would be provided for the stator winding and direct cooling would be provided for the rotor winding.

A combined-cycle unit using both the steam turbine and combustion turbine to power one electrical generator rated at 220 MW would be added under Phase 2. The combustion turbine would be similar to the first two and would be rated at 160 MW.

2.2.1.3 Heat Recovery Steam Generators and Air Pollution Control Equipment

The high-temperature (about 1,000 degrees Fahrenheit) combustion turbine exhaust gas would be directed through its HRSG, for combined-cycle operation. This HRSG system would use the heat available in the exhaust gas to produce steam for the steam turbine.

Duct burners would be located in the transition section between each combustion turbine exhaust and the HRSG. Duct burners are natural gas burners that would add about 45 million British Thermal Units (BTU) per hour of heat to each HRSG. This additional heat energy would increase plant electrical output up to an additional 9 MW for each HRSG. The duct burners would be used during periods of peak energy demand to maximize the plant's electrical output.

The reduction in combustion turbine gas temperature in the HRSG would allow the use of advanced SCR systems to minimize concentrations of CO and NO_X. The SCR system would control emissions, as needed, to satisfy air quality standards. NO_X would be controlled in the exhaust gas during normal operations to a maximum of 2.5 parts per million volume, dry (ppmvd), corrected to 15 percent oxygen and dry gas conditions. The CO would be controlled during normal operation to a maximum emission rate from the turbine of 5 ppmvd. CO emissions would increase to 8 ppmvd during duct firing. The exhaust gas would be discharged through an integral exhaust stack about 130 feet in height.

The catalyst planned for NO_x control requires the addition of ammonia to the system. Aqueous ammonia is planned for this Project. About 10 part per million (ppm) of aqueous ammonia would be expected to exit the system unreacted. In addition, some formaldehyde and other gases would be released as a result of the natural gas combustion process.

Additional details on air pollutant emissions expected from operation of the proposed power plant are provided in Section 3.1, Air Resources.

2.2.1.4 Steam Turbines, Generators, and Condensers

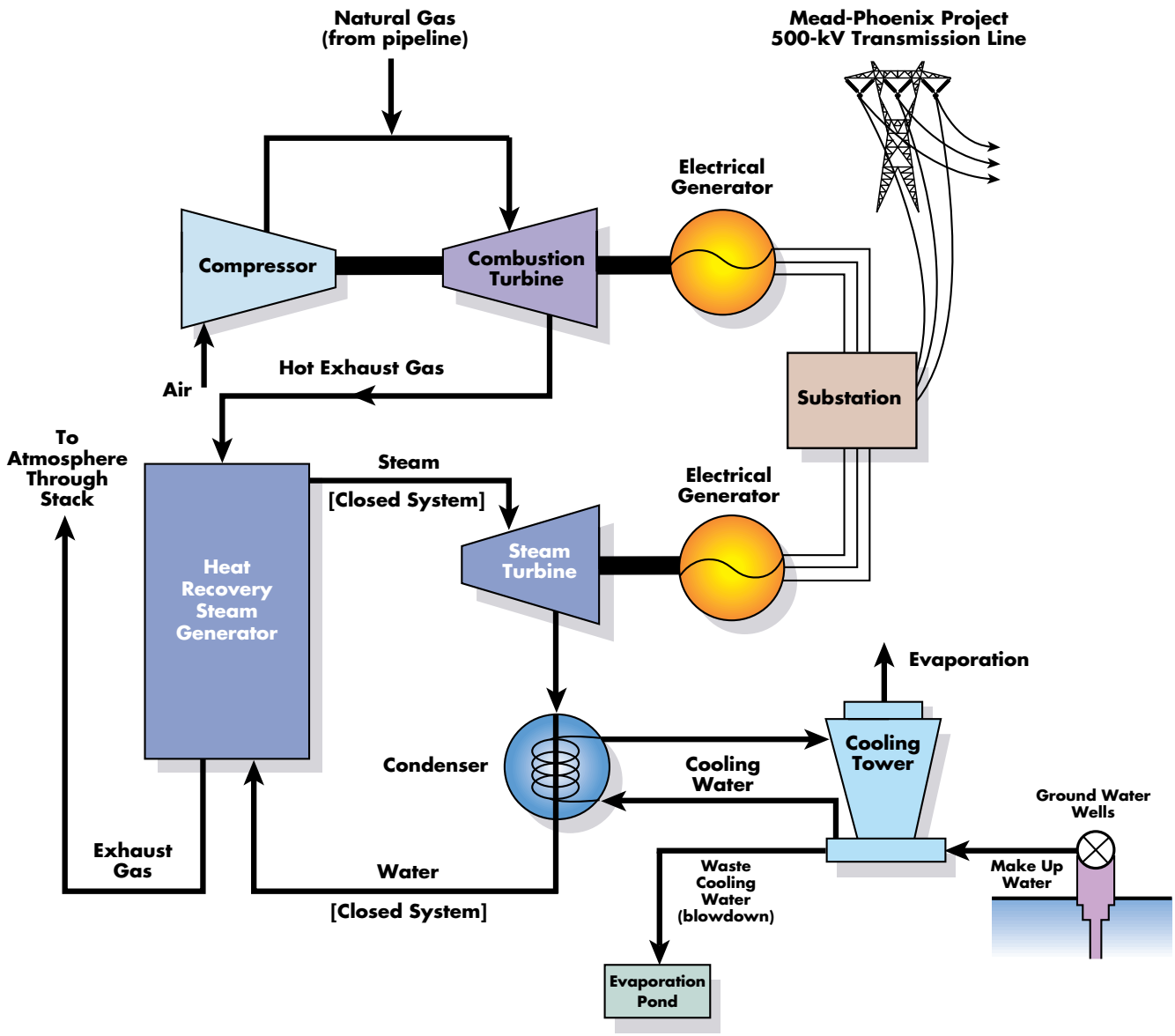
Two steam turbines are proposed, one with Phase 1 and one with Phase 2. The initial steam turbine would power a generator rated at about 160 MW with a water-cooled condenser. The steam turbine would be fitted with stop and control valves for the high-pressure steam admission. The steam turbine and condensers would be factory-assembled and shipped in modules for field erection. The proposed design and size of the steam turbine would provide for incremental output during peak operations.

