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8.0 ALTERNATIVES

8.1 INTRODUCTION

The California Environmental Quality Act (CEQA) requires consideration of "a range of reasonable alternatives to the project, or to the location of the project, which would feasibly attain most of the basic objectives of the project but would avoid or substantially lessen any of the significant effects of the project, and evaluate the comparative merits of the alternatives" (14 California Code of Regulations [CCR] 15126.6[a]). Therefore, the focus of an alternatives analysis should be on alternatives that "could feasibly accomplish most of the basic objectives of the project and could avoid or substantially lessen one or more of the significant effects" (14 CCR 15126.6(c)). The CEQA Guidelines further provide that "[a]mong the factors that may be used to eliminate alternatives from detailed consideration in an EIR [Environmental Impact Report] are: (i) failure to meet most of the basic project objectives, (ii) infeasibility, or (iii) inability to avoid significant environmental impacts" (14 CCR 15126.6(c)).

A range of reasonable alternatives that could feasibly attain most of the basic objectives of the Willow Pass Generating Station (WPGS) are identified and evaluated in this section. These include:

- The No Project Alternative (that is, not developing a new power generation facility);
- Alternative site locations for constructing and operating the WPGS within the property boundaries of the Mirant Delta, LLC (Mirant Delta) Pittsburg Power Plant (PPP) property;
- Alternative site locations outside the PPP site; and
- Alternative generation technologies.

8.2 PROJECT OBJECTIVES

Mirant Willow Pass, LLC (Mirant Willow Pass) has identified several basic objectives for the development of a power project:

- Providing new dispatchable, operationally flexible resources to meet the electric needs of the State of California.
- Installing new generating capacity at an existing brownfield site owned by a Mirant entity and avoiding the need for significant new electricity or gas infrastructure or rights-of-way.
- Generating electric power at a location near the electric load center to increase reliability of the regional electricity grid, while satisfying local capacity requirements and reducing regional dependence on imported power.
- Producing quick-start electricity during times when renewable (e.g., wind) generation is not available (i.e., as backup generation for renewables).
- Safely producing electricity without creating significant environmental impacts.

8.3 NO PROJECT ALTERNATIVE

If the No Project Alternative is selected, Mirant Willow Pass would not receive authorization to construct and operate a new power generation facility at this brownfield site. Electricity required for local reliability and peaking or intermediate load requirements that would have been produced by the WPGS would need to be generated by another source and/or imported to northern California.

The State of California has projected a shortfall in peak load power supply for the Northern California region. The No Project Alternative would not assist the state in meeting this projected peak load demand.

If the WPGS is not built, other projects might be constructed on greenfield sites to meet energy demands and could result in more environmental impacts than development on a brownfield site. In addition, the No Project Alternative could result in greater fuel consumption and air pollution if older, less-efficient plants with higher air emissions and greater water consumption requirements are used to meet future demand that could have been served by the WPGS. The No Project Alternative would result in the loss of a substantial new local property tax revenue source and other local economic benefits that would be created by the construction and operation of the WPGS.

8.4 PROPOSED AND ALTERNATIVE SITES

8.4.1 Alternative Site Selection Criteria

The 26-acre WPGS site is located in the northeastern corner of the existing PPP site. The project site is currently occupied by retired PPP Units 1 through 4, an unused #6 fuel oil storage tank associated with prior uses at the existing plant, and an administration building and associated parking lot. These areas will be demolished for construction of the project. Construction of the new facility on the preferred site will capitalize on the close proximity to the existing Pacific Gas and Electric Company (PG&E) switchyard, which is located adjacent to the WPGS site. Additionally, locating the WPGS within the boundaries of the existing PPP site will allow the sharing of infrastructure such as the natural gas transmission line, the PG&E switchyard, the firewater system and access roads.

According to Public Resource Code 25540.6(b), evaluation of alternative sites is not required when a natural-gas–fired thermal power plant is proposed for development at an existing industrial site and the project has a strong relationship to the existing industrial site. The WPGS is exactly the type of project that was envisioned by this code section; therefore, it is reasonable not to analyze alternative sites for the project. The WPGS will be indirectly owned by the same ultimate parent corporation as the PPP, Mirant Corporation. The WPGS will be adjacent to the existing PG&E switchyard; and, because of adjacent existing infrastructure, will minimize the need for offsite transmission and gas linear facilities. As such, evaluation of alternative sites outside the boundaries of the PPP site is not legally required. However, to provide some level of information to the California Energy Commission (CEC) staff and in accordance with pre-filing guidance from CEC staff, a description of potential local industrial sites is provided.

