3.0. Plant Description

This chapter describes the proposed construction and operation of STP 3 & 4. This chapter presents detailed information about the proposed U.S. Advanced Boiling Water Reactors (ABWR) in the following sections:

- External Appearance and Plant Layout (Section 3.1)
- Reactor Power Conversion System (Section 3.2)
- Plant Water Use (Section 3.3)
- Cooling System (Section 3.4)
- Radioactive Waste Management System (Section 3.5)
- Nonradioactive Waste Systems (Section 3.6)
- Power Transmission System (Section 3.7)
- Transportation of Radioactive Materials (Section 3.8)
- Construction Activities (Section 3.9S)
- Workforce Characterization (Section 3.10S)

3.1 External Appearance and Plant Layout

3.1.1 Existing Site

The STP site is located in south-central Matagorda County west of the Colorado River, 8 miles north-northwest of the town of Matagorda, Texas, and about 89 miles southwest of the city of Houston. The plant is located about 12 miles south-southwest of Bay City, Texas and about 13 miles east-northeast of Palacios, Texas on Farm to Market (FM) Road 521 between FM 1095 and the Colorado River. The closest incorporated communities are Bay City and Palacios. The site area consists of approximately 12,220 acres.

The existing station is composed of two units, each having an identical pressurized water reactor (PWR) Nuclear Steam Supply System and turbine generator. The existing STP 1 & 2 are Westinghouse PWR plants licensed by the NRC in 1987 and 1988, respectively. Each unit has a power rating of 3853 MWt. Each unit is designed for a net electrical power output of 1250 MWe at 3.5 inches of mercury turbine back-pressure. A complete description of the existing site is provided in the STP 1 & 2 Updated Final Safety Analysis Report (Reference 3.1-1). The units are arranged using a "slide-along" (i.e., identical arrangement) concept which results in STP 2 being similar to STP 1, and 600 feet away. Supporting features and structures located on the site include a 7000-acre Main Cooling Reservoir (MCR), an essential cooling pond, circulating water intake structure, and circulating water discharge structure. Figure 3.1-1 and Figure 3.1-4 provide aerial photographs of the existing STP site. Figure 3.1-3 and Figure 3.1-6 depict the site drawing illustrating the existing plant layout and the

proposed Advanced Boiling Water Reactor (ABWR) layout and topographical map of the site and vicinity, respectively.

The existing STP site was originally proposed as a four-unit site. However, only two units were actually constructed. Architectural treatment of building exteriors for STP 1 & 2 were designed to minimize visual impact. The building's exterior consists of gray concrete and neutral-colored metal siding, and seeding was used in prominent areas to enhance the appearance of the facility (Reference 3.1-2).

3.1.2 Proposed Site

STP Nuclear Operating Company, operator of STP, has selected the ABWR certified plant design for new units at the STP site. The ABWR units, to be referred to as STP 3 & 4, will be located to the northwest of the existing STP 1 & 2 as shown in Figure 3.1-3. The south face of the power block will be located approximately 2100 feet from the base of the MCR embankment. The reference ABWR has a thermal power rating of 3926 MWt, with a net electrical output of approximately 1300 MWe. The projected commercial operation dates for STP 3 & 4 are approximately March 2015 and March 2016, respectively.

A complete description of the ABWR design is provided in the reference ABWR Design Control Document. Each ABWR is based on an essentially "stand-alone" concept and consists of the following principal structures: Reactor Building, Turbine Building, Control Building, Radwaste Building, and Service Building. STP 3 & 4 will share common support facilities and structures for the Circulating Water System Intake and Discharge Structures. The MCR will be shared among all four units and will serve as the main condenser heat sink for all the units. STP 3 & 4 will also share certain support structures such as office buildings, water treatment, and wastewater. New waste-handling facilities will be built to be shared between all four units. Paved site roadways will connect the new units to the rest of the STP site, providing routine and nonroutine access to the existing and new units with minimal disturbance of the area.