After powering the steam turbine, the exhaust steam would be condensed to water using a closed system condenser, which would transfer the heat to water circulated through a cooling tower.

Under Phase 2, the proposed steam turbine would drive the same shaft as the gas turbine also proposed to be installed during Phase 2. Together, the steam and gas turbines would power an enclosed air-cooled generator rated at 220 MW. After powering the steam turbine, the exhaust steam would be condensed, as described above.

2.2.1.5 Plant Cooling System

The Proposed Action would include two separate cooling systems. The first would be the cooling system installed at the inlet of the turbine that would use evaporation of water to cool incoming air. This would increase the air



Process Description

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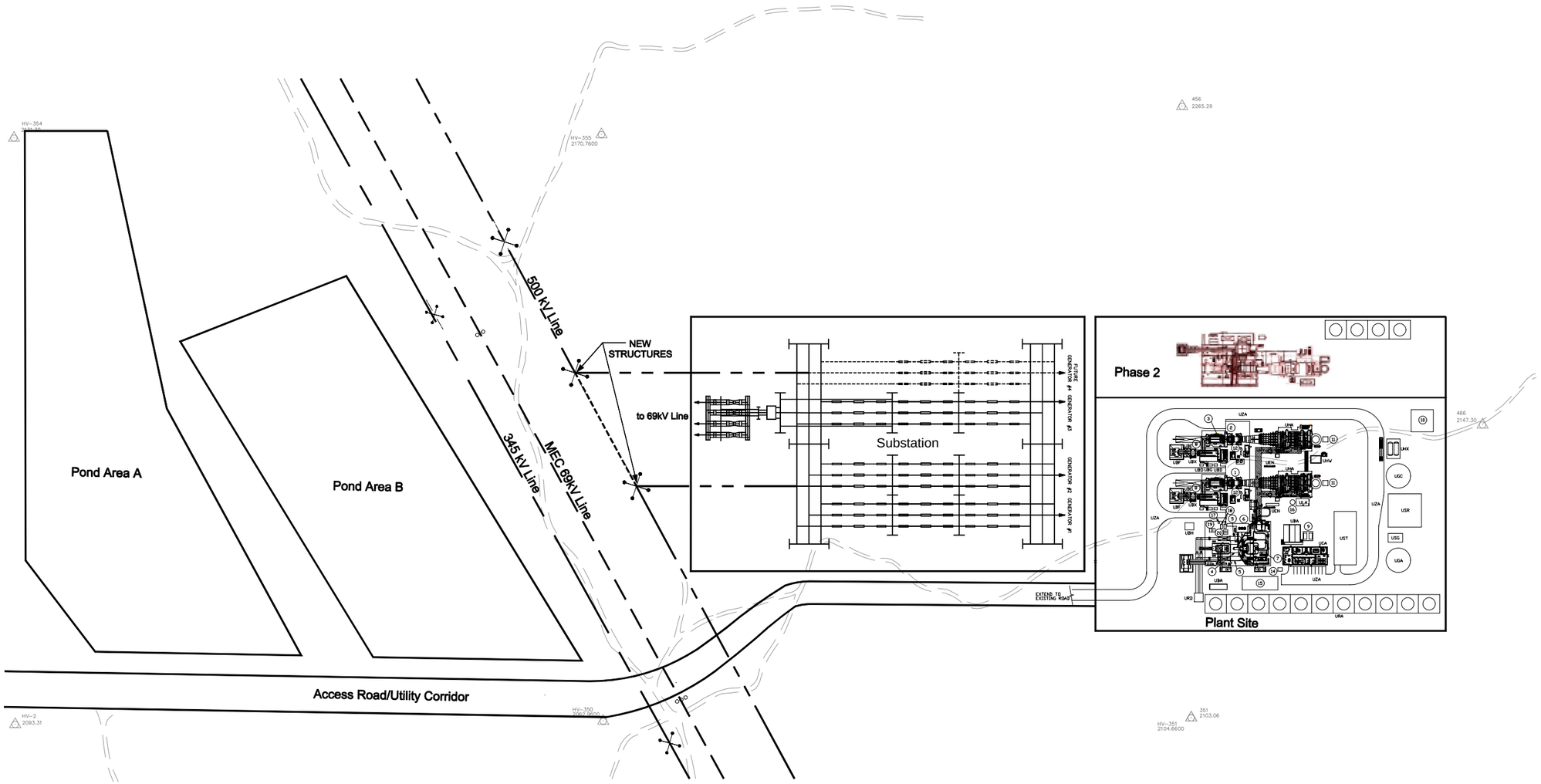
Figure 2-3



LEGEND

1	GAS TURBINE	UBA	POWER CONTROL CENTER
2	AIR INTAKE DUCT	UBD	LV-AUXILIARY POWER TRANSFORMER
3	GENERATOR (TEWAC)	UBE	MV-AUXILIARY POWER TRANSFORMER