8.4.2 Onsite Alternative Configurations Considered

8.4.2.1 Proposed Configuration

The proposed configuration includes two Flex Plant 10 units operated in combined-cycle mode to meet intermediate electric demand. The location of the WPGS as configured was dictated by space requirements, including insufficient space further west due to the operation of Units 5 through 7 (including constraints from the existing transmission corridor) and the existing PG&E switchyard. The open areas on the west portion of the PPP site are freshwater brackish marsh, including areas of designated jurisdictional wetlands; these areas were not considered feasible for siting a power plant. The

identified location for the WPGS is the most efficient location within the PPP site boundaries that could support this facility.

8.4.2.2 Restore Retired Units 1 Through 4

Repowering of the retired PPP Units 1 through 4 was considered and rejected as these units have exceeded their design life, and are not suitable candidates for restoration, as major components of the units have been removed and recycled. Restoration of these units cannot achieve the objective of creating new efficient, reliable intermediate load generation to support future demand in the region. Additionally, this option would be less economical and less efficient than the proposed configuration. Therefore, this option was rejected.

8.4.2.3 Replacement or Repowering of Units 5, 6, and 7

The replacement of PPP Units 5, 6, and 7 was considered and rejected. The units are contracted to PG&E under a Tolling Agreement. These units are needed to meet near-term critical reliability during periods of high electric demand. Repowering of Units 5, 6, and 7 will not achieve the project objectives, specifically related to operational flexibility and quick starting capabilities. Therefore, this option was rejected.

8.4.2.4 Conventional Combined-Cycle Plant

Constructing conventional combined-cycle plants (e.g., 2 X 1 or 3 X 1) of comparable power output was considered, but was rejected as being less dispatchable and operationally flexible than the proposed project. Available space on the PPP site could also be an issue with this alternative. This option could use either wet or dry cooling. Wet cooling towers would substantially increase water consumption and exceed available space. Dry cooling with this configuration would not be practical due to space constraints. Therefore, this option was rejected.

8.4.3 Offsite Areas Considered

Alternate properties were evaluated as possible locations for the project that would reduce or eliminate environmental effects associated with development on the proposed site. Four alternate sites were identified based on current land use (vacant), parcel size, maximizing distance from residential uses, and minimizing the length of water, electric, and gas transmission lines. The four locations are shown on Figure 8-1 and evaluated below.

As described below, the selection of any one of these four of these sites could potentially have more significant environmental impacts because they are not located within an existing power plant site. The first alternative site would be closer to an existing residential area than the proposed site and would require construction of longer offsite linear facilities for natural gas transmission lines and electric transmission lines. The other three alternative sites would be farther away from existing residential areas and require shorter water transmission connections than the proposed site; however, these would require significantly longer offsite connections to transmission and gas lines than the proposed site. As described below, there are several environmental disadvantages to each of the offsite locations considered. Further, none of these sites are currently owned by a Mirant entity. For these reasons, these alternatives were rejected from further consideration.

8.4.3.1 Alternative Site 1

The Alternative 1 site is a 75-acre property located on the north side of Willow Pass Road, approximately 2.8 miles west of the PPP site. This site is currently undeveloped and designated for light and heavy industrial development in the Contra Costa County General Plan. Development of this site with energy

facilities would be consistent with local land use plans and would site new facilities adjacent to a small area of industrial development located along the site's eastern property line. However, residential development is located directly adjacent to the western boundary of the site, whereas the WPGS boundary is approximately 500 feet from the nearest residence. In addition, Mirant entities do not currently own this site and development would require acquisition of the property. While acquisition and development could be feasible, this would not be consistent with the objectives of the project.

Development of this site would also require longer offsite connections to transmission, gas, and water lines than the proposed site. Compared with development of the WPGS site, development of this site would result in similar types of environmental impacts and would not reduce any impacts. Visual impacts associated with the Alternative 1 site could potentially be greater than those associated with the WPGS site because this site is undeveloped and the location of the project at the site would significantly change the visual character of the site. Therefore, this alternative site has several environmental disadvantages and no apparent advantages over the proposed site.

