2.0 DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES

2.1 INTRODUCTION

This chapter presents the following information:

- Description of the Proposed Action
- Actions incorporated into the Proposed Action to reduce or prevent environmental impacts
- Description of alternatives, including alternative gas pipeline routes and the No-Action alternative
- Alternatives considered but eliminated from further analysis
- Comparative summary of environmental impacts

Council on Environmental Quality (CEQ) regulations (Title 40 Code of Federal Regulations [CFR] Parts 1500-1508) require that the Bureau of Land Management (BLM) and Western Area Power Administration (Western) use the review process established by the National Environmental Policy Act (NEPA) as amended to evaluate not only the Proposed Action, but also to identify and review reasonable alternatives to the Proposed Action, as well as a "No-Action" Alternative. The No-Action Alternative means the proposed Project would not take place. The No-Action Alternative provides an environmental baseline against which impacts of the Proposed Action and alternatives can be compared. CEQ (1981) states that reasonable alternatives include those that are practical or feasible from a common sense, technical, and economic standpoint. CEQ requires this document to identify those alternatives that have been eliminated from further analysis, and briefly discuss the reasons why they have been eliminated (40 CFR 1502.14(a)).

The BLM and Western decision-makers must consider all the alternatives discussed in this document. This comprehensive review ensures that environmental information is available to public officials and citizens before decisions are made and before actions are taken. BLM and Western will identify the preferred alternative in the final environmental impact statement (EIS), after considering public and agency comments on this document.

2.2 DESCRIPTION OF THE PROPOSED ACTION

The Proposed Action is to construct, operate, and maintain a baseload 720-megawatt (MW) natural gas-fired, combined-cycle power plant and ancillary facilities, as described further in this section. The proposed power plant would interconnect with the regional electric transmission grid through an existing 500-kilovolt (kV) transmission line.

The Proposed Action would be located in the southeastern portion of Mohave County, Arizona, in the Big Sandy Valley (Figures 2-1 and 2-2). The primary components of the Proposed Action include the following:

- power plant and associated facilities and operations, including the plant cooling system, waste management operations, lighting, and fire protection and other safety systems
- 500-kV substation, with associated transmission line modifications and communications facilities
- water supply system consisting of deep groundwater wells and associated pipelines
- new county access road
- natural gas supply pipeline and interconnection facilities

- development of land for agricultural purposes

- actions to reduce or prevent environmental impacts

The proposed power plant and substation would be located on private land about 4 miles southeast of Wikieup, Arizona. Water necessary for power plant and agricultural operations would be provided from wells drilled on private land in the vicinity of the proposed power plant site. The access road to the power plant and well field would extend eastward to the proposed power plant site from U.S. Highway 93 (US 93), crossing about 2.3 miles of public and private lands. The high-pressure natural gas pipeline would extend about 39 miles across private and Federal and state public lands to the site from existing pipelines owned by several natural gas suppliers located along the Interstate 40 (I-40) corridor. Agricultural development would occur on private land adjacent to the access road immediately southwest of the proposed power plant site. Figure 2-2 shows the general location of the proposed power plant and most of the major Project components in the area.

The following sections describe each of the primary components of the Proposed Action in more detail.

3.1.1 Power Plant and Associated Facilities

The proposed power plant and associated evaporation ponds would occupy about 33 acres of a 120-acre site located on private land in the southwest quarter of Section 5, Township 15 North, Range 12 West (T15N, R12W). The power plant would be built in two phases. Phase 1 would be a 500-MW natural gas-fired, combined-cycle power plant, composed of the following:

- two combustion turbine generator sets and auxiliaries

- one steam turbine generator set and auxiliaries

- two triple-pressure heat recovery steam generators (HRSGs) and exhaust stacks, each equipped with a selective catalytic reduction (SCR) system as necessary for the exhaust gases to meet U.S. Environmental Protection Agency (EPA) and Arizona Department of Environmental Quality (ADEQ) air standards

- ancillary equipment for the balance of the power plant systems including cooling towers, administration (control room) and support buildings, a communication system, water systems, fire systems, transformers, switching gear, and other facilities