4	STEAM TURBINE	UBF	GENERATOR TRANSFORMER
5	CONDENSER	UBG	START UP TRANSFORMERS
6	MAIN CONDENSATE PUMPS	UBH	OIL/WATER SEPARATOR
7	LUBE OIL TANK ROOM	UBX	CIRCUIT BREAKER
8	GENERATOR BUS DUCT	UCA	CONTROL ROOM BUILDING
9	HVAC UNIT FOR UCA	UEN	GAS PREHEATER
10	FUEL GAS CONDITIONING AREA	UGA	RAW WATER SUPPLY TANK
11	CEMS ENCLOSURE	UGC	DEMINERALIZED WATER STORAGE TANK
12	PLANT AIR COMPRESSORS	UHA	HEAT RECOVERY STEAM GENERATOR
13	NOT USED	UHW	BOILER BLOWDOWN
14	SEPTIC TANK	UHX	AMMONIA STORAGE AREA
15	DRAIN FIELD	ULA	FEEDWATER PUMPHOUSE
16	S/U DEAERATOR	UMY	PIPE BRIDGE
17	EXPANSION TANK	URA	COOLING TOWER
18	CLOSED COOLING WATER PUMPS	URD	CIRCULATING WATER PUMPS
19	COOLING WATER BOOSTER PUMPS	USG	FIRE PUMP HOUSE
20	PLATE FRAME HEAT EXCHANGER	USR	WASTE TREATMENT BUILDING (BY OTHERS)
		UST	WORKSHOP
		UZA	ROADS

NOTES

1. THE EQUIPMENT SHOWN IS REPRESENTATIVE INFORMATION. THIS DESIGN IS SUBJECT TO CHANGE AT THE DISCRETION OF SIEMENS WESTINGHOUSE.
2. REFERENCE DRAWING G7530102 FOR COMBUSTION TURBINE EQUIPMENT DIMENSIONS AND IDENTIFICATION.