The Reactor Building houses and provides protection and support for the reactor primary systems, the primary containment, and the majority of the plant safety-related equipment. The Reactor Building is constructed of reinforced concrete and structural steel with a steel frame and reinforced concrete roof. The Reactor Building encloses the primary containment. The Control Building houses and provides protection and support for plant control and electrical equipment, batteries, portions of the Reactor Building Cooling Water System, and Control Building heating, ventilating, and air conditioning equipment. The Control Building is located between the Reactor and Turbine Buildings. The Control Building is constructed of reinforced concrete and structural steel. The Turbine Building includes the electrical building and houses the main turbine generator and other power conversion cycle equipment and auxiliaries. The Turbine Building is located on the north end of the power block. The Radwaste Building is a structure that houses the solid and liquid radwaste treatment systems. The Radwaste Building is located to the west of the Reactor Building. STP 3 & 4 will be constructed from materials architecturally similar in color and texture to those used on STP 1 & 2.

STP 3 & 4 will be constructed northwest of the STP 1 & 2 plant complex. Most of this area has already been graded to the same elevation as the existing units. The area also contains access roads, various buried utilities, concrete slabs from old construction buildings, and several structures supporting operation of the existing units. STP 3 power block structures will be separated from the STP 2 structures by approximately 1500 feet. The center of the STP 3 containment will be approximately 1400 feet west and 1500 feet north of the center of the STP 2 containment. The STP 4 footprint will be separate from but adjacent to the STP 3 footprint. The center of STP 4 will be approximately 900 feet west of the center of STP 3. The power block footprints of STP 3 & 4 will require an area of approximately 53 acres. The proposed location integrates well with the existing units, and the layout has been designed to give the appearance of a plant site originally designed for four units. Figure 3.1-2 provides an artist's rendering of the STP site with the existing nuclear units and the two proposed units. A representative ground-level photograph of the site on which STP 3 & 4 is superimposed is included in Figure 3.1-5.

The STP 3 & 4 Circulating Water Intake Structure will be located in the MCR on the south side of the existing STP 1 & 2 Circulating Water Intake Structure. The STP 3 & 4 Circulating Water Return Structure will be located in the MCR on the west side of the existing STP 1 & 2 Circulating Water Return Structure. There is a dedicated UHS basin for each unit at STP 3 & 4 that is located directly south of the reactor buildings. Each cooling tower consists of six cells that are oriented along the east-west axis of the UHS basin. The basin is approximately 144 ft. x 292 ft. The height of the cooling tower is approximately 119 ft, which corresponds to Elev. 153.0 ft MSL. Figure 3.1-3 illustrates the location of these structures.

The elevation of the tallest building in the new units will be approximately 140 feet, which is approximately the same elevation as the existing nuclear units. This will result in a consistent visual effect and promote a pleasing overall aesthetic view (Figure 3.1-2 and Figure 3.1-5).

Existing infrastructure will be modified to integrate the new units with the existing units; however, none of the existing units' structures or facilities that directly support power generation will be shared with STP 3 & 4, with the exception of the MCR. The existing switchyard will be modified to provide interconnections with the new switchyard for the new units, and the onsite transmission lines modified and rerouted as required to incorporate the new generation capacity into the electric grid. Information concerning the planned transmission corridors is provided in Subsection 2.2.2. A training center will be built adjacent to the existing training center to support the training needs for the new units. In addition, other support facilities such as a new sewage treatment facility will be built, as required. Existing administrative buildings, warehouses, and other minor support facilities will be used, expanded, or replaced, based on prudent economic and operational considerations. Figure 3.1-3 shows the integration of the new and existing units as well as site roadways and access.

After the completion of construction of the new units, areas used for construction support will be graded, landscaped, and planted to enhance the overall site appearance. Previously forested areas cleared for temporary construction facilities will

be revegetated and harsh topographical features created during construction will be contoured to match the surrounding areas. These areas would include equipment laydown yards, module fabrication areas, a concrete batch plant, and construction parking.