8.4.3.2 Alternative Site 2

The Alternative 2 site is a 150-acre property located approximately east of the proposed site along the Pittsburg-Antioch Highway. This site is zoned for Limited and General Industrial uses and designated in the City of Pittsburg's General Plan for Industrial uses. Currently the northwest corner of the site is developed with industrial uses and the remaining portion of the site is undeveloped. Development of the project would be consistent with these land use designations; however, Mirant entities do not currently own this site and development would require acquisition of the undeveloped portion of the property from its current owner. While subdivision and acquisition of the property could be feasible, this would not be consistent with the objectives of the project.

The undeveloped portion of the Alternative 2 site is characterized by undulating hills with Great Valley willow scrub and a small area of wetlands. The site has been previously used for industrial uses and when evaluated as an alternative site location for the Calpine Delta Energy Center in 1998 by the CEC, it was determined that the site would require extensive soil remediation in order to be redeveloped (CEC, 1998).

The nearest residential neighborhood is located directly across the Pittsburg-Antioch Highway, approximately 200 feet south of the Alternative 2 site boundary; this is a closer distance than the nearest residential area to the proposed site. The length of the offsite water transmission line connecting the site to the Delta Diablo Sanitation District Wastewater Treatment Plant (DDSD WTP) would be approximately 1.5 miles long, less than the proposed connection between the WPGS site and the DDSD WTP, which would be approximately 5 miles in length; however, the gas and electric transmission lines required for this alternative site would be significantly longer than those required for the proposed site (approximately 1.5 miles long) and would traverse a variety of residential, commercial, industrial and open space areas.

Development of this site would have potentially greater visual impacts because it is currently undeveloped, is readily visible from the Pittsburg-Antioch Highway, and the location of the project on the site would significantly change its visual character. This alternative site has several environmental disadvantages, including potential site contamination, and would not reduce any significant impacts associated with development on the proposed site.

8.4.3.3 Alternative Site 3

A third alternative site is a 99-acre property located approximately 2.5 miles east of the proposed site between West Tenth Street and the Burlington Northern Santa Fe (BNSF) railroad. This site is currently vacant and zoned for industrial uses by the City of Pittsburg. The City's General Plan also designated

most of the site for industrial uses, with a portion of the site surrounding Dowest Slough designated as open space. The Delta Energy Center is located adjacent to the eastern property line of this site. This site includes areas of wetlands. Development of this site with energy facilities (assuming impacts on the wetlands could be avoided) would be consistent with local land use plans and would result in the siting of new facilities in proximity to existing heavy industrial development. However, Mirant entities do not currently own this site and development would require acquisition of the property. While development and acquisition could be feasible, this would not be consistent with the objectives of the project.

This site is located approximately 2,100 feet from a residential area south of the Union Pacific Railroad, which is farther than the project. While the length of the offsite water pipelines would be reduced for this alternative because the DDSD WTP is located adjacent to the eastern boundary of this site, the length of the gas and transmission lines would be significantly longer than those required for the preferred site (approximately 3 miles long) and would traverse a variety of residential, commercial, industrial, and open space areas.

In addition, development of this site could potentially result in more significant environmental impacts than the proposed site because the Alternative 3 site has not been previously developed and a wetland surrounding the Dowest Slough traverse a portion of the site. Development of this site would have potentially greater visual impacts than those associated with the project because it is undeveloped, is readily visible from the Pittsburg-Antioch Highway, and the location of the project on this site would significantly change its visual character. This alternative site has several environmental disadvantages and would not reduce any significant impacts associated with development on the proposed site.

8.4.3.4 Alternative Site 4

The Alternative 4 site is a currently vacant 96-acre site located between the BNSF railroad and West Tenth Street. The Contra Costa Water District operates the Contra Costa Canal spillway that extends north/south along the western property line, and a 15-acre freshwater marsh bisects the site. The site is currently zoned Light Industrial by the City of Antioch and designated for Business Park development in the City's General Plan. Development of energy generation facilities at this site would be inconsistent with these designations and zoning and General Plan amendments would be required. In addition, Mirant entities do not currently own this site and development would require acquisition of the property from Dow Chemical. While development and acquisition could be feasible, this would not be consistent with the objectives of the project.