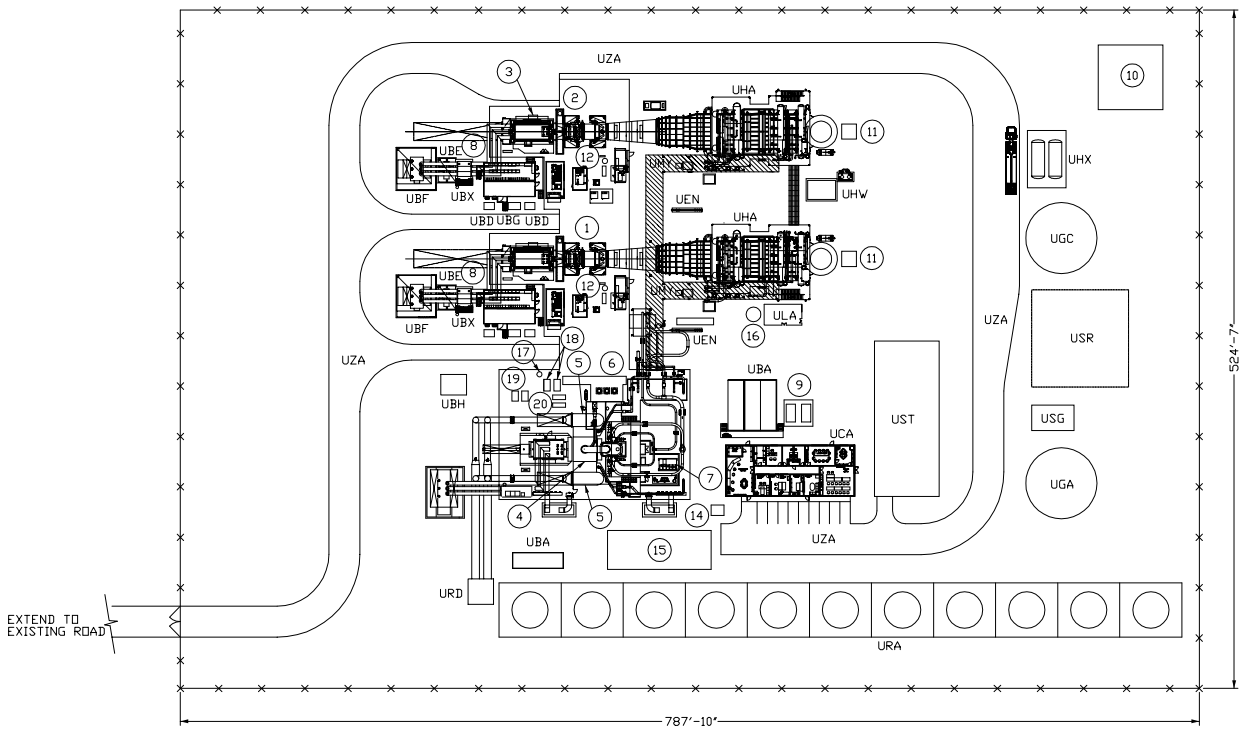
N

0 100 200
Scale (ft)

Project Site Diagram

Big Sandy Energy Project EIS

Figure 2-4a



LEGEND

1 GAS TURBINE
2 AIR INTAKE DUCT
3 GENERATOR (TEWAC)
4 STEAM TURBINE
5 CONDENSER
6 MAIN CONDENSATE PUMPS
7 LUBE OIL TANK ROOM
8 GENERATOR BUS DUCT
9 HVAC UNIT FOR UCA
10 FUEL GAS CONDITIONING AREA
11 CEMS ENCLOSURE
12 PLANT AIR COMPRESSORS
13 NOT USED
14 SEPTIC TANK
15 DRAIN FIELD
16 S/U DEAERATOR
17 EXPANSION TANK
18 CLOSED COOLING WATER PUMPS
19 COOLING WATER BOOSTER PUMPS
20 PLATE FRAME HEAT EXCHANGER