3.1.3 References

3.1-1 “STPEGS Updated Final Safety Analysis Report, Units 1 & 2,” Revision 13.

3.1-2 “South Texas Project Units 1 and 2 Environmental Report.”

Figure 3.1-1 STP 1 & 2 with MCR on Left and Essential Cooling Pond on Right

Figure 3.1-2 Artist's Rendering of STP 3 & 4 with STP 1 & 2 and MCR in Background

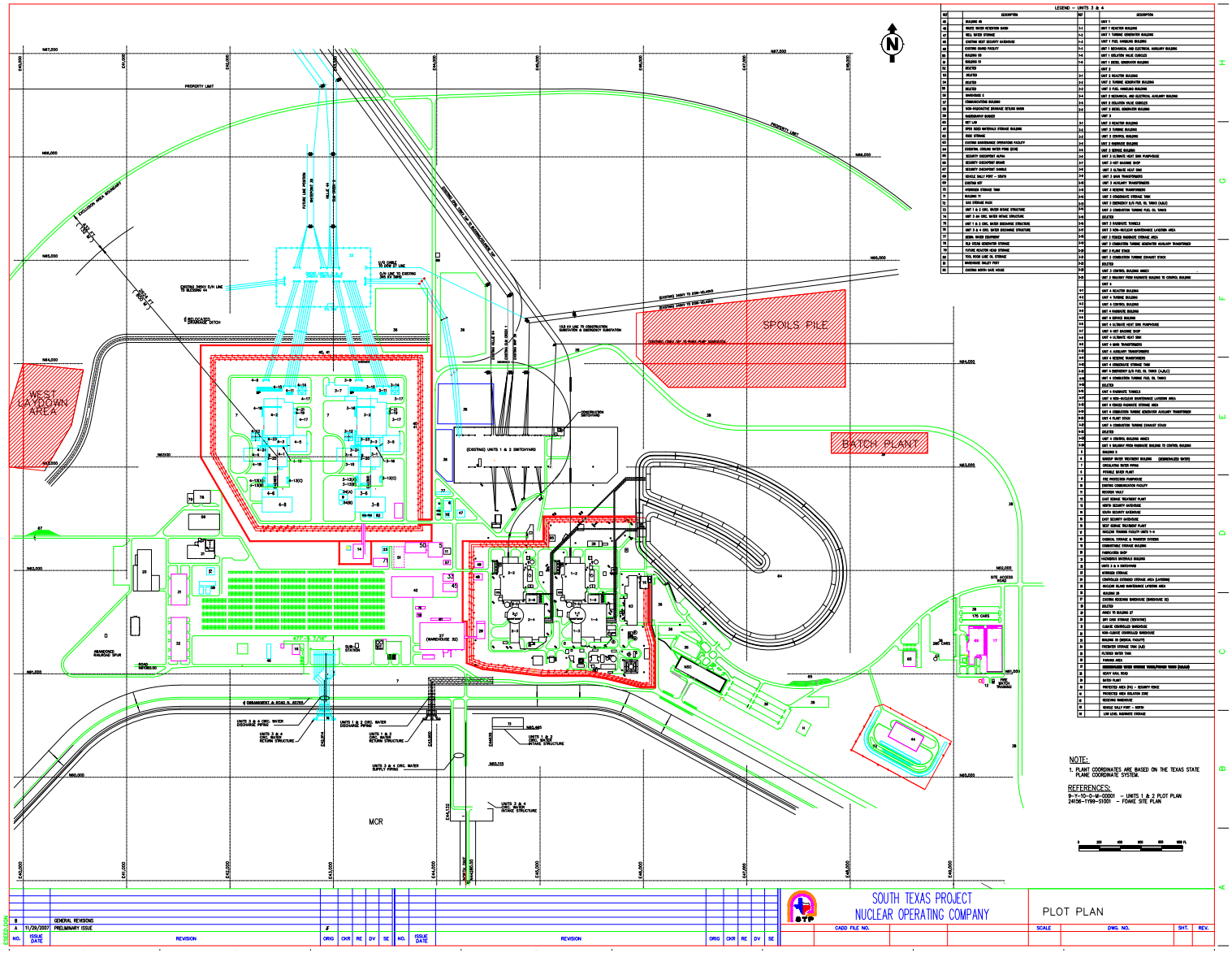

Figure 3.1-3 General Plant Layout

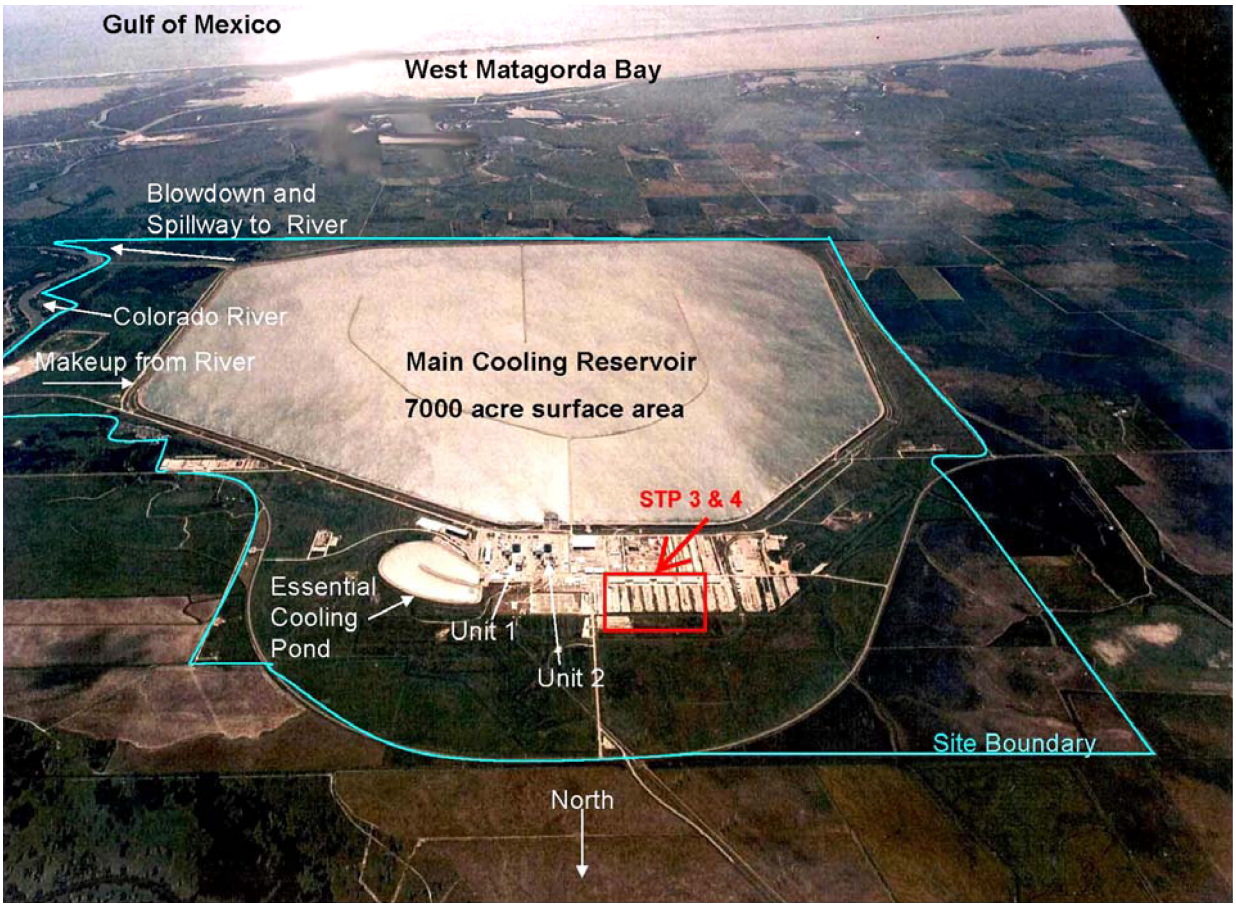