The nearest residence to this site is located behind a restaurant adjacent southeast of the site near the intersection of the Pittsburg-Antioch Highway and Somersville Road approximately 925 feet from the site boundary. In addition, several baseball fields are located on the adjacent parcel, approximately 400 feet from the parcel boundary. A residential area is located south of West Tenth Street approximately 1,200 feet to the southeast of the site. While the length of the offsite connection to water pipelines would be reduced for this alternative because the DDSD WTP is located adjacent to the western boundary of this site, the length of the gas and transmission lines would be significantly longer than with the preferred site (approximately 3 miles long) and would traverse a variety of residential, commercial, industrial and open space areas.

The site contains annual grassland habitat that has been known to support nesting white-tailed kite, which is a California fully protected species. The spillway and the freshwater marsh contain riparian habitat, wetland plant communities, and associated wildlife species and has the potential to support several potential threatened and endangered species. Therefore, development of this site could potentially result in more significant environmental impacts than those associated with the preferred site because the Alternative 4 site has not been previously developed and contains unique biological resources.

Development of this site could also have greater visual impacts because it is currently undeveloped, is readily visible from the Pittsburg-Antioch Highway, and the location of the project within this site would significantly change its visual character. This alternative has several environmental disadvantages and would not reduce any significant impacts associated with development on the preferred site.

8.5 WATER SUPPLY

The CEC studied use of water for power plant cooling in its 2003 Integrated Energy Policy Report (IEPR) proceeding. The proceeding produced the following policy:

> Consistent with the Board Policy[1] and the Warren-Alquist Act, the Energy Commission will approve the use of fresh water for cooling purposes by power plants which it licenses only where alternative water supply sources and alternative technologies are shown to be "environmentally undesirable" or "economically unsound" (CEC, 2003).

The WPGS will not use freshwater for cooling purposes. Instead, the WPGS will be a dry-cooled facility which reduces water consumption and uses recycled water. The source of the process water will be recycled water from the local sanitation district (the DDSD). Because the WPGS will use dry cooling technology and recycled water, no alternative water supply analysis is required to demonstrate compliance with the policies identified in the 2003 IEPR.

Two new 5-mile-long water pipelines are proposed to bring recycled water from, and return wastewater to, the DDSD WTP. Three miles of the five-mile-long route currently contains an unused fuel oil pipeline owned by Mirant Delta, which historically was used to convey oil between the Contra Costa Power Plant and the PPP. The existing pipeline is 10.75 inches in diameter, is now out of service, and will be replaced by the new water pipelines (see Figure 2.2-1 in Chapter 2).

The water pipeline alignment runs through the PPP site, crosses under Willow Pass Road/West 10th Street and BNSF railroad, then turns east and runs adjacent to the Union Pacific Railroad. The alignment crosses beneath railroad tracks in several locations (consistent with the location of the existing unused fuel oil pipeline). The east section of the water pipeline alignment crosses under Pittsburg-Antioch Highway, runs along the north side of the Highway, and continues north on Arcy Lane to the DDSD WTP.

Areas that will be affected have been previously disturbed for construction of the Pittsburg-Antioch Highway and the placement of existing utilities. The alignment selected is the most direct route with the least environmental impact due to the presence of the existing unused fuel oil pipeline along the majority of the route.

Potable water will be provided by the City of Pittsburg, which is the local water supply purveyor. Since the project will use a small quantity of potable water and there is an existing water supply line on the existing plant property, no alternative potable water pipelines were considered.

8.6 WASTEWATER DISCHARGE

The WPGS will discharge process wastewater to the DDSD WTP along the same route as water delivered to the WPGS. Sanitary wastewater will be conveyed to the existing sanitary sewer system at the PPP. As noted above for process water, the majority of the route currently contains an unused fuel oil pipeline owned by Mirant Delta, which historically was used to convey oil between the Contra Costa Power Plant and the PPP. The water pipeline alignment outside of this area are located within the PPP site or are adjacent to

[1] This reference is to State Water Resources Control Board Policy 75-58.

Pittsburg-Antioch Highway and Arcy Lane. The areas that will be affected have been previously disturbed for construction of the PPP, Pittsburg-Antioch Highway and the placement of existing utilities. The alignment selected is the most direct route with the least environmental impact.

The WPGS will use dry-cooling technology to reduce water consumption. The project will make use of recycled water that will be discharged by DDSD. More than 60 percent of the recycled water delivered to the plant will be consumed. Due to the project's proposed use of recycled water, the benefits of a zero-liquid discharge system would be negligible.

8.7 ELECTRIC TRANSMISSION LINES

The WPGS will interconnect at the existing PG&E switchyard, which is adjacent to the WPGS site. Because the WPGS transmission line will be very short and connect directly into the PG&E switchyard without the construction of offsite transmission lines, no alternative transmission lines were considered.

8.8 NATURAL GAS SUPPLY LINE

Natural gas will be delivered to the WPGS by PG&E, which currently delivers natural gas to the PPP site. Natural gas will be provided using a new 12-inch-diameter gas line connection, which will be constructed to transport natural gas approximately 2,700 feet from the existing PPP metering station to the WPGS site. Because the gas pipeline interconnection will be short and run through a developed area of the PPP site, no alternative gas pipeline routes were considered.

8.9 ALTERNATIVE AIR POLLUTION EMISSION CONTROL ANALYSIS

The project must comply with the requirements of the Bay Area Air Quality Management District's (BAAQMD) permit regulations requiring the application of the Best Available Control Technology (BACT) to control air emissions. To comply with the BAAQMD's BACT requirements for oxides of nitrogen (NO_x), the project's design includes ultra low NO_x combustion controls on the gas turbines and selective catalytic reduction (SCR) to control NO_x emissions. To comply with BAAQMD's BACT requirements for carbon monoxide (CO) and volatile organic compounds (VOCs), a CO catalyst will be employed.

The SCR system for each unit will operate with aqueous ammonia injected into the exhaust gas stream upstream of a catalyst bed to reduce NO_X to inert nitrogen and water. The SCR technology proposed for WPGS uses a 19 percent solution of ammonia to reduce NO_x emissions to elemental nitrogen, water, and a small quantity of unreacted ammonia. However, the use and storage of ammonia—even the less toxic aqueous ammonia proposed for the WPGS—will represent a potential risk to the public in the event of a catastrophic breach of the storage tank. The offsite consequence analysis (presented in Section 7.12, Hazardous Materials Handling) shows that the potential impacts associated with the project's use and storage of ammonia will not result in a significant public health impact.

To provide a comprehensive analysis of the alternative project configuration, the remainder of this section presents alternative NO_x emission control technologies considered for the project. The information presented below is based on the air quality analysis presented in Section 7.1, Air Quality.

Potential NO_x control technologies for combustion gas turbines include the following:

- Combustion controls
  - Dry combustion controls
  - Ultra low NO_x combustor design
  - Catalytic combustors (e.g., XONON)

- Post-combustion controls
  - Selective non-catalytic reduction (SNCR)
  - Non-selective catalytic reduction (NSCR)
  - SCONOx™

The technical feasibility of available NO_x control technologies are presented below.

8.9.1 Combustion Modifications

8.9.1.1 Dry Combustion Controls

Combustion modifications that lower NO_x emissions without wet injection include lean combustion, reduced combustor residence time, lean premixed combustion, and two-stage rich/lean combustion. Lean combustion uses excess air (greater than stoichiometric air-to-fuel ratio) in the combustor's primary combustion zone to cool the flame, thereby reducing the rate of thermal NO_x formation. Reduced combustor residence times are achieved by introducing dilution air between the combustor and the turbine sooner than with standard combustors. The combustion gases are at high temperatures for a shorter time, which also has the effect of reducing the rate of thermal NO_x formation. Dry low NO_x combustion will be used on both gas turbines for this project.

Catalytic combustors use a catalytic reactor bed mounted within the combustor to burn a very lean fuel-air mixture. This technology has been commercially demonstrated under the trade name XONON in a 1.5-megawatt (MW), natural-gas–fired combustion turbine in Santa Clara, California. The technology has not been announced as being commercially available for the engines used at WPGS. No turbine vendor, other than Kawasaki, has indicated the commercial availability of catalytic combustion systems at the present time and the largest size is 18 MW; therefore, catalytic combustion controls are not commercially available in the size range for this specific project and are not discussed further.

8.9.1.2 Wet Combustion Controls

Steam or water injection directly into the turbine combustor is one of the most common NO_x control techniques. These wet injection techniques lower the peak flame temperature in the combustor, thus reducing the formation of thermal NO_x. The injected water or steam exits the turbine as part of the exhaust. Although the lower peak flame temperature has a beneficial effect on NO_x emissions, it can also reduce combustion efficiency and prevent complete combustion. As a result, emissions of CO and VOCs increase as water/steam injection rates increase.

Water and steam injection have been in use on both oil- and gas-fired combustion turbines in all size ranges for many years; therefore, these NO_x control technologies are generally considered technologically feasible and widely available. Since dry low NO_x combustion controls are used in both gas turbines and are more effective than water injection, water injection is not considered for this project.

8.9.1.3 Post-Combustion Controls

SCR is a post-combustion technique that controls both thermal and fuel-bound NO_x emissions by reducing NO_x with a reagent (generally ammonia or urea) in the presence of a catalyst to form water and nitrogen. NO_x conversion is sensitive to exhaust gas temperature, and performance can be limited by contaminants in the exhaust gas that could mask the catalyst (sulfur compounds, particulates, heavy metals, and silica). SCR is used in numerous gas turbine installations throughout the United States, almost exclusively in conjunction with other wet or dry NO_x combustion controls. SCR requires the consumption of a reagent (ammonia or urea) and requires periodic catalyst replacement. Estimated levels

of NO_x control are in excess of 90 percent. SCR will be used on this project in conjunction with the dry low NO_x combustion controls on the Siemens 5000F gas turbine.

SNCR involves injection of ammonia or urea with proprietary conditioners into the exhaust gas stream without a catalyst. SNCR technology requires gas temperatures in the range of 1,200 degrees Fahrenheit (°F) to 2,000°F and is most commonly used in boilers. Some method of exhaust gas reheat, such as additional fuel combustion, will be required to achieve exhaust temperatures compatible with SNCR operations, and this requirement makes SNCR technologically infeasible for WPGS.

NSCR uses a catalyst without injected reagents to reduce NO_x emissions in an exhaust gas stream. NSCR is typically used in automobile exhaust and rich-burn stationary internal combustion engines, and employs a platinum/rhodium catalyst. NSCR is effective only in a stoichiometric or fuel-rich environment where the combustion gas is nearly depleted of oxygen, and this condition does not occur in turbine exhaust where the oxygen concentrations are typically between 14 and 16 percent. For this reason, NSCR is not technologically feasible for the WPGS.

SCONOx™ is a proprietary catalytic oxidation and adsorption technology that uses a single catalyst for the control of NO_x, CO, and VOC emissions. The catalyst is a monolithic design, made from a ceramic substrate with both a proprietary platinum-based oxidation catalyst and a potassium carbonate adsorption coating. The catalyst simultaneously oxidizes NO to nitrogen dioxide (NO_2), CO to carbon dioxide (CO_2), and VOCs to CO_2 and water, while NO_2 is adsorbed onto the catalyst surface where it is chemically converted to and stored as potassium nitrates and nitrites. The SCONOx potassium carbonate layer has a limited adsorption capability and requires regeneration approximately every 12 to 15 minutes in normal service (see Section 7.1, Air Quality, for details). Each regeneration cycle requires approximately 3 to 5 minutes. At any point in time, approximately 20 percent of the compartments in a SCONOx system will be in regeneration mode, and the remaining 80 percent of the compartments will be in oxidation/absorption mode.

There are serious questions about the probability of a successful application of the SCONOx technology for application to WPGS, as well as the levels of emission control that can be consistently achieved. Therefore, this technology is not considered feasible for WPGS. CEC staff have determined in other recent citing cases that SCONOx is not a preferable alternative, stating: "Applicant also reviewed alternative technologies for air pollution control and combustion modification, including: … SCONOx. None of the alternative pollution control technologies is more effective than that proposed for the project due to their lack of commercial viability in a scaled-up project and/or their technological infeasibility for a peaking unit. (…) Therefore, the evidence shows that none of the alternative fuels or technologies is a feasible option" (CEC, 2006).

8.9.2 Alternatives to Ammonia-Based Emission Control Systems

Over the last few years, several vendors have designed urea-based systems to generate ammonia on site, thereby eliminating the need to transport and store ammonia. These units are referred to as Ammonia on Demand and Urea to Ammonia (U2A) systems. A U2A system has limited commercial availability.

The U2A system generates ammonia from solid dry urea. The process starts by dissolving urea in deionized water to produce an aqueous urea solution. Steam is used in the U2A reactor to convert the urea solution into a gaseous mixture of ammonia, carbon dioxide, and water for use in the SCR system. The U2A technology has not been widely applied and accepted for use at combined-cycle turbine facilities.

Aqueous ammonia is currently used at the PPP. Site personnel will be trained and familiar with the safe handling and operation of the systems. Therefore, the U2A system is not considered for this project.

8.10 ALTERNATIVE TECHNOLOGIES

Other generation technologies considered for the project are grouped according to the fuel used:

- Oil
- Coal
- Nuclear
- Hydroelectric
- Biomass
- Solar
- Wind

Alternative technologies were evaluated with respect to commercial availability, practicality, and cost effectiveness.

8.10.1 Oil, Coal, and Conventional and Supercritical Boiler/Steam Turbine

Oil, coal, and conventional supercritical boiler/steam turbine technologies are commercially available and could be implemented. However, because of relatively low efficiency, some of these fuels or technologies could emit a greater quantity of air pollutants per kilowatt-hour generated than technologies that are more efficient. Natural gas, with its lower sulfur dioxide and particulate emissions, is the preferable fossil fuel for use in California. Space requirements, water usage, and the cost of generation for these alternative technologies are relatively high compared to natural-gas–fired technologies. Also, these technologies do not allow for the same operating flexibility that the natural-gas–fired technologies provide.

8.10.2 Nuclear

California law prohibits new nuclear plants until the scientific and engineering feasibility of disposal of high-level radioactive waste has been demonstrated. To date, the CEC is unable to make the findings of disposal feasibility required by law for this technology to be viable in California. This technology, therefore, is not possible at this time.

8.10.3 Water

Hydroelectric, geothermal, and ocean energy conversion technologies use water as "fuel."

8.10.3.1 Hydroelectric

Most of the sites for hydroelectric facilities have already been developed in California, and the remaining potential sites face lengthy environmental licensing periods. It is doubtful that this technology could be implemented within 3 to 5 years, and the cost will probably be higher than the cost of a conventional simple-cycle combustion turbine. There are no hydroelectric sites within the project vicinity.

8.10.3.2 Geothermal

Geothermal development is not viable at the WPGS because suitable thermal resources and strata are not present. Therefore, geothermal was eliminated from consideration.

8.10.4 Biomass

Biomass technology requires a reliable supply of biomass fuels. Major biomass fuels include forestry and mill wastes, agricultural field crop and food processing waste, and construction and urban wood wastes. The available supply, cost, and variability of these fuels, coupled with lower thermal conversion efficiencies, make this technology relatively more costly than combustion turbine technology. In addition, emissions from biomass units are typically higher than from gas-fired units. Biomass units may not be able to meet air quality requirements. Also, biomass technology is generally feasible only at sizes of less than 50 MW, which does not meet the project's capacity objectives. For these reasons, biomass technology was rejected.

8.10.5 Solar

Most solar technologies collect solar radiation, heat water to create steam, and use the steam to power a steam turbine generator. Power is only available while the sun shines so the units may not be available to meet demand swings. Solar technology is typically used as a demand reduction technology and does not provide quick-start generation capability. The cost of solar power is relatively high when compared to natural gas-burning units. In addition, the amount of surface area required to generate modest quantities of energy make these technologies infeasible for the quantity of energy to be generated. Typical solar panels generate on the order of 1 MW per acre of land (CEC, 1996). At this rate, approximately 550 acres of land will be required to generate an equivalent amount of energy as the project. Parabolic troughs typically require approximately 4 to 5 acres per MW output (CEC, 1996). To produce 500 MW, approximately 2,000 to 2,500 acres would be needed for a parabolic trough system. This type of system would need 80 to 100 times more land than the amount of land to be used by the project; therefore, this technology was not considered to be a feasible technology for the project. The Bay Area is not considered a prime location for a solar facility of this type. Other areas, such as the Mojave Desert, would be considered better suited and more competitive for this type of technology.

8.10.6 Wind Generation

Wind generation, like solar, is dependent on climatic conditions and may not be available to meet demand swings. The WPGS has been specifically designed to produce additional electricity during periods of high electricity demand when wind generation facilities, which rely on wind to produce electricity at any given time, may not be available. Typical wind generation farms require large tracts of land; approximately 17 acres of land are needed to produce approximately 1 MW of electricity (CEC, 1996). To produce 550 MW, approximately 9,350 acres of land would be required. Therefore, with these characteristics, wind energy was rejected as a feasible technology alternative.