UBA POWER CONTROL CENTER
UBD LV-AUXILIARY POWER TRANSFORMER
UBE MV-AUXILIARY POWER TRANSFORMER
UBF GENERATOR TRANSFORMER
UBG START UP TRANSFORMERS
UBH OIL/WATER SEPARATOR
UBX CIRCUIT BREAKER
UCA CONTROL ROOM BUILDING
UEN GAS PREHEATER
UGA RAW WATER SUPPLY TANK
UGC DEMINERALIZED WATER STORAGE TANK
UHA HEAT RECOVERY STEAM GENERATOR
UHW BOILER BLOWDOWN
UHX AMMONIA STORAGE AREA
ULA FEEDWATER PUMPHOUSE
UMY PIPE BRIDGE
URA COOLING TOWER
URD CIRCULATING WATER PUMPS
USG FIRE PUMP HOUSE
USR WASTE TREATMENT BUILDING (BY OTHERS)
UST WORKSHOP
UZA ROADS

NOTES

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2. REFERENCE DRAWING G7530102 FOR COMBUSTION TURBINE EQUIPMENT DIMENSIONS AND IDENTIFICATION.

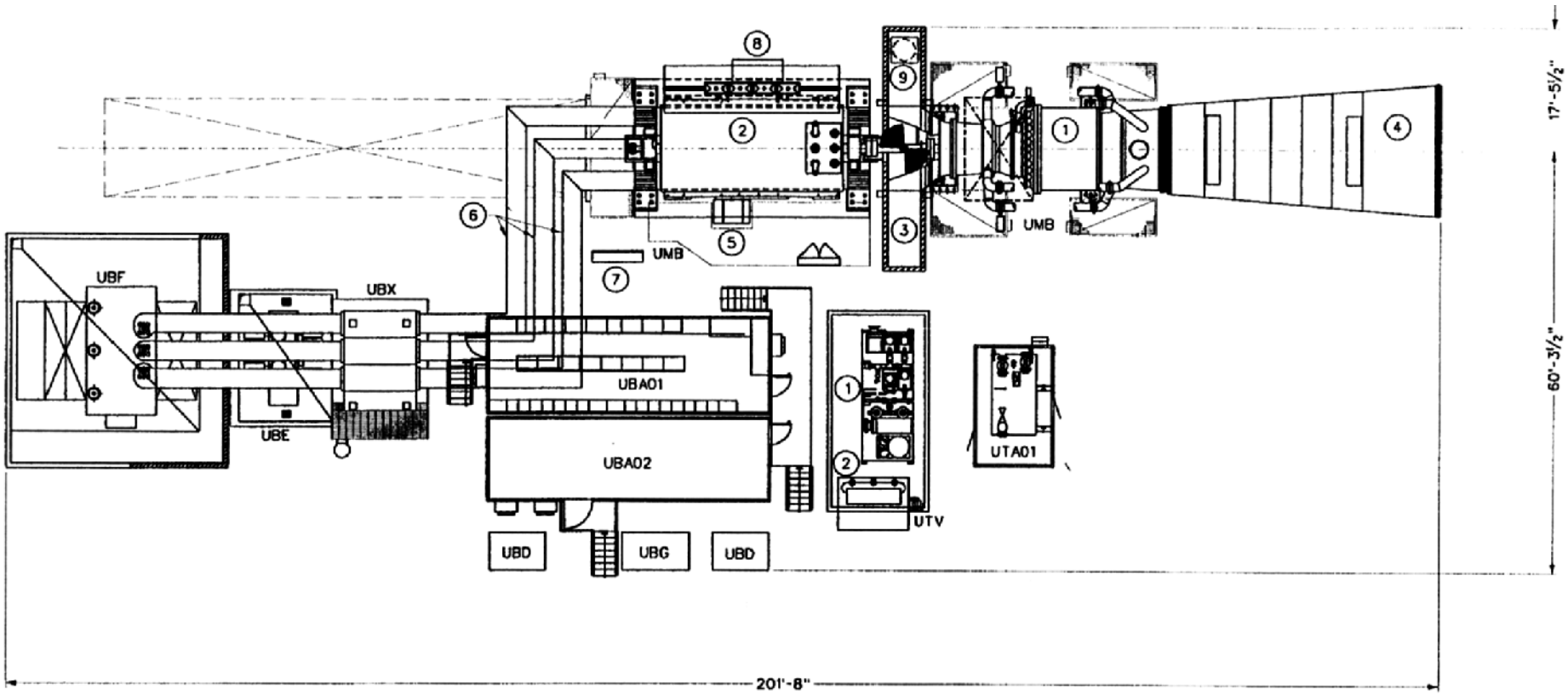
TERMINAL POINTS

A. FUEL GAS
B. RAW WATER
C. POTABLE WATER
D. WASTE WATER
E. OILY WATER
F. INTAKE AIR
G. LUBE OIL
H. CHEMICALS
J. FLUE GAS
K. ELECTRICAL EQUIPMENT
L. ACCESS ROADS
M. FENCES
N. DEMINERALIZED WATER
P. AMMONIA
R. CO2

Phase 1 General Plant Site Arrangement

Big Sandy Energy Project EIS

Figure 2-4b



LEGEND

UMB GAS TURBINE HOUSE
1. GAS TURBINE V84.3A
2. GENERATOR TLRI 108/46-36
3. AIR INTAKE DUCT
4. DIFFUSER
5. NEUTRAL CUBICLE
6. BUS DUCT
7. MOTOR CONTROL CENTER
8. BLADE CLEANING SKID
9. DEHUMIDIFIER

UTA01 MECHANICAL CONTAINER #1

UTV LUBE OIL ENCLOSURE
1. LUBE OIL TANK
2. PLATE FRAME HEAT EXCHANGER

UBA01 & 02 POWER CONTROL CENTER
UBE AUXILIARY TRANSFORMER
UBF GENERATOR TRANSFORMER
UBD LOW VOLTAGE TRANSFORMER
UBG START UP TRANSFORMER
UBX GENERATOR BREAKER

NOTES

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2. ALL DIMENSIONS SHOWN ARE IN FEET AND INCHES.

