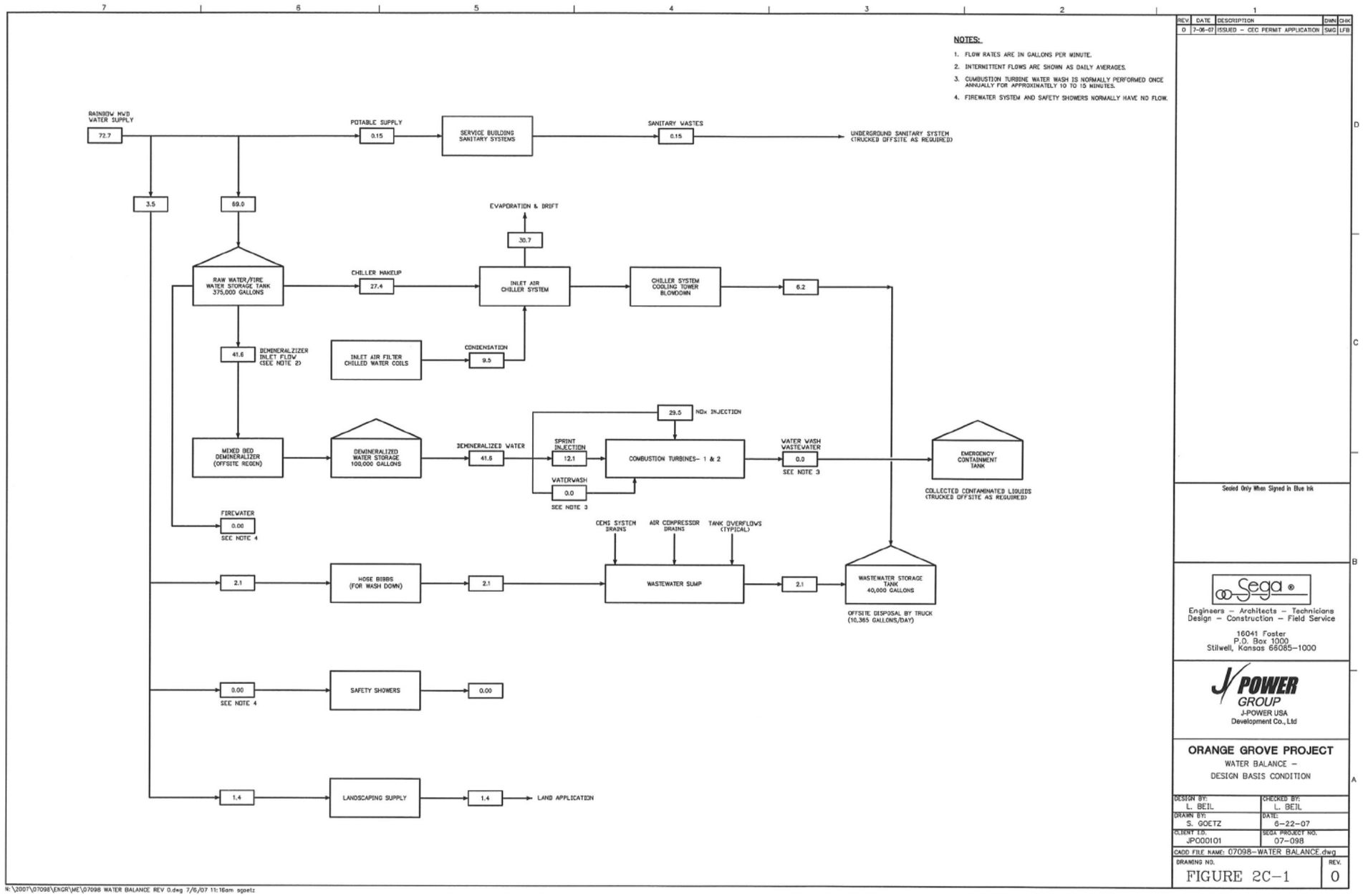
Figure 2-C-1 – Water Balance



Source: Sega, Inc. –Figure 2C-1, June 22, 2007