8.11 REFERENCES

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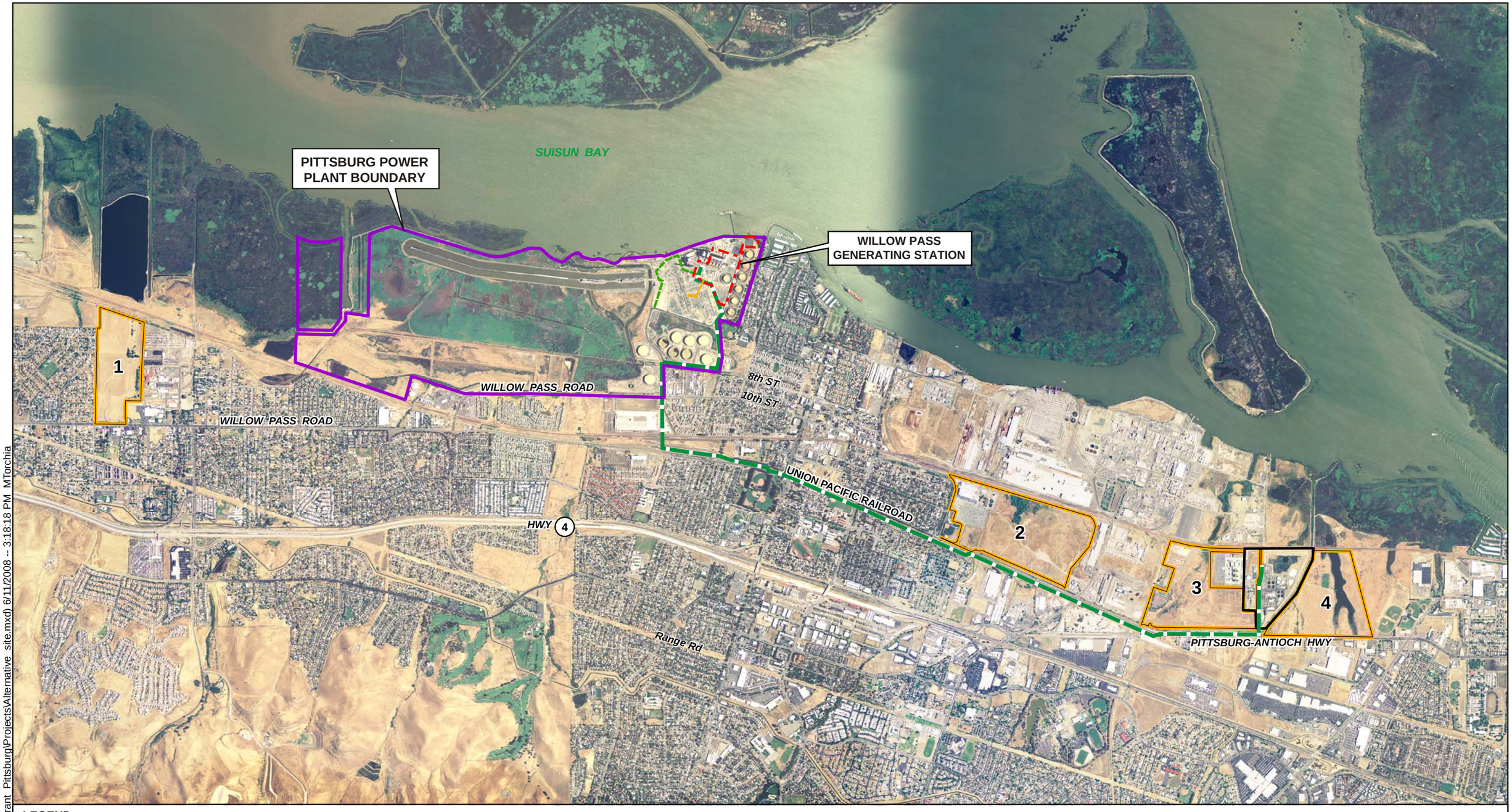

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LEGEND

- Pittsburg Power Plant Boundary
- Willow Pass Generating Station Site
- Potential Alternative Sites
- DDSD Wastewater Treatment Plant
- Proposed Gas Line
- Proposed Transmission Lines
- Proposed Offsite Water Supply and Discharge Pipeline Route

Potential Alternative Sites

Site No.	Assessors Parcel No. (APN)
1	098240062
2	073200021
3	073230046
4	074040045

N

0 1,250 2,500

Scale in Feet

POTENTIAL ALTERNATIVE SITES

Willow Pass Generating Station
Mirant Willow Pass, LLC
Pittsburg, California

June 2008
28067343

URS

FIGURE 8-1

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