Construction of Phase 2, which is expected to commence within 18 months following completion of Phase 1, would add the following, for a total of 720 MW:

- one single-shaft combustion turbine/steam turbine generator set and auxiliaries

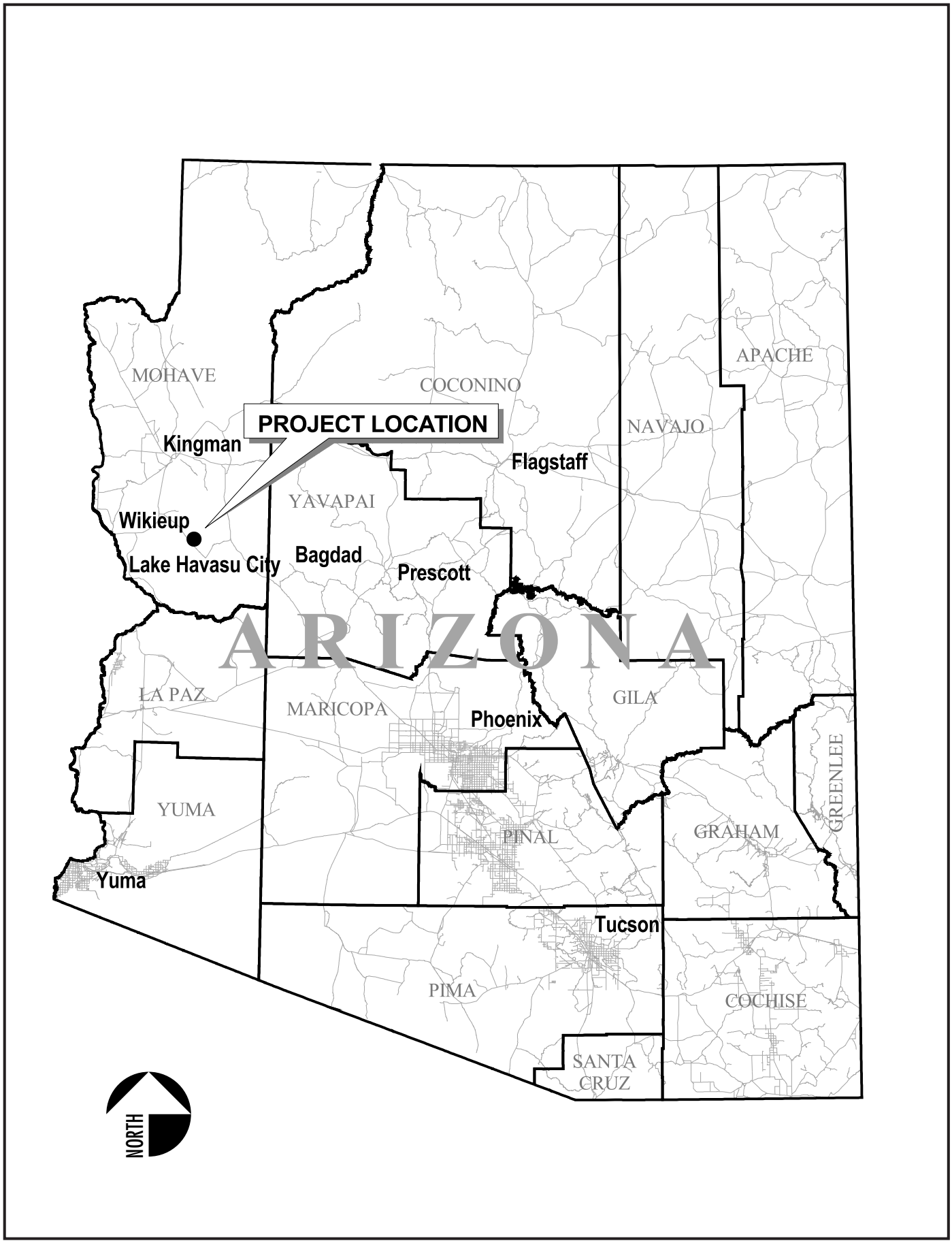
- one triple-pressure HRSG and exhaust stack equipped with an SCR system as necessary to meet EPA and ADEQ air standards

- ancillary equipment for the balance of the plant systems including cooling towers, water systems, fire systems, a transformer, switching gear, and other facilities

Specifics of the proposed power plant and associated facilities are subject to change during final design and construction. However, no environmental impacts beyond those assessed in this document are anticipated. If future changes to the design of the proposed power plant that constitute a Federal action create the potential for impacts not assessed in this EIS, BLM and Western would conduct additional environmental reviews pursuant to NEPA.