Phase 2 General Plant Site Arrangement

Big Sandy Energy Project EIS

Figure 2-4c

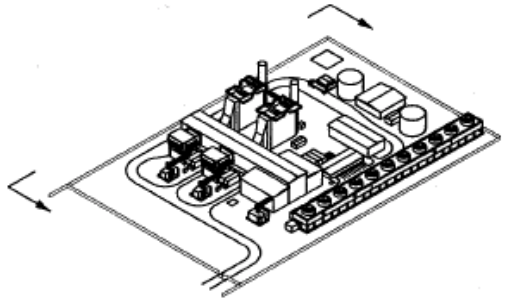
VIEW FROM WEST LOOKING EAST

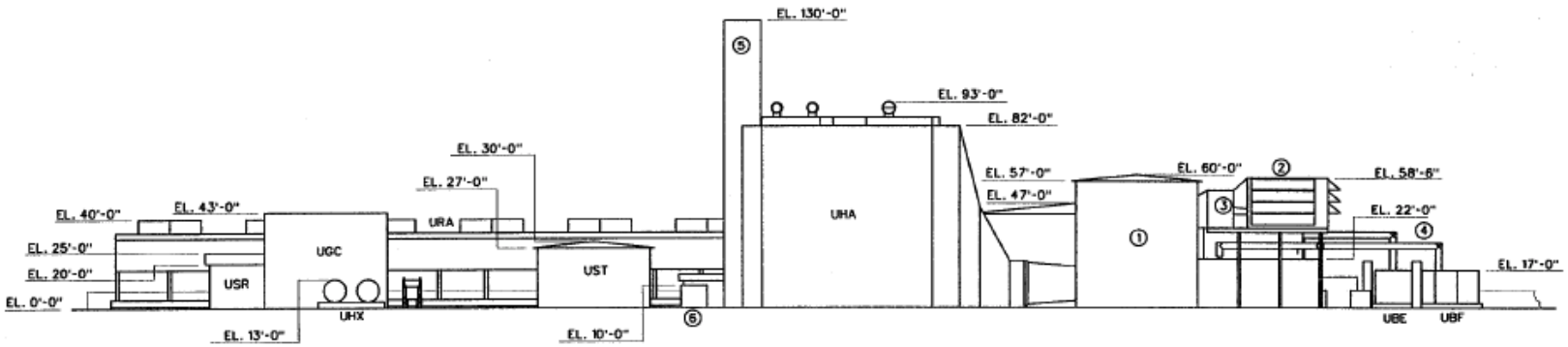
891/bigsand-views2.dwg

Artist's Rendering of Power Plant

Big Sandy Energy Project EIS

Figure 2-5





LEGEND

1 GENERATION BUILDING
2 CT INLET FILTER
3 AIR INTAKE DUCT
4 GENERATOR BUS DUCT
5 HRSG STACK
6 CEM ENCLOSURE
UBE MV-AUXILIARY POWER TRANSFORMER
UBF GENERATOR TRANSFORMER
UGC DEMINERALIZED WATER STORAGE TANK
UHA HEAT RECOVERY STEAM GENERATOR
UHX AMMONIA STORAGE AREA
USR WATER TREATMENT BUILDING
UST WORKSHOP
URA COOLING TOWER

NOTES

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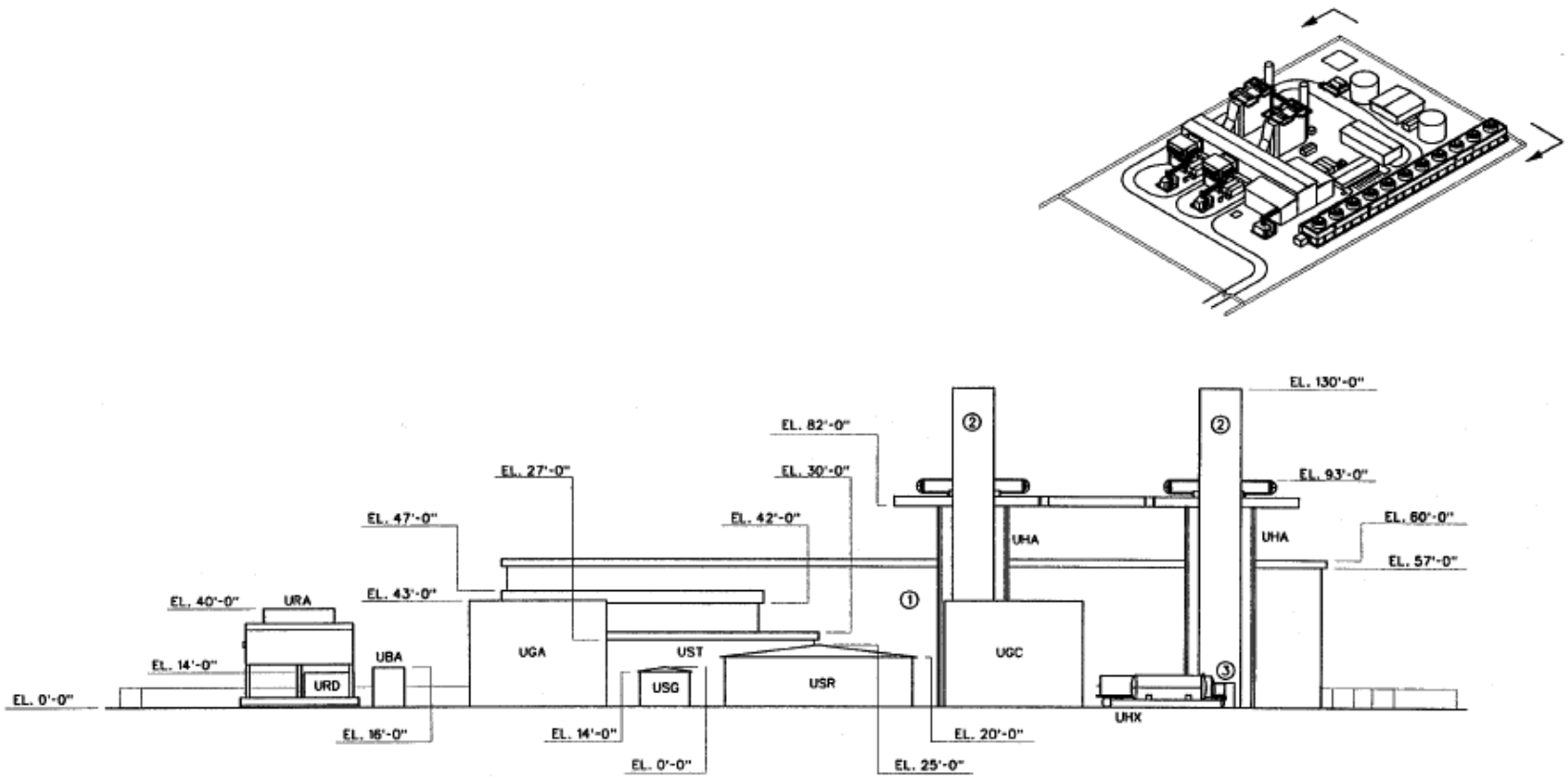
Phase 1 Power Plant Cross Section – Elevation 1