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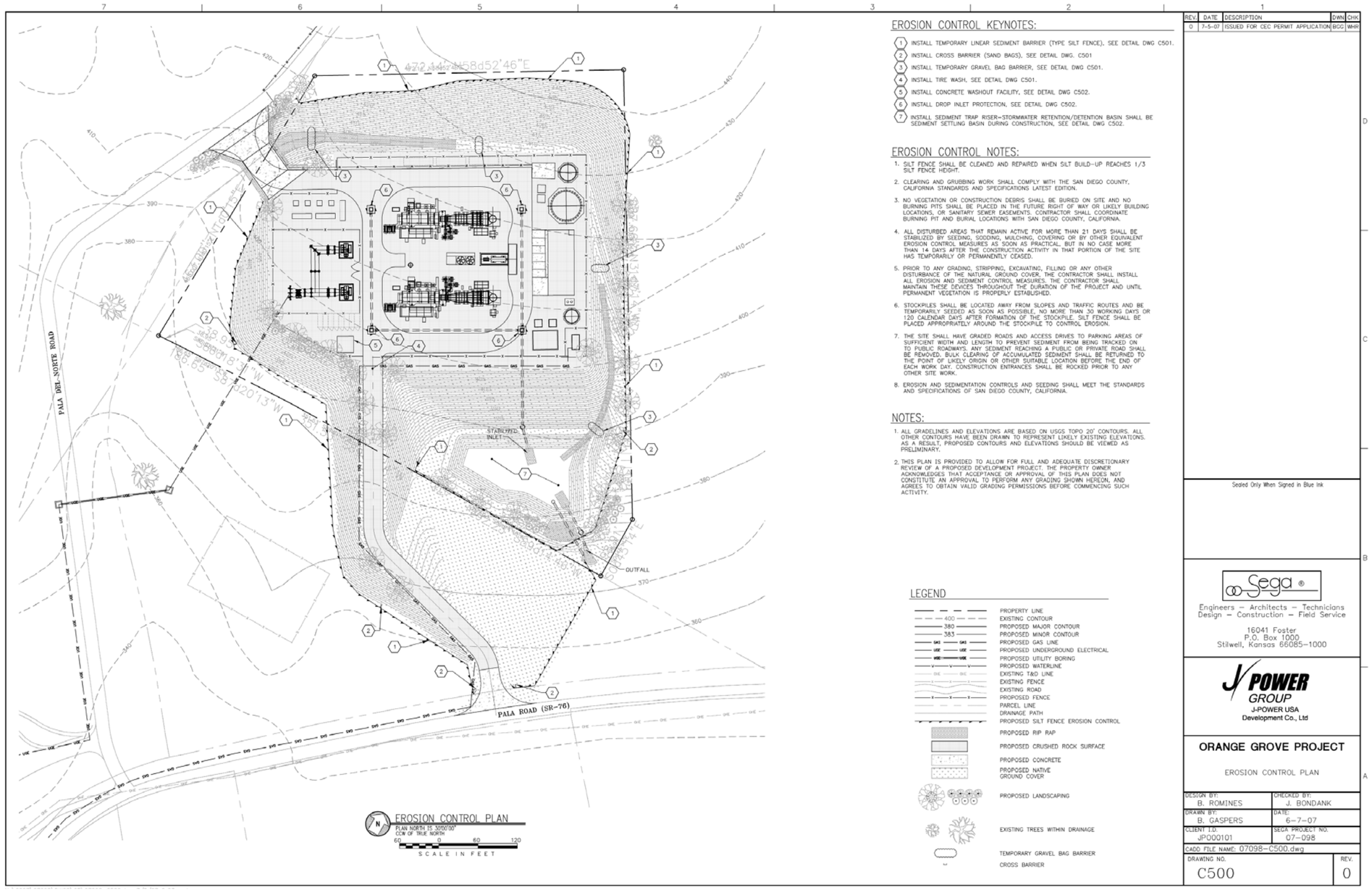
2-D. D