2.2.1.1 Process Description

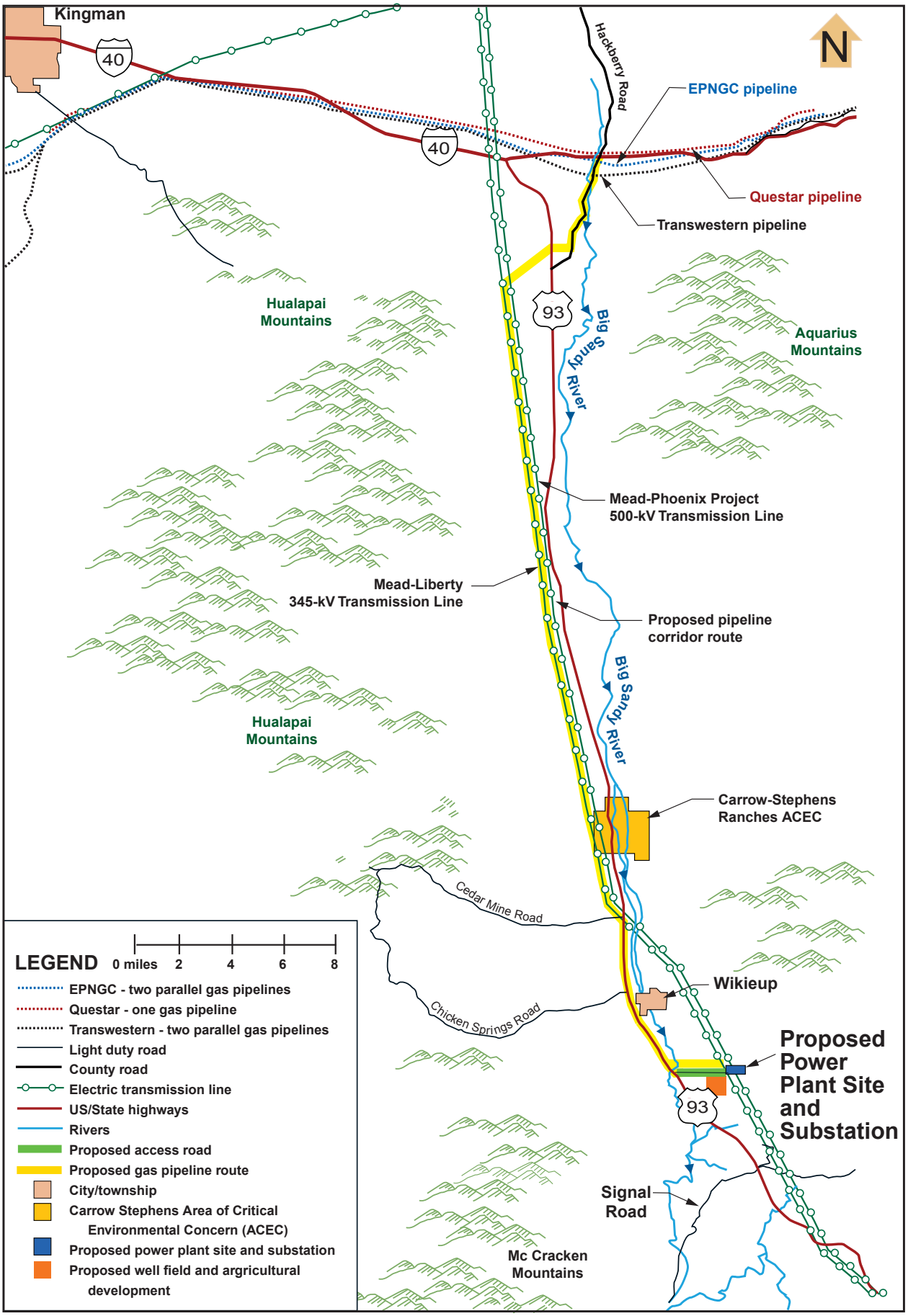
The proposed combined-cycle operation uses a combination of a combustion turbine and steam turbine to generate electricity. The electrical generation process converts the heat energy