Big Sandy Energy Project EIS

Figure 2-6



LEGEND

1 GENERATION BUILDING
2 HRSG STACK
3 CEM ENCLOSURE
UBA POWER CONTROL CENTER
UGA RAW WATER SUPPLY TANK
UGC DEMINERALIZED WATER STORAGE TANK
UHA HEAT RECOVERY STEAM GENERATOR
UHX AMMONIA STORAGE AREA
URA COOLING TOWER
URD COOLING TOWER PUMP BUILDING
USG FIRE PUMP HOUSE
USR WASTE TREATMENT BUILDING
UST WORKSHOP

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Phase 1 Power Plant Cross Section – Elevation 2

Big Sandy Energy Project EIS

Figure 2-7

density, allowing the combustion turbine to generate additional energy.

The second cooling system would consist of an 11-cell wet cooling tower installed during Phase 1 that would evaporatively cool the water that has passed through the steam condenser to condense the low-pressure steam to water. An additional four-cell cooling tower would be installed as part of Phase 2. The cooling tower for the steam cycle built during Phase 1 would cycle water at the rate of about 219,000 gallons per minute (gpm). The smaller cooling tower added as part of Phase 2 would recycle about 82,125 gpm. About 2,400 gpm of water would be evaporated or lost as water droplets (drift) from the cooling towers during full load operation of the 720-MW (Phase 1 and Phase 2) power plant. Make-up water for the cooling towers would be provided from the groundwater supply wells. The water in the cooling tower would be cycled through the cooling system up to 12 times. To keep the dissolved solids concentration from going too high, a slip stream of cooling water would be discharged to the evaporation ponds (refer to Section 2.2.1.6) and make-up water would be added. Water for cooling needs would be treated with sodium hypochlorite (bleach) to control algal fouling. Less than 0.2 ppm of residual chlorine would be expected at the cooling water cycle outlet.

2.2.1.6 Waste Management

Solid and Hazardous Waste/Materials

Most of the solid waste generated during both construction and operation of the proposed power plant and associated facilities would be non-hazardous wastes typical of those generated by other human activities, such as used rags, empty parts containers, and office waste. About 50 tons per year (tpy) of general solid waste (rubbish) would be expected from routine operations.

Solid waste would be temporarily stored at the proposed power plant site in containers provided by a commercial waste handling facility. These materials would be collected and transported by a licensed hauler to an approved disposal facility authorized to accept this type of waste. All waste collection and disposal would be performed in accordance with regulatory requirements (Resource Conservation and Recovery Act [RCRA]) and applicable health and safety standards.

Several special or potentially hazardous wastes would be generated from routine operations. These include waste lubricating oils (12 tpy) and associated used oil filters, spent solvents (12 tpy), 100 empty drums per year, and spent SCR catalyst (24 tpy). Used oil, spent solvents, used oil filters and empty drums would be recycled by a licensed contract recycling company. Spent SCR catalyst would be returned to the supplier to be recycled or disposed of as a hazardous waste in an approved and permitted landfill.

Other hazardous wastes generated would include chemical cleaning wastes (such as alkaline and acid cleaning solutions used during pre-operational chemical cleaning of the HRSGs), acid cleaning solutions used for chemical cleaning of the HRSGs after the units are put into service, and turbine wash and HRSG fireside wash waters. These would be classified as characteristically hazardous because of their typically high metal concentrations. They would be stored temporarily on site in portable tanks and would be disposed of in accordance with applicable regulatory requirements (RCRA). About 120 tpy of these cleaning/flushing waste solutions could be expected from routine operations.

Hazardous materials, including solvents, acid, and oil, would be stored and used during construction and operation of the proposed power plant and associated facilities. Table 2-1 lists the various chemicals that likely would be used at the proposed power plant or other facilities. All materials would be stored, handled, and used in accordance with applicable regulations and standards (RCRA), and workers would be properly trained in hazardous materials identification and handling.