ALTERNATIVES

SECTION 3

3.0 ALTERNATIVES

As required by NEPA and Commission policy, we evaluated alternatives to the proposed Project to determine whether any would be reasonable and have significant environmental advantages compared to the proposed action. The range of alternatives analyzed included the No-Action Alternative, system alternatives for the Terminal Expansion and the Pipeline Expansion, alternative Terminal Expansion sites, alternative terminal configurations and designs, alternative Pipeline Expansion aboveground facility sites, and alternative compressor station design.

As part of the No-Action Alternative, we considered the effects and actions that might result if the proposed Project were not constructed. We identified system alternatives to evaluate the ability of existing, modified, planned, or proposed LNG export terminals and pipeline systems to meet Cameron's objectives. We also evaluated alternative sites for the Terminal Expansion and the compressor station of the Pipeline Expansion, as well as alternative designs for both facilities.

The evaluation criteria for considering alternatives are:

- technical and economic feasibility and practicality;
- significant environmental advantage over the proposed Project; and
- ability to reasonably meet the Project primary objective of transporting and liquefying domestic natural gas into LNG for export, and delivering competitively priced LNG to foreign markets.

Cameron participated in our pre-filing process during the preliminary design stage for the Project (see section 1.3). This process emphasized identification of potential stakeholder issues, as well as identification and evaluation of alternatives that could avoid or minimize impacts. We analyzed each alternative based on public comments and guidance received from federal, state, and local regulatory agencies. Additional input used during the analysis of alternatives included information provided by Cameron's field surveys, aerial photographs, U.S. Geological Survey (USGS) topographic maps, National Wetland Inventory (NWI) maps, existing pipeline system maps, agency consultations, and other publicly available information. Identical data sources were used when comparing the alternative to the Project (e.g., NWI maps used for both). The results of the alternatives analyses are provided in the following sections.

3.1 NO-ACTION ALTERNATIVE

Under the No-Action Alternative, the objectives of the Project would not be met and Cameron would not provide the proposed natural gas transportation capacity for export. In addition, the potential adverse and beneficial environmental impacts identified in section 4.0 of this EIS would not occur.

Development of and production from conventional and unconventional gas formations are occurring throughout many areas of the United States and are projected to continue for many years. Cameron LNG indicated it could provide LNG to foreign countries at a competitive price and, therefore, replace higher-cost shipments from other sources. With or without the No-Action

Alternative, other LNG export projects could also be developed elsewhere in the Gulf Coast region or in other areas of the United States resulting in both adverse and beneficial environmental impacts. Expansions of alternative existing terminals with minor expansions of existing pipeline systems would result in similar magnitude and duration of potential adverse environmental impacts to those of the proposed Project. Development of any new LNG export terminals on previously undeveloped sites would likely result in greater environmental impacts, in both magnitude and duration, than those of the proposed Project.

The No-Action Alternative could also require that potential end users make other arrangements to obtain natural gas service, make use of alternative fossil fuel energy sources (for example, coal or fuel oil), or possibly make use of other traditional long-term fuel source alternatives (such as nuclear power) and/or renewable energy sources (for example, solar power) to compensate for the reduced availability of natural gas that would otherwise be supplied by the proposed Project. Although international energy conservation could also result from the No-Action Alternative, that option is beyond the scope of this analysis.

We believe it is important to consider alternative energy sources as part of the alternative selection process. As noted above, implementing the No-Action Alternative could force potential natural gas customers to seek other forms of energy. Traditional energy alternatives to natural gas include coal, oil, hydroelectric, and nuclear power. Renewable energy resources such as solar, ocean energy, biomass, wind, landfill gas, and municipal solid waste represent new, advanced energy alternatives. Conceivably, each of these energy alternatives could support the generation of new electric power, which is a major consumer of natural gas along with residential heating, commercial, and industrial uses.

The International Energy Agency (IEA) (2012b) reported that coal exports are increasing, and in the United States several new coal export projects were recently proposed, suggesting that in many international markets coal will remain competitive with natural gas in spite of coal's greater air emissions. EPA (2013) stated that compared to the average air emissions from coal-fired generation, natural gas produces half as much carbon dioxide, less than a third as much nitrogen oxides, and 1 percent as much sulfur oxides at power plants. Similarly, fuel oil is commonly used for power generation in many countries and will continue to compete with natural gas as a fuel source in spite of greater emissions. As a result, if the No-Action Alternative is selected, it could result in a greater use of other fossil fuels and a potentially substantial increase of environmental impacts as compared to the use of natural gas. However, many countries are cognizant of the greater environmental impact of coal and fuel oil and prefer to use natural gas as a fuel source.

There has been a recent renewed interest in electric power generation by nuclear energy. However, because of the increasing demand in electricity consumption worldwide, EIA (2012) estimates that the proportion of electricity generated by nuclear power will decrease from 19 percent to 15 percent. In addition, regulatory hurdles, public concern over nuclear power and nuclear waste disposal, construction costs, and plant construction lead times make it unlikely that nuclear generating capacity could be available to serve all the markets targeted by the Project on a similar timeline. Further, plans for nuclear power generation have been scaled back as countries reconsidered policies after the accident at the Fukushima Daiichi nuclear power plant near Fukushima, Japan, but capacity is still projected to rise, led by China, Korea, India, and Russia (IEA 2012a).

Renewable energy may become an increasingly significant factor in meeting future energy demands worldwide. As reported by IEA (2012a and 2012b), renewables are projected to become the world's second-largest source of power generation by 2015, and are expected to close in on coal as the primary source by 2035. However, this rapid increase hinges critically on continued subsidies. In 2011, these subsidies (including for biofuels) amounted to $88 billion, but to reach the projection noted above, the subsidies would need to increase to $4.8 trillion by 2035 (IEA 2012a).

Hydropower is currently the largest source of renewable electric power generation worldwide, and IEA expects this trend to continue through 2030. However, as with nuclear power generation, there are high costs associated with developing substantial hydropower projects and long time periods between project conception and the production of electric power.

Other promising renewable energy resources include solar, ocean energy, and biomass. However, the cost of these types of renewable energy projects is currently high per energy output unit in comparison to natural gas-fired power generation. Photovoltaic production in support of solar energy is increasing, and the cost of photovoltaic systems is decreasing, with photovoltaic cells potentially able to greatly supplement electrical generation resources.

Ocean energy is a largely unexplored renewable resource. Technologies to capture ocean energy are in their infancy, and environmental and engineering considerations are being studied to better understand the implications of placement of power generating facilities in the ocean.

Entrepreneurs and scientists are exploring the emerging use of algae for biofuels and other renewable energy applications, and are working to accelerate the development of applications to use algal biomass. IEA (2012b) projected electric power generation from biomass technology to increase four-fold through 2035, but that time frame is well beyond the planned startup and the currently requested authorization lifetime of the proposed Project.

Further generation of electrical power by wind would require construction of new wind turbines and additional electric transmission lines. Although this is likely to occur in many parts of the world, it is also likely that such development will be slow-paced in most countries due to the high cost of construction. In addition, wind power cannot be used for constant and reliable energy production because of the variability in winds, and other power generation facilities are commonly in place as backup facilities.