Project Location Map

Big Sandy Energy Project EIS

Figure 2-1



Power Plant Location with Major Project Components

Big Sandy Energy Project EIS

Figure 2-2

available from the natural gas to mechanical energy, then to electrical energy. Inputs to the system would include natural gas and cooling water. Outputs would include heat, electrical energy, and combustion byproducts. Combustion byproducts primarily would be water and carbon dioxide (CO_2). Some air pollutants also would be emitted (primarily nitrogen oxide [NO_X], carbon monoxide [CO], and particulates). A simplified process diagram (Figure 2-3) is provided to indicate the major processes that would be involved with the production of electrical power at the proposed power plant.

As shown on Figure 2-3, natural gas would be burned in combustion turbines, which are connected to electrical generators that produce electricity. Each combustion turbine then would exhaust hot gas to an HRSG, which is a boiler specifically designed to recover heat from the gas. Steam generated in the boiler would be routed to a steam turbine to produce additional electricity. Each HRSG would include a section containing a catalyst to reduce air pollutants present in the combusted gas. The HRSG would remove some heat and pollutants in the gas, and the residual heat and air pollutants would be exhausted through a stack about 130 feet tall. The stack would contain equipment to monitor air emissions. Wet cooling towers would provide cooling for the steam generation cycle and turbine inlet air. Cooling make-up water would be supplied from Project groundwater wells, and wastewater from the cooling system would be directed to one of two evaporation ponds.

Figures 2-4a, b, and c are Project site diagrams that show locations of the various components of the proposed power plant, and proposed location of the substation and evaporation ponds. The combustion turbines and steam turbines are sited in close proximity to one another to maximize the use of shared infrastructure and minimize system losses. The combustion turbines, HRSGs, steam turbines, and supporting generation equipment are referred to throughout this environmental impact statement (EIS) collectively as the proposed power plant. The proposed power plant would cover about 15 acres and would contain the turbines, generators, HRSGs, stacks, administration building (control room), maintenance building/workshop, warehouse, storage, cooling towers, and parking for the operating staff. Several buildings and/or enclosures would contain the mechanical and electrical equipment. The size of these buildings would vary with the final layout and design. An artist's rendering of Phase 1 of the proposed power plant is shown on Figure 2-5. Figures 2-6 and 2-7 provide cross-sectional views of the proposed power plant layout for Phase 1; Phase 2 would involve the addition of more of the same equipment.

The following sections describe the proposed power plant and associated facilities in more detail. Refer to Figures 2-4a, b, and c; and Figure 2-7 for details on locations of the features discussed. Construction-related information for the proposed power plant is contained in Section 2.2.7.

2.2.1.2 Combustion Turbines and Generators

A combustion turbine is similar to a jet engine. In general, air is compressed and then heated by the fuel combustion. Energy is recovered as the high-pressure, high-temperature gas expands through and turns the turbine. This energy is used to turn the air compressor and a generator, producing electrical energy. Two 170-MW combustion turbines would be constructed as part of Phase 1. Each combustion turbine would use advanced combustion technology to minimize pollutant emissions, and would be housed in a metal building to protect the unit from the elements and provide noise reduction.

The air intake system would be mounted above each combustion turbine to provide filtered air to the combustion turbine compressor. The intake system would be equipped with a multistage, static filter system to clean particulates from the air. Silencers would be installed to reduce the potential for noise from the combustion turbine compressor inlet. The system would be provided with access for inspection and maintenance. An inlet air evaporative cooling system using water as the cooling medium would be provided to enhance combustion turbine performance at high local ambient air temperatures. Indirect cooling

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