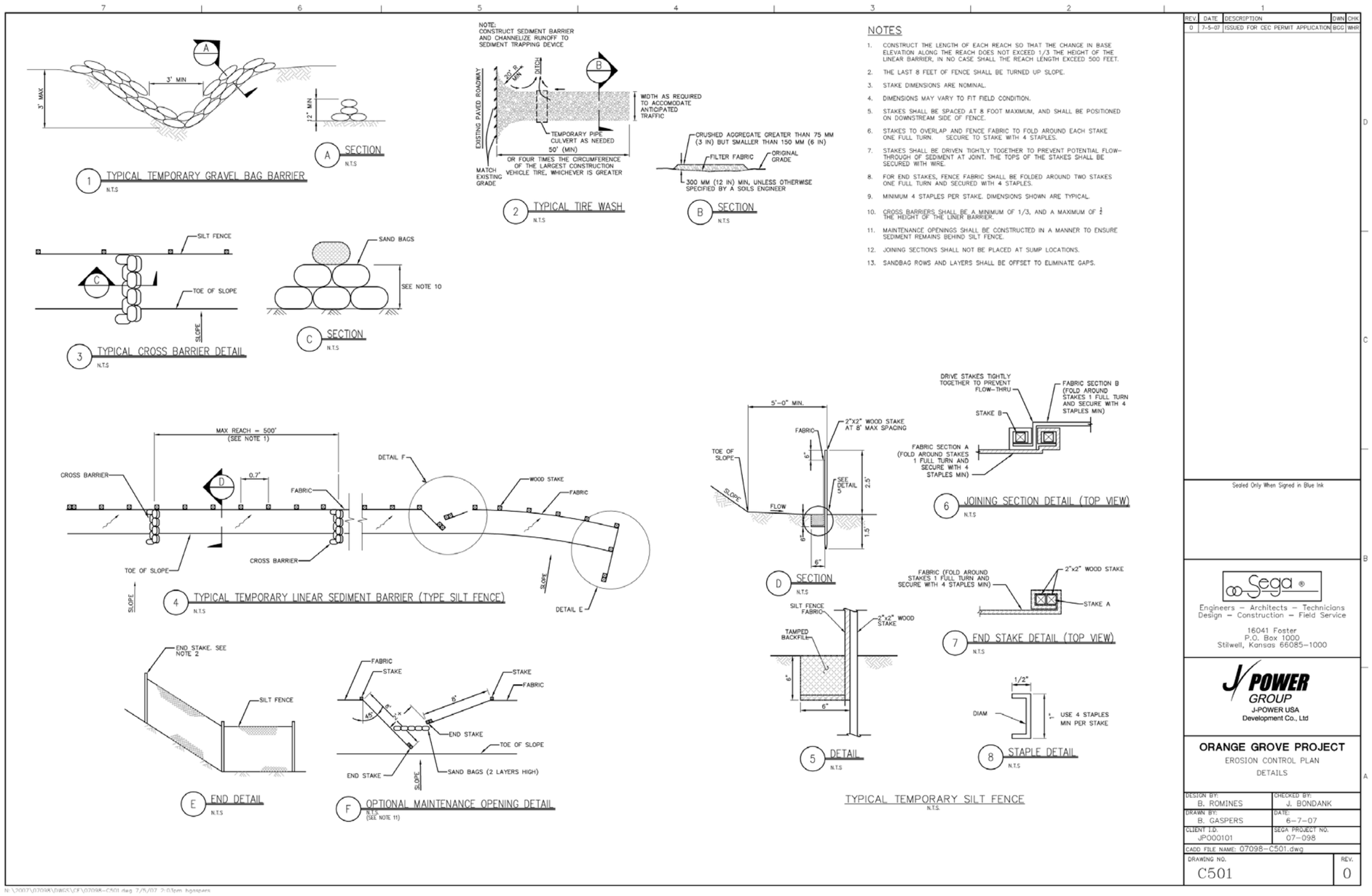
APPENDIX 2-D – EROSION CONTROL PLAN AND DETAILS (FOR CONSTRUCTION)

Figure 2-D-1 – Erosion Control Plan



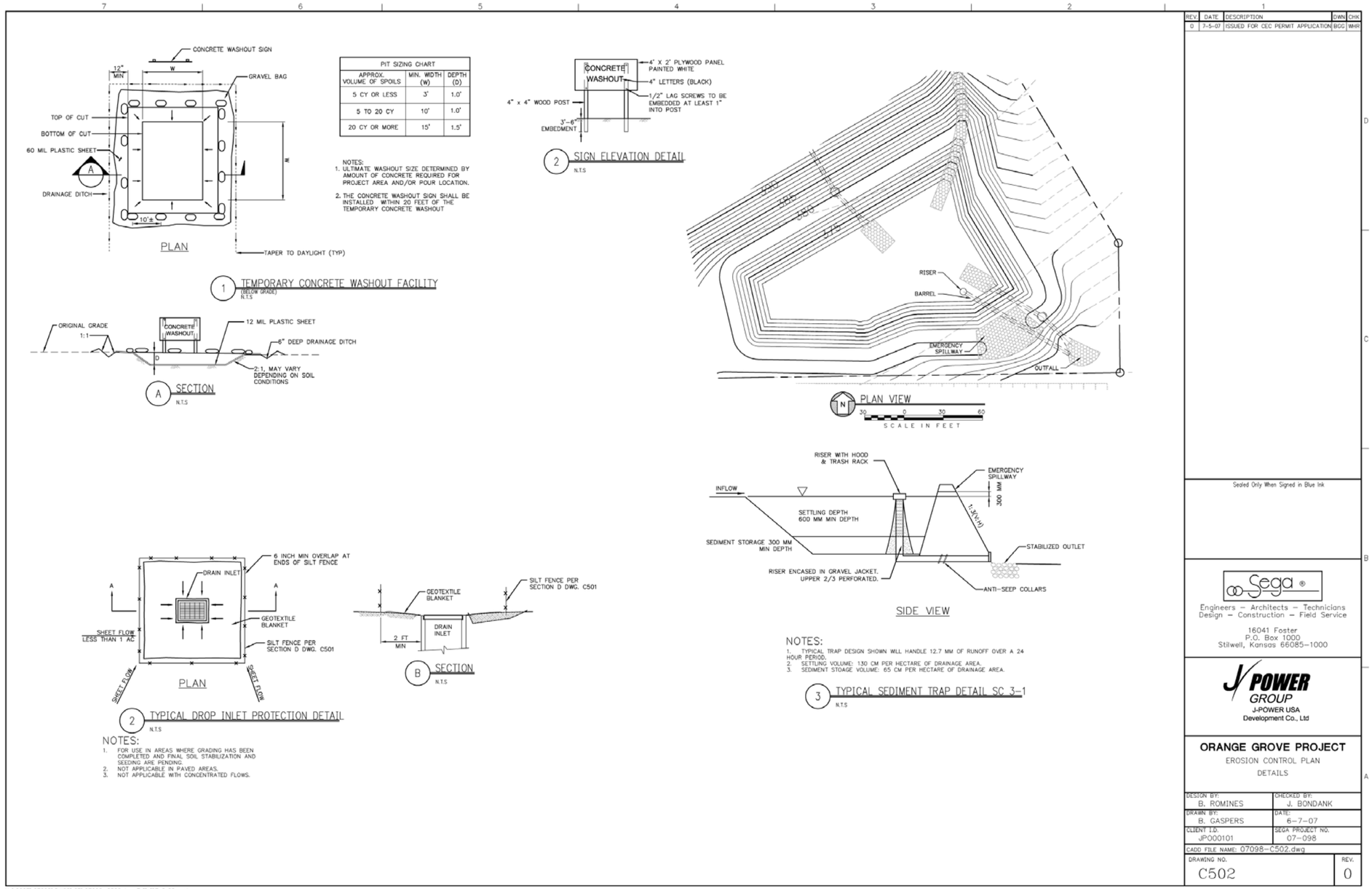
Source: Sega, Inc. – Drawing C500, June 7, 2007

Figure 2-D-2 – Erosion Control Plans Details 1



Source: Sega, Inc. – Drawing C501, June 7, 2007

Figure 2-D-3 – Erosion Control Plans Details 2



Source: Sega, Inc. – Drawing C502, June 7, 2007