Electric generation from municipal waste and landfill methane are growing trends in developed countries. Again, the cost of these facilities, including operating costs, is beyond the means of many countries.

With regard to these renewable sources of energy, natural gas is often considered a "bridge fuel;" a fuel that bridges the time between the dominant use of fossil fuels today and the greater use of renewable energy sources in the future. Natural gas is cleaner burning than other fossil fuels and can also reliably serve as a backup fuel to renewable energy facilities, which often provide power intermittently.

There is currently considerable momentum behind advancing renewable energy technologies and moving toward more diversified energy sources. These advanced technologies, either individually or in combination, will likely be important in addressing future energy

demands. Presumably new energy technologies will continue to offset an increasing amount of fossil fuels to meet growing energy demands, and that situation is not expected to change in the next decade.

Although it is speculative and beyond the scope of this analysis to predict what action might be taken by policymakers or end users in response to the No-Action Alternative, it is possible that without the proposed Project, the energy needs may be met by alternative energy sources, likely resulting in impacts on the environment. Alternative energy forms such as coal and oil are available and could be used to meet increased demands for energy; however, natural gas is a much cleaner-burning fuel. These other fossil fuels emit greater amounts of particulate matter, sulfur dioxide ($SO_{2)}$, carbon monoxide (CO), carbon dioxide (CO_2), hydrocarbons, and non-criteria pollutants. The use of nuclear energy as replacement of other fuel sources also carries undesirable consequences, such as negative public perception of the safety of electric generation through nuclear plants and the disposal of waste products created. Renewable energies, such as solar, hydroelectric, and wind are not always reliable or available in sufficient quantities to support most market requirements and would not necessarily be an appropriate substitute for natural gas in all applications. Therefore, we have dismissed this alternative as a reasonable alternative to meet the Project objectives.

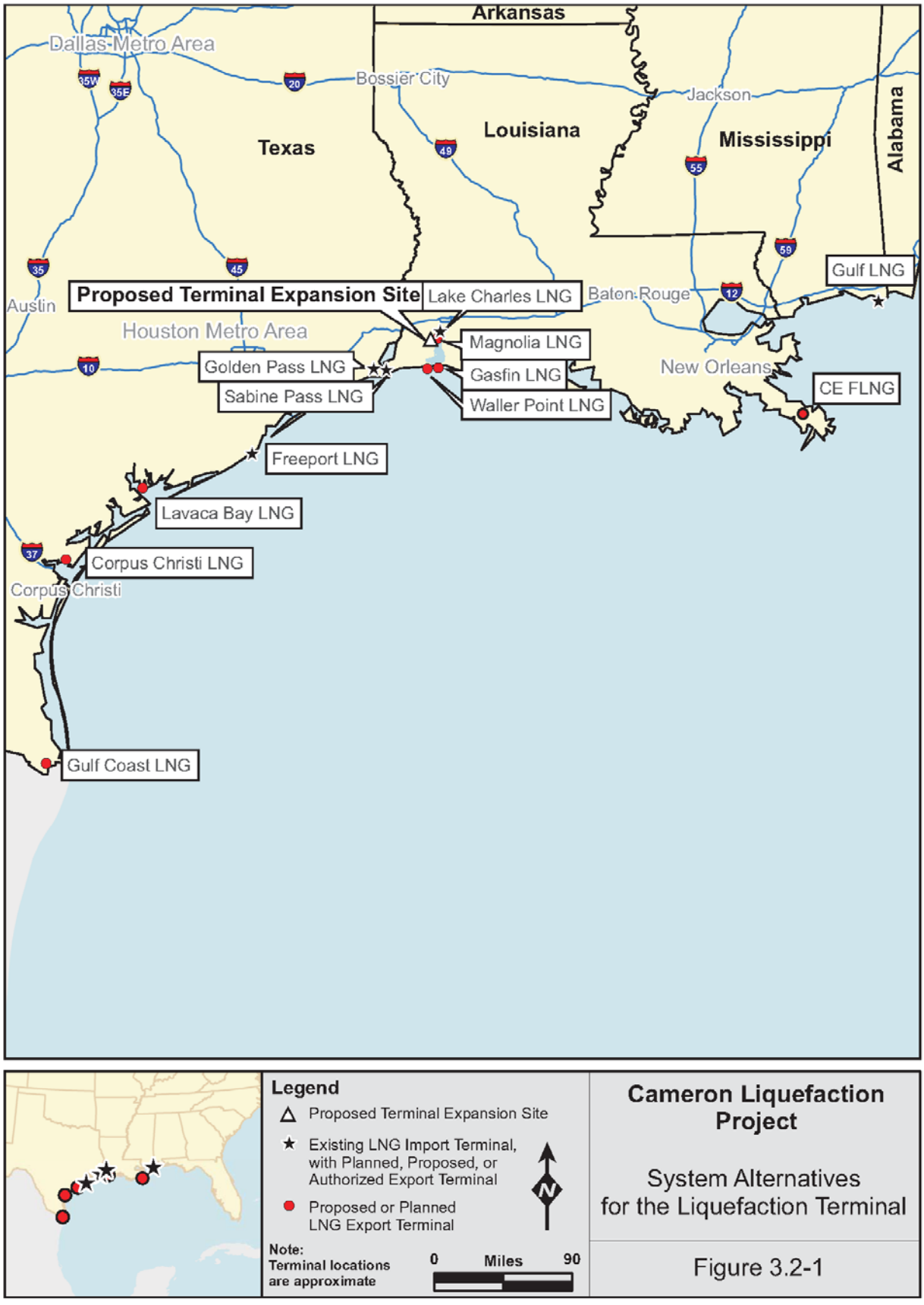
3.2 SYSTEM ALTERNATIVES

We reviewed system alternatives to evaluate the ability of existing, modified, or proposed facilities to meet the stated objectives of the Project. Our analysis of the systems alternatives is presented below in sections 3.2.1 and 3.2.2. The purpose of identifying and evaluating system alternatives was to determine whether potential environmental impacts associated with the construction and operation of the Project could be avoided or reduced. By definition, implementation of a system alternative would make it unnecessary to construct all or part of the proposed Project, although modifications or additions to the system alternative may be required to increase capacity or provide receipt and delivery capability consistent with that of the proposed Project. Such modifications or additions may result in environmental impacts less than, comparable to, or greater than those associated with construction and operation of Cameron's Project.

3.2.1 Terminal Expansion System Alternatives

For a system alternative to be viable, it must be technically and economically feasible. It must also be compatible with Cameron LNG's contractual agreements relating to the export of LNG (see section 1.1 for information on Cameron LNG's contractual agreements). In addition, a viable system alternative would offer a significant environmental advantage over the Project. The system alternatives considered in this analysis are depicted on figure 3.2-1 and described below. Although we have considered each of the planned, proposed, or authorized projects[17] below as potential system alternatives, the market will ultimately decide which and how many of these facilities are built.