Figure 3.1-4 Aerial Photograph of STP 1 & 2 With Proposed Location of STP 3 & 4

Figure 3.1-5 Representative Ground-Level Photograph of STP 1 & 2

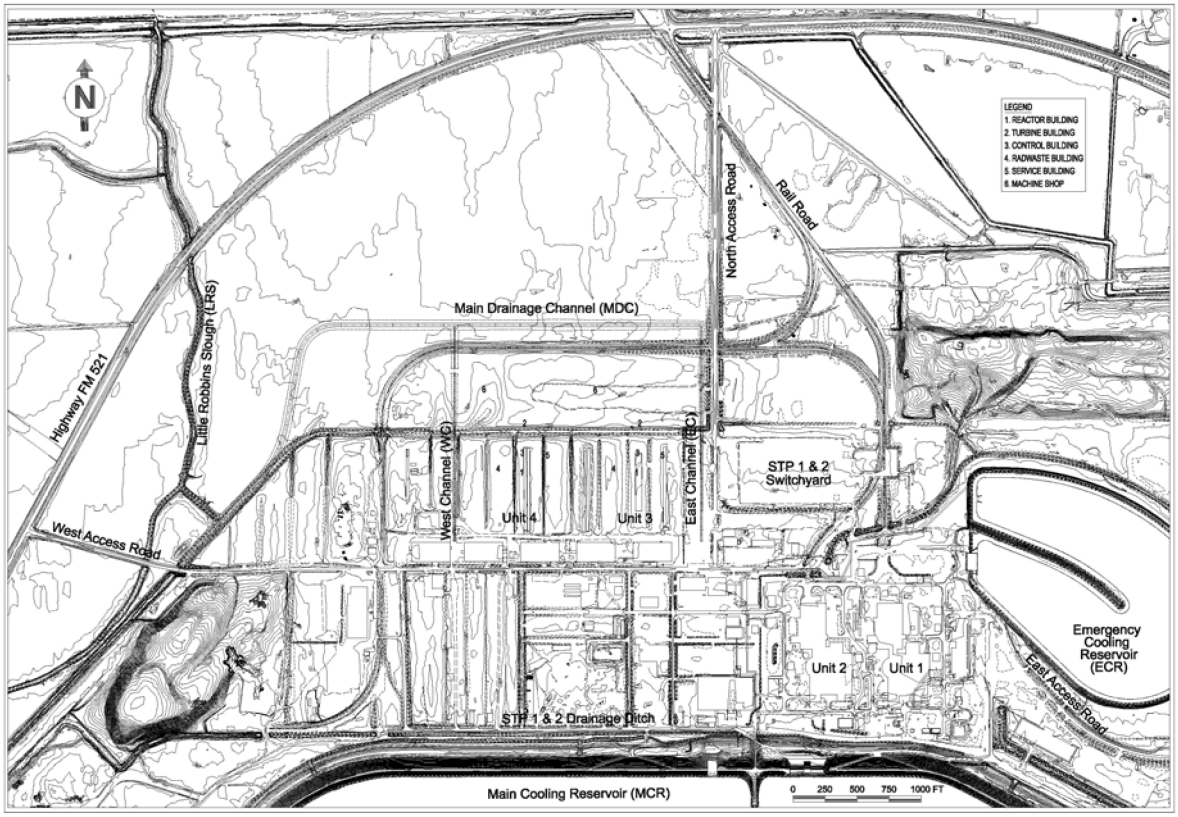

Figure 3.1-6 Topographical Map of the Site and Vicinity