[17] Proposed projects are projects for which the proponent has submitted a formal application with the FERC; planned projects are projects that are either in pre-filing or have been announced, but have not been proposed.


Arkansas
Dallas-Metro Area
Bossier City
Jackson
Texas
Louisiana
Mississippi
Alabama
Austin
Proposed Terminal Expansion Site
Lake Charles LNG
Baton Rouge
Houston Metro Area
Magnolia LNG
Golden Pass LNG
Gasfin LNG
New Orleans
Sabine Pass LNG
Waller Point LNG
Gulf LNG
CE FLNG
Freeport LNG
Lavaca Bay LNG
Corpus Christi LNG
Corpus Christi
Gulf Coast LNG
Legend
Proposed Terminal Expansion Site
Existing LNG Import Terminal, with Planned, Proposed, or Authorized Export Terminal
Proposed or Planned LNG Export Terminal
N
Note: Terminal locations are approximate
0
Miles
90
Cameron Liquefaction Project
System Alternatives for the Liquefaction Terminal
Figure 3.2-1

3.1.1.1 Existing LNG Import Terminals with Planned, Proposed, or Authorized Liquefaction Projects

There are five operating LNG import terminals in the southeastern United States along the Gulf of Mexico in addition to the existing Cameron LNG Terminal:

- Freeport LNG Development, LP (Freeport LNG) Terminal;
- Golden Pass LNG, LLC (Golden Pass LNG) Terminal;
- Gulf LNG Energy, LLC (Gulf LNG) Terminal;
- Sabine Pass LNG, LP's (Sabine Pass LNG) Terminal; and
- Trunkline LNG Company, LLC's (Trunkline LNG) Lake Charles LNG Terminal.

The Sabine Pass Liquefaction Project is under construction, and the other import terminals are in the regulatory review and permitting process for adding liquefaction and export capabilities. Each of these facilities was considered as a system alternative to Cameron LNG's proposed Project.

Freeport LNG Terminal

The Freeport LNG Terminal is on Quintana Island in Brazoria County, Texas. The import terminal, which started operations in 2008, includes two 160,000 m^3 LNG storage tanks and a single berth capable of handling LNG carriers in excess of 200,000 m^3. It has a peak send out capability of approximately 1.5 Bcf of natural gas.

Freeport LNG Expansion, LP and FLNG Liquefaction, LLC (collectively, FLEX) propose to add liquefaction facilities to its existing terminal to provide export capacity of approximately 13.2 mtpy of LNG. The existing Freeport LNG Terminal is about 142 miles southwest of the proposed Terminal Expansion site. This project would require approximately 86 acres for three proposed trains, each with a nominal capacity of 4.4 mtpy. FLEX filed two separate applications to DOE/FE to export LNG to Free Trade Agreement countries, each for export of 511 Bcf per year. DOE/FE approved the applications in February 2011 and 2012. On December 17, 2010 FLEX submitted an application to DOE/FE to export LNG to non-Free Trade Agreement nations, and DOE/FE authorized such export on May 17, 2013. FLEX filed its application with the FERC in August 2012.

On July 31, 2012, Freeport LNG Expansion signed a 20-year agreement with Osaka Gas and Chubu Electric for 100 percent of the first train (4.4 mtpy), and in February 2013 signed a 20-year agreement with BP for all of the second train (4.4 mtpy). In September 2013, FLEX signed separate liquefaction tolling contracts with Japan's Toshiba Corp and South Korea's SK E&S for all of the plant's third train.

FLEX anticipates start-up for the first liquefaction train in November 2016, with full service anticipated 48 to 54 months after initiation of construction, or 2020 to 2021. Although the Freeport LNG Terminal expansion is estimated to start operations prior to the Cameron Liquefaction Project, it would not produce at full capacity until about 2 years after the planned full capacity date of the Terminal Expansion. In addition, the full capacity of the Freeport LNG Terminal expansion is contracted and use of the Freeport LNG Terminal as a system alternative

to meet Cameron LNG's commitments to its clients would require that FLEX construct and operate three additional liquefaction trains and associated facilities, similar to those of the proposed Project which would likely result in environmental impacts similar to those of the proposed Project. However, FLEX has not requested authorization for the increased capacity and receipt of permits and approvals for the additional facilities that would be needed to meet Cameron LNG's objectives. The increased time to acquire the necessary permits and it would not meet Cameron LNG's timeline commitments of initial export in 2017. Therefore, the Freeport Liquefaction Project was not considered to be significantly environmentally preferable or a reasonable alternative to the proposed Terminal Expansion and was removed from further consideration.

Golden Pass LNG Terminal

The Golden Pass Terminal is near the town of Sabine Pass, Texas, on the western shore of Sabine Pass Channel, about 40 miles west of the proposed Terminal Expansion site. Operations started in 2010 on the approximately 477-acre site. The import terminal includes five 155,000 m^3 LNG storage tanks and two LNG carrier berths. It has a maximum send-out capacity of 2.5 Bcfd of natural gas. The planned export facility would use the existing storage tanks, berthing facilities, and pipeline infrastructure of the import terminal and would have a send-out capacity of 15.6 mtpy of LNG.

Golden Pass Products, LLC (GPP) received approval from DOE/FE to export LNG to Free Trade Agreement countries on October 7, 2012. On October 26, 2012, GPP submitted an application to export LNG to non-Free Trade Agreement nations.

On May 16, 2013, GPP requested that the FERC initiate the pre-filing process for the project.[18] At the time this EIS was prepared, Golden Pass was still early in our pre-filing process. As a result, the Golden Pass LNG Terminal is substantially behind Cameron LNG in the permitting and review schedule and therefore would likely not be permitted for service in time to meet the customer commitments of the Cameron Liquefaction Project, beginning in 2017. In addition, the environmental impacts of constructing and operating the facilities needed to expand beyond the planned capacity would likely be similar to those of Cameron's proposed Project. Therefore, this project would not provide a significant environmental advantage to Cameron's proposed Project and was not considered further.

Gulf LNG Terminal

The Gulf LNG Terminal is on a 40-acre site in Pascagoula, Mississippi, about 290 miles east of the proposed Terminal Expansion site. The terminal started operations in October 2011 and has a send-out capacity of 1.3 Bcfd of natural gas. The import terminal includes two 160,000 m^3 LNG storage tanks and a single LNG carrier berth designed to receive LNG carriers up to 250,000 m^3 in capacity. On June 15, 2012, Gulf LNG Liquefaction Company, LLC received authorization from DOE/FE to export to Free Trade Agreement countries.

Gulf LNG would construct its export project at its existing terminal with plans to export up to 11.5 mtpy of LNG. On December 5, 2012, Gulf LNG requested to use the FERC pre-filing

[18] Docket No. PF13-14

process, and on December 14, 2012, the FERC denied the request until Gulf LNG fully complies with the relevant Commission regulations. At the time of preparation of this EIS, the FERC had not initiated the pre-filing process for Gulf LNG.

The Gulf LNG Terminal is substantially behind Cameron LNG in the permitting and review schedule and therefore could not be permitted for service in time to meet the customer commitments of the Cameron Liquefaction Project beginning in 2017. As a result, the planned Gulf LNG Liquefaction Project does not meet the Project objective and was not further evaluated.

Sabine Pass LNG Terminal

The Sabine Pass LNG Terminal is in Cameron Parish, Louisiana, on the eastern shore of the Sabine Pass Channel, about 38 miles west of the proposed Terminal Expansion site. The terminal is on an approximately 853-acre site and includes five LNG storage tanks with a total storage capacity of 16.9 Bcf and two LNG carrier berths. The facility has a send-out capacity of 4 Bcfd of natural gas.

On April 16, 2012, the FERC authorized Sabine Pass LNG to receive, process, and export 16 mtpy of domestically produced natural gas as part of its liquefaction project (Docket No. CP11-72). The Sabine Pass Liquefaction Project is permitted for up to four liquefaction trains, each with an average liquefaction capacity of approximately 4 mtpy, and in August 2013, Sabine Pass LNG applied to the FERC to construct and operate two additional trains. The project is under construction and will involve the permanent use of about 191 acres as well as temporary disturbance of about 97 acres within the existing Sabine Pass LNG Terminal site. All 16 mtpy of LNG of the first four trains is fully committed to Sabine Pass LNG customers. In early 2013, Sabine Pass LNG announced that Total had signed up to take gas volumes equivalent to 2 mtpy from the fifth train and UK-based Centrica had contracted for an additional 1.75 mtpy. Therefore, the Sabine Pass Liquefaction Project would have to construct additional facilities to meet the Project's stated purpose, which would likely have similar environmental impacts to the proposed Project. The permitting and authorization processes for constructing these additional facilities would preclude Sabine Pass LNG from meeting Cameron LNG's timeline commitments. As a result, the Sabine Pass Liquefaction Project was not considered to provide a significant environmental advantage or be a reasonable system alternative to Cameron's proposed Liquefaction Project and was not evaluated further.

Lake Charles LNG Terminal

The Lake Charles LNG Terminal is in Lake Charles, Louisiana, and started operations in 1977. The import terminal is situated on approximately 125 acres about 6 miles north-northeast of the proposed Terminal Expansion site and has a peak send-out capacity of 2.1 Bcfd of natural gas. Two LNG carrier berths provide loading and unloading capacity.

On July 22, 2011, Lake Charles Export, LLC received authorization from DOE/FE to export LNG to Free Trade Agreement countries from the Lake Charles LNG Terminal. On April 6, 2012, Trunkline LNG received approval from the FERC to use the pre-filing process for the Lake Charles Liquefaction Project. Trunkline LNG would construct the project on an approximately 400-acre parcel, about 0.5 mile west of the existing Lake Charles LNG Terminal.

The facility would include three liquefaction trains, each capable of producing 5 mtpy for a total output capacity of 15 mtpy. Trunkline LNG anticipates an in-service date of August 2018[19].

Although the Lake Charles Liquefaction Project would provide 3 mtpy more LNG send-out capacity than the Cameron LNG Liquefaction Project, its export capacity is solely contracted to one customer, BG LNG. Further, the Lake Charles LNG Terminal export expansion is not proposed to be in service until August 2018. Additional facilities at the Lake Charles LNG Terminal could meet Cameron LNG's objective. The environmental impacts of those facilities would likely be similar to those of Cameron's proposed project. Therefore, additions to Trunkline LNG's proposed project would not provide a significant environmental advantage to the proposed Project. Additionally, Trunkline LNG has not requested authorization for the increased capacity, and receipt of permits and approvals for the additional facilities required to meet Cameron LNG's objectives would likely not meet Cameron LNG's timeline commitments. Therefore, this alternative was not evaluated further.

3.1.1.2 Proposed and Planned Stand-Alone LNG Export Terminals

In addition to the five existing LNG import facilities described above, there is one proposed stand-alone liquefaction project and six planned stand-alone liquefaction projects along the Texas Gulf Coast:

- proposed Corpus Christi Liquefaction, LLC (Corpus Christi) Liquefaction Project;
- planned Gulf Coast LNG Exports, LLC (Gulf Coast) Liquefaction Terminal;
- planned Excelerate Liquefaction Solutions, LLC (ELS) Lavaca Bay LNG Project;[20]
- planned Magnolia LNG (Magnolia) Project;[21]
- planned Gasfin Development USA, LLC (Gasfin) LNG Project;
- planned Waller Point LNG (Waller Point) Project; and
- planned CE FLNG, LLC (CE FLNG) LNG Project[22].

These projects are new or "greenfield" projects that are not associated with existing LNG import terminals, but we considered them as potential system alternatives.

Corpus Christi Liquefaction Project

The proposed Corpus Christi Liquefaction Project is in San Patricio County, Texas, on the northeast side of Corpus Christi Bay at its previously authorized site for the Corpus Christi LNG Import Terminal that was never constructed due to market conditions (see Docket No. CP04-37). The proposed export terminal site is about 281 miles southwest of Cameron LNG's proposed Terminal Expansion site and includes three liquefaction trains, each with an average

[19] Docket No. PF12-8.
[20] Docket No. PF13-1.
[21] Docket No. PF13-9.
[22] Docket No. PF13-11.

liquefaction capacity of about 4.5 mtpy for a total send-out capacity of 13.5 mtpy; three 160,000 m^3 LNG storage tanks; and two LNG carrier docks. The proposal includes an approximately 23-mile-long, 48-inch-diameter pipeline that would connect the LNG terminal with five interstate and intrastate natural gas transmission pipelines in south Texas. This project would affect approximately 1,000 acres of land during construction.

Corpus Christi received approval to use the FERC pre-filing process on December 22, 2011, and submitted its application on August 31, 2012.[23] In Resource Report 1 of its application, Corpus Christi proposed a construction start date of October 2013 with "substantial completion of Train 1 planned for late 2017." The Corpus Christi Liquefaction Project would not have the capacity to meet both Corpus Christi's and Cameron LNG's customer commitments without significant expansion of the project. In addition, as a greenfield facility requiring about 1,000 acres of land during construction and requiring new berthing facilities, this project would not provide a significant environmental advantage to Cameron's Project. Therefore, this system alternative was not considered further.

Gulf Coast Liquefaction Project

The Gulf Coast Liquefaction Project would export LNG from a planned export terminal at the Port of Brownsville in Brownsville, Texas, about 376 miles west-southwest of the proposed Terminal Expansion site. On October 16, 2012, Gulf Coast received authorization from DOE/FE to export LNG to Free Trade Agreement countries. At the time this EIS was prepared, Gulf Coast had not requested that the FERC initiate the pre-filing process.

The project, as proposed to DOE/FE, would include a new terminal on about 500 acres, four liquefaction trains capable of liquefying a total of 2.8 Bcfd of natural gas, an unspecified number of LNG storage tanks, a marine berth, and a pipeline connecting the terminal to existing natural gas transportation lines. Rather than enter into long-term natural gas supply or LNG export contracts, Gulf Coast would set up liquefaction tolling agreements allowing individual gas customers to deliver gas and receive LNG from the terminal. Gulf Coast anticipates in service in 2018.

As a greenfield facility, the environmental impacts associated with development on an undisturbed site would likely be greater in both magnitude and duration than those of the Cameron Liquefaction Project. Therefore, the Gulf Coast Liquefaction Project would not provide a significant environmental advantage to Cameron LNG's Terminal Expansion. In addition, the Gulf Coast Liquefaction Project would not be completed in Cameron LNG's timeline for commitments to customers. Therefore, this system alternative was not considered further.

Lavaca Bay LNG Project

The planned Lavaca Bay LNG Project includes two floating liquefaction, storage, and offloading (FLSO) units that produce LNG from North American natural gas. The project would also include onshore pre-treatment facilities and infrastructure associated with the FLSOs. LNG would be stored, as needed, prior to transferring the LNG to carriers for export. The FLSOs

[23] Docket No. CP12-507.

would be permanently moored at a proposed shoreside dock in Port Lavaca in Calhoun County, Texas, about 215 miles southwest of the proposed Terminal Expansion site.

The Lavaca Bay LNG Project would include a total of eight liquefaction trains, storage of up to 500,000 m^3 of LNG, and a send-out capacity of 10 mtpy of LNG.

On October 23, 2012, ELS submitted a Letter of Intent and a preliminary WSA to the Coast Guard for consideration in its assessment of the waterway and issuance of a LOR regarding the suitability of the waterway for LNG marine traffic. At the time this EIS was prepared, ELS was in the FERC pre-filing process, with a planned in-service date of December 31, 2017. The Lavaca Bay LNG Project would not have the capacity needed to meet Cameron LNG's commitments to customers. While additional facilities at the Lavaca Bay LNG Project site could meet Cameron LNG's export objective, the additional facilities required would include creation of two new berthing areas and turning basins as well as additional pretreatment and other onshore facilities. We anticipate that the environmental impacts associated with construction and operation of those facilities would be greater than or similar to those of Cameron's proposed Project. Therefore, the Lavaca Bay LNG Project would not provide a significant environmental advantage to Cameron LNG's Terminal Expansion. Additionally, receipt of permits and approvals for the additional facilities that would be needed to meet Cameron LNG's objectives, which Lavaca Bay has not requested, would likely not meet Cameron LNG's timeline commitments. Therefore, this system alternative was not considered further.

Magnolia LNG Project

Magnolia would construct its liquefaction and LNG export project at the Port of Lake Charles in Calcasieu Parish, at the port's Industrial Canal, off the Calcasieu Ship Channel, about 5.5 miles north-northeast of the proposed Terminal Expansion site (see figure 3.2-1). The Magnolia LNG Project would be a stand-alone LNG export facility, not associated with an existing LNG terminal, and constructed on a 90-acre site. At full capacity, the project would export 8 mtpy of LNG using four liquefaction trains, each with a nominal capacity of 2.0 mtpy of LNG.

In December 2012, Magnolia filed an application with DOE/FE requesting long-term authorization to export LNG to foreign countries with which the United States has existing Free Trade Agreements. On March 20, 2013, the FERC initiated its pre-filing process for the project under Docket No. PF13-9. Magnolia proposes to start commercial operations with the first train in 2017 and the second train in 2018. The third and fourth trains would be constructed and operated if market conditions were favorable.

To meet Cameron LNG's customer commitments, Magnolia would need to commit all of the capacity of the four trains to Cameron LNG and construct at least two additional trains. This would expand Magnolia's greenfield project to roughly the same acreage as Cameron LNG's Terminal Expansion to export 12 mtpy. As a greenfield facility, the environmental impacts associated with development on an undisturbed site would likely be greater in both magnitude and duration than those of Cameron LNG's proposed Terminal Expansion. Therefore, this project does not possess a significant environmental advantage to Cameron LNG's Terminal Expansion. Additionally, Magnolia has not requested authorization for the increased capacity

and receipt of permits and approvals for the additional facilities that would be needed to meet Cameron LNG's objectives would likely not meet Cameron LNG's timeline commitments. Therefore, this system alternative was not considered further.

Gasfin LNG Project

The planned Gasfin LNG Project is a liquefaction and LNG export project in Cameron Parish on the east side of the Calcasieu Ship Channel, about 18 miles south of the proposed Terminal Site (see figure 3.3-1). The project would be a stand-alone LNG export facility that is not associated with an existing LNG terminal and would have an LNG export capacity of 1.5 mtpy.

On March 7, 2013, DOE/FE granted Gasfin long-term authorization to export LNG to countries with which the United States has existing Free Trade Agreements. The Gasfin Project is in the initial development phase and an anticipated scheduled has not yet been released. At the time this EIS was prepared, Gasfin had not requested that the FERC initiate the pre-filing process. We do not consider the Gasfin LNG Project to be a reasonable alternative to the proposed Terminal Expansion because it would not be completed in time or have the send-out capacity for Cameron LNG to meet its commitments to customers and is a greenfield project that likely would not provide a significant environmental advantage to the proposed Terminal Expansion. Therefore, this system alternative was not considered further.

Waller Point LNG Terminal

The planned Waller Point LNG Project is a stand-alone liquefaction and LNG export facility in Cameron Parish on the western shore of the entrance point of the Calcasieu Ship Channel from the Gulf of Mexico, about 19 miles south of the proposed Terminal Expansion site. The project would have an LNG export capacity of about 1.25 mtpy. On December 20, 2012, DOE/FE granted long-term authorization to Waller Point LNG for LNG export to countries with which the United States has existing Free Trade Agreements.

The project is in the initial development phase and Waller Point LNG has not announced a planned schedule. Further, at the time this EIS was prepared, Waller Point LNG had not requested that the FERC initiate the pre-filing process. We do not consider the Waller Point LNG Terminal to be a reasonable system alternative to the Terminal Expansion because it would not be completed in time or have the send-out capacity for to meet Cameron LNG's commitments to customers and is a greenfield project that likely would not provide a significant environmental advantage to the proposed Terminal Expansion. Therefore, this system alternative was not considered further.

CE FLNG LNG Project

CE FLNG announced plans for developing a floating LNG liquefaction and export terminal on the east bank of the Mississippi River north of the confluence of Baptiste Collette Bayou in Plaquemines Parish, Louisiana, about 245 miles east-southeast of the proposed Terminal Expansion site. Project facilities include two FLSO vessels, each capable of producing up to 4 mtpy of LNG. The FLSOs would have an LNG storage capacity of 250,000 m^3. LNG carriers would berth next to the units to load LNG. The project would include a 45-mile-long

pipeline to connect the terminal with two sources of natural gas: (1) the existing Enterprise Products natural gas processing plant in Bernard Parish, (2) and the existing Targa Venice natural gas processing plant in Plaquemines Parish, Louisiana. CE Pipeline, LLC plans to construct and operate the pipeline.

The project would be a stand-alone liquefaction and LNG export facility that is not associated with an existing LNG terminal. On November 21, 2012, DOE/FE granted long-term export authorization to CE FLNG for LNG export to foreign countries with which the United States has existing Free Trade Agreements. At the time this EIS was prepared, CE FLNG was in the FERC pre-filing process under Docket No. PF13-11. CE FLNG anticipates that the first FLSO vessel would be in service in March 2018, with the second FLSO vessel starting up in October 2018.

To meet Cameron LNG's customer commitments, CE FLNG would need to commit the entire capacity of the project to Cameron LNG's customers and install an additional FLSO vessel which would require establishing an additional berthing facility and a turning basin and associated onshore facilities. The environmental impacts associated with development of marine berthing facilities in an undisturbed area would likely be greater in both magnitude and duration than those of Cameron LNG's proposed Terminal Expansion. Therefore, CE FLNG's project would not provide a significant environmental advantage to Cameron LNG's Terminal Expansion. Additionally, CE FLNG has not requested authorization for the increased capacity, and receipt of permits and approvals for the additional facilities that would be needed to meet Cameron LNG's objectives would likely not meet Cameron LNG's timeline commitments. Therefore, this system alternative was not considered further.

3.2.2 Pipeline System Alternatives

To serve as a viable system alternative to the proposed Pipeline Expansion, the system would have to (1) transport all or a part of the volume of natural gas required for liquefaction at the expanded terminal, and (2) cause significantly less impact on the environment than the proposed Pipeline Expansion. Gas provided by a system alternative must connect to either the existing Cameron Interstate Pipeline or directly to the expanded terminal.

The existing Cameron Interstate Pipeline has interconnections to four interstate natural gas pipelines: FGT, TGP, TETCO, and Transco. These pipelines would provide natural gas to the expanded pipeline and were therefore not considered as system alternatives. There are three other pipelines in the vicinity of the existing Cameron Interstate Pipeline and the proposed Terminal Expansion that we evaluated as potential system alternatives to the proposed Pipeline Expansion: Chenier Energy's Creole Trail Pipeline, Trunkline Gas Company's Trunkline Pipeline, and the Gulf South Pipeline.

3.1.1.3 Creole Trail Pipeline

The Creole Trail Pipeline is a 153-mile-long, 42-inch-diameter pipeline that can transport vaporized LNG from the Sabine Pass LNG Terminal and is being modified to provide natural gas to the Sabine Pass Liquefaction Project for liquefaction and exportation. At full capacity, the pipeline transports approximately 2.6 Bcfd of natural gas to the Sabine Pass Liquefaction Project (FERC 2011). The pipeline extends from the Sabine Pass LNG Terminal in Cameron Parish to

interconnections with National Gas Pipeline Company of America, Transco, TGP, FGT, Bridgeline Holding Company, TETCO, and Trunkline.

The Creole Trail Pipeline is being modified to provide bi-directional flow. At its maximum flow rate of 2.6 Bcfd, it can transport sufficient natural gas to allow the Sabine Pass Liquefaction Project to export up to 16 mtpy of LNG. Because all 16 mtpy of LNG from the Sabine Pass Liquefaction Project is committed to customers, the Creole Trail Pipeline would not have sufficient capacity to supply natural gas to the Cameron Liquefaction Project without substantially expanding the system by looping. The pipeline is in the vicinity of both the Terminal Expansion site and the existing Cameron Interstate Pipeline and has interconnections with many of the same pipelines as the proposed Pipeline Expansion. However, to provide the 2.35 Bcfd required by the Terminal Expansion, an additional 42-inch-diameter pipeline would be needed over a distance at least as long as that of the proposed Pipeline Expansion. As a result, similar environmental impacts would occur to those of the proposed Pipeline Expansion. Therefore, the Creole Trail Pipeline would not provide a significant environmental advantage to the proposed Pipeline Expansion and was not considered further as a system alternative.

3.1.1.4 Trunkline Gas Pipeline

Trunkline has several pipelines at the existing Lake Charles LNG Terminal approximately 6 straight-line miles northeast of the Cameron LNG Terminal. The existing pipelines vary from 24 to 36 inches in diameter, and four additional pipelines are planned to transport gas from the Trunkline mainline north of the Lake Charles Terminal to the planned Lake Charles Liquefaction Project. To connect to the Cameron LNG Terminal, Trunkline must install a new pipeline across the Gulf Intracoastal Waterway and the Calcasieu Ship Channel, potentially terminating at an interconnection with the existing Cameron Interstate Pipeline north of the Terminal Expansion. Assuming that the planned new and looped pipelines for the Lake Charles Liquefaction Project would be at or near capacity, to provide the required volume of gas for the Terminal Expansion, Trunkline would also have to loop about 60 miles of the existing pipelines and planned new pipelines. The total length of new and looped pipeline, including about 6 miles of pipeline from the Lake Charles Terminal to the Cameron Interstate Pipeline north of the Terminal Expansion site, would be about 65 miles. The looped and new pipelines would extend over a distance more than three times that of the proposed Pipeline Expansion and would have substantially more environmental impacts. In addition, the new pipeline from the Lake Charles Liquefaction Project to the Cameron Interstate Pipeline would extend through more developed areas than the proposed Pipeline Expansion. Therefore, use of the Trunkline pipeline at the Lake Charles LNG Terminal would not have significant environmental advantages to the proposed Pipeline Expansion and was not considered further as a system alternative.

3.1.1.5 Gulf South Pipeline

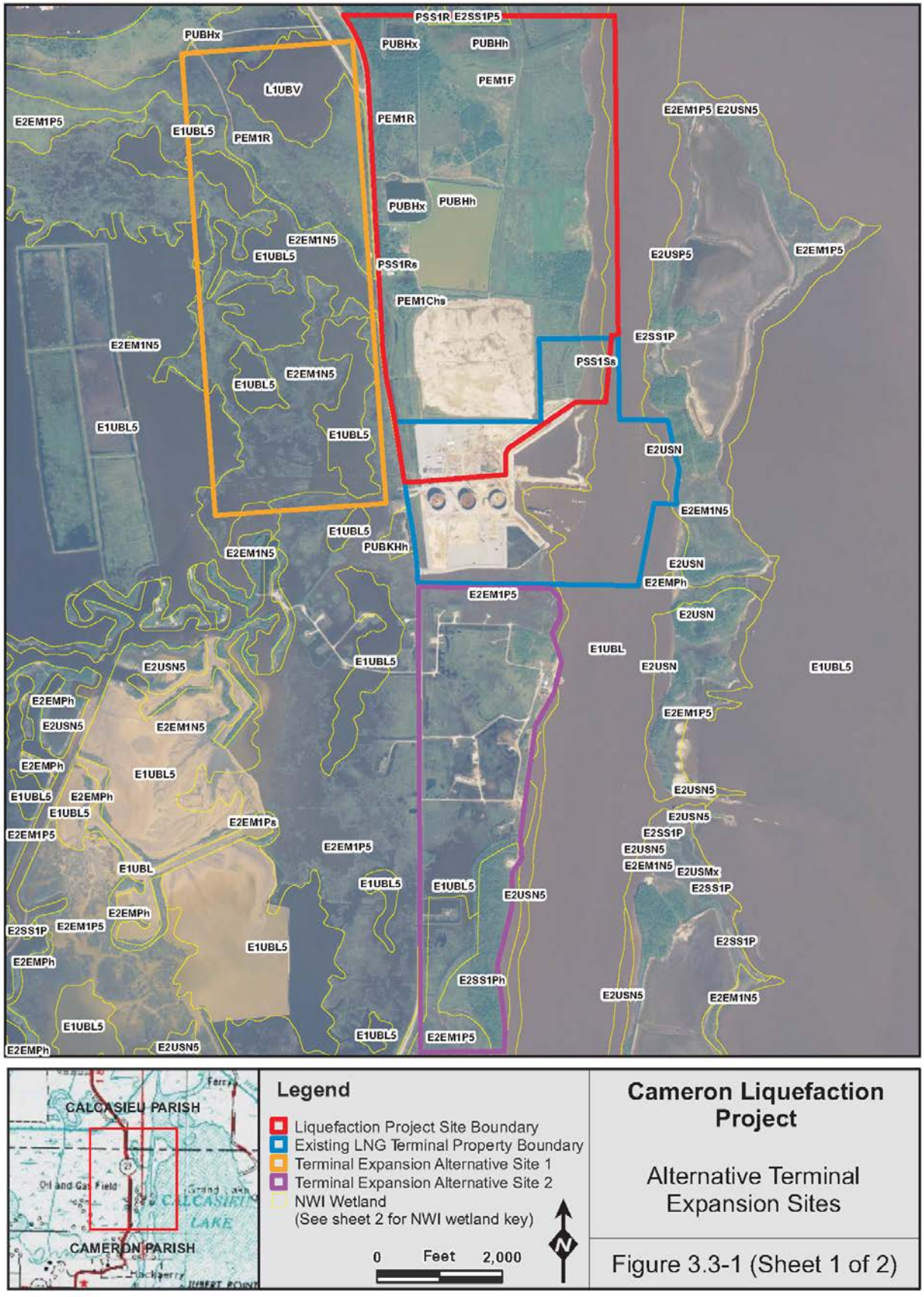
The Gulf South Pipeline system includes approximately 7,360 miles of pipeline, with a capacity of approximately 6.9 Bcfd. The markets served by the Gulf South Pipeline are local distribution companies and municipalities, natural gas-fired power plants across the Gulf South System, industrial end-users, and Lake Charles, Louisiana, where it provides service for imported LNG.

Given the supply sources and delivery points of the Gulf South System, it is not likely that the system could accommodate conversion to the bi-directional capability required to support the Terminal Expansion or provide the 2.35 Bcfd of natural gas required for operation of the expanded terminal. In addition, the nearest point on the system to the Terminal Expansion site is the Lake Charles LNG Terminal, which would require at least 5 miles of greenfield pipeline to connect to the existing Cameron Interstate Pipeline north of the Terminal Expansion site, or longer to connect directly to the expanded terminal. In either case, the pipeline would extend through more developed areas than Cameron Interstate's Pipeline Expansion and cross under the Gulf Intracoastal Waterway and the Calcasieu Ship Channel. In addition, providing the required volume of natural gas would likely require looping portions of the Gulf South System in the vicinity of the Lake Charles LNG Terminal, and perhaps portions of the mainline. We would not expect that a greenfield pipeline through developed areas and looped pipeline to provide a significant environmental advantage to the Pipeline Expansion. Therefore, that system alternative was not considered further.

3.3 ALTERNATIVE TERMINAL EXPANSION SITES

We evaluated the area in the vicinity of the existing Cameron LNG Terminal for alternative sites to the proposed Terminal Expansion site. Proximity to the existing terminal was a criterion in the evaluation to allow Cameron LNG to use the existing infrastructure, such as the LNG storage tanks, the LNG carrier berths and cargo loading/unloading facilities, and associated facilities. Use of those existing facilities would avoid the impacts of constructing and operating new facilities.

Our evaluation of alternative sites considered construction and operation of the expanded terminal on two sites near the western and southern borders of the existing Cameron LNG Terminal: Terminal Expansion Alternative Site 1 (TEA-1) is directly west of the proposed site, on the western side of LA-27, and TEA-2 is directly south of and adjacent to the existing LNG terminal (see figure 3.3-1). TEA-1 has approximately the same area as the proposed Terminal Expansion site (about 500 acres). Although TEA-2 has less acreage, it would require construction of a work dock that would increase the area depicted on figure 3.3-1. In both cases, we assumed that the additional LNG storage tank would be constructed on the existing LNG terminal site as proposed. Our impact analysis focused on wetland impacts due to the high prevalence of wetlands in both areas and most other impacts being similar. Affected wetland areas for TEA-1 and TEA-2, based on NWI wetland information, are listed in table 3.3-1 along with wetland and open water information for the proposed Terminal Expansion site.



Legend

- Liquefaction Project Site Boundary
- Existing LNG Terminal Property Boundary
- Terminal Expansion Alternative Site 1
- Terminal Expansion Alternative Site 2
- NWI Wetland
  (See sheet 2 for NWI wetland key)

0 Feet 2,000

N

Cameron Liquefaction Project

Alternative Terminal Expansion Sites

Figure 3.3-1 (Sheet 1 of 2)

NWI Wetland Key

Estuarine (salt and brackish tidal wetlands - The Estuarine System describes deepwater tidal habitats and adjacent tidal wetlands that are influenced by water runoff from and often semi-enclosed by land. They are located along low-energy coastlines and they have variable salinity.)

E2EM1P5 – estuarine emergent
E2EM1N5 – estuarine emergent
E2USN5 – estuarine, intertidal, unconsolidated bottom
E1UBL – estuarine, subtidal, unconsolidated bottom
E1UBL5 - estuarine, subtidal, unconsolidated bottom
E2USP5 – estuarine, unconsolidated shore
E2USN – estuarine, unconsolidated shore
E2SS1Ph – estuarine scrub shrub

Lacustrine (deepwater habitat)

L1UBV – Open water, less than 30% vegetative/substrate visible, unconsolidated bottom; permanently flooded-tidal

Palustrine (freshwater – non tidal)

PUBHx - Open water, less than 30% vegetative/substrate visible, unconsolidated bottom
PUBKHh - Open water, less than 30% vegetative/substrate visible, unconsolidated bottom
PEM1F - PEM
PEM1Chs - PEM
PSS1Ss - PSS

Cameron Liquefaction Project

Alternative Terminal Expansion Sites

Figure 3.3-1 (Sheet 2 of 2)

TABLE 3.3-1
Wetlands Affected by Alternative Terminal Expansion Sites

	NWI Wetland and Open Space Areas (acres)		
Type	**Proposed Terminal Expansion Site**	**Terminal Expansion Alternative Site 1**	**Terminal Expansion Alternative Site 2**
Freshwater Emergent	119.4	95.7	-
Estuarine Emergent	-	169.0	130.7
Scrub/Shrub	69.8	-	49.6
Forested	24.5	-	-
Fresh Open Water	70.1	44.3	-
Estuarine/Marine Open Water	9.4	152.8	157.7
Unconsolidated Shore	-	-	18.3
Total	**293.2**	461.8	356.3

LA-27 extends roughly parallel to and is adjacent to the western border of the existing terminal. The area west of the highway consists of open water and marsh, including previously disturbed marsh, which also includes active oil and gas production. Use of the area west of the highway would result in impacts on about 168.6 more acres of wetland, open water, and marsh areas than the proposed site (about 56 percent greater). In addition, the wetlands on the proposed site are generally of lower quality as most are on fill from dredge deposit, whereas incorporation of the liquefaction terminal at TEA-1 would affect higher quality wetlands. While some industrial facilities are within and surrounding TEA-1, these wetlands have not been disturbed to the degree of those at the proposed site. Additionally, the wetlands at TEA-1 are estuarine, whereas the wetlands at the proposed site are palustrine. Those impacts would result in greater impacts on the fish and wildlife using those areas. In addition, use of TEA-1 would likely result in impacts on existing oil and gas production activities. Development of the expanded terminal in that area would require longer cryogenic pipelines to the existing and new LNG storage tanks than those proposed. The alternate cryogenic pipelines would extend under the highway creating a new right-of-way and affecting the visual character of the area west of the highway (most industrial facilities are east of the highway). In addition, the visual impacts would be greater than those at the proposed site due to the presence of industrial structures and night lighting on both sides of the road.

The area to the south is also primarily open water, includes previously disturbed marsh, and includes areas of active oil and gas production facilities. Use of the southern area for the Terminal Expansion would affect about 63.1 more acres of wetlands, marsh, and open water than the proposed site (about 22 percent greater). As for TEA-1, the wetlands of TEA-2 are primarily high-quality wetlands, whereas the wetlands on the proposed Terminal Expansion site are of low quality. Impacts on the wetlands, marsh, and open water areas of TEA-2 would affect fish and wildlife using those habitats. Use of TEA-2 would also result in impacts on existing oil and gas production activities and would require longer cryogenic pipelines to the existing and new LNG

storage tanks than those at the proposed site. The visual impacts would be similar to those of the proposed Terminal Expansion.

The proposed Terminal Expansion site, which is north of the existing Cameron LNG Terminal, is undeveloped land comprised of uplands and largely palustrine wetlands. Portions of the proposed area were previously disturbed by the disposal of dredged material from maintenance of the Calcasieu Ship Channel and by construction activities associated with the existing Cameron LNG Terminal. Of the approximately 502 acres required for the proposed Terminal Expansion, about 70 acres is within the existing terminal. As noted throughout section 4 of this EIS, the potential impacts associated with construction and operation of the expanded terminal on the parcel north of the existing terminal would have minimal impacts. We believe these impacts would be substantially less than the impacts on open water, marsh, fish, wildlife, and active oil and gas activities associated with development of either TEA-1 or TEA-2. In addition, siting the Terminal Expansion at TEA-1 would have greater visual impact than that of the proposed site. As a result, we determined that development of the Terminal Expansion on either TEA-1 or TEA-2 would not provide a significant environmental advantage to the proposed Terminal Expansion location. Therefore, these alternatives are not considered further.

3.4 ALTERNATIVE TERMINAL CONFIGURATIONS AND DESIGNS

3.4.1 Alternative Configurations

Although alternative configurations of the Terminal Expansion were evaluated, design of the site was limited by the siting requirements of 49 CFR 193 and other industry or engineering standards. Regulatory requirements stipulate that potential thermal exclusion and vapor dispersion zones remain on-site; therefore, those requirements dictate the locations of specific pieces of equipment for the liquefaction facilities. Similarly, thermal radiation zones associated with flares require specific distances from other pieces of equipment and from property lines. The selected location of each of the components of the expanded terminal was based on the relevant regulations, codes, and guidelines. We did not find any alternative configurations that would meet the regulations, codes, and guidelines and at the same time avoid or reduce impacts in comparison to those of the proposed terminal configuration.

3.4.2 Alternative Design

Cameron LNG originally proposed to install and operate 10 gas turbine-driven generators, providing approximately 240-MW of on-site electric power while purchased power alternatives could be more fully explored and analyzed. Cameron LNG completed its evaluation and eliminated on-site power turbine generators (as suggested by the Sierra Club in its scoping comments) in favor of purchased power for the proposed Terminal Expansion, to be supplied by the new non-jurisdictional Entergy 12-mile-long, 230-kV double-circuit electric transmission line (see section 1.4 for additional details). As a part of this non-jurisdictional project, the electric transmission line would connect to a new Entergy switchyard in the southwest region of the Terminal Expansion site. The use of on-site power generation is now considered a design alternative. However, Cameron LNG still proposes to install and operate three 1.5-MW, diesel-fueled stand-by generators for emergency backup power for the Terminal Expansion.

TABLE 3.4.2-1
Estimated Emissions for Alternative Power Sources
During Operation of the Terminal Expansion

Option	Pollutant Emissions (tons per year) [a]						
	NO_x	CO	SO_2	PM_{10}	VOC[b]	HAPs	GHG
On-site Power Generation	3,532	1,620	17	215	83	35	5
Purchased Power	2,333	891	9	133	98	22	3

[a] Does not include indirect emissions from the power plant used to supply electricity. Rounded to nearest whole numbers.

[b] Fugitive emissions were not reported for on-site power generation, and the increase in VOCs is a result of fugitive emissions. Without fugitive emissions, VOCs would be 61 tons per year.

TABLE 3.4.2-2
Estimated Noise Levels for Alternative Power Sources
During Operation of the Terminal Expansion

Option	L_{dn} Background Noise Level (dBA)	L_{dn} with Terminal Expansion (dBA)	Expected Increase (dBA)
On-site Power Generation	50.9	54.2	3.3
Purchased Power	50.9	53.8	2.9

Abbreviations:

L_{dn} = Day-night sound level

dBa = A-weighted decibel scale

During construction of the Entergy transmission line and switchyard, emissions, fugitive dust, and noise would temporarily increase due to the use of construction equipment and land disturbance. These increases would be temporary, end after construction is completed, and be similar to those that result from construction of the alternative of 10 gas-fired turbine generation units on the Terminal Expansion site, but occurring over a more expansive area. During operation, emissions and noise levels of the turbine generators would be greater than those of purchased power in the vicinity of the Terminal Expansion site. Table 3.4.2-1 presents a comparison of emissions, and table 3.4.2-2 presents a comparison of noise levels during operation. Air dispersion modeling results also indicate lower emissions for purchased power, with the exception of modeling for carbon dioxide (CO) for the 1-hour standard. For both options, dispersion modeling results show no exceedances of Significant Impact Levels (SILs) with the exception of nitrogen dioxide (NO_2), which showed no contribution of exceedance of National Ambient Air Quality Standards (NAAQS) in refined analyses.

Emissions for the on-site power generation option would be concentrated at the Terminal Expansion site, whereas it is likely that the emissions for purchased power would not be from a single source because Entergy obtains electricity from more than one power generation facility.

Therefore, it is not possible to determine the difference of the emission between the two design options. Because on-site power generation would not provide a significant environmental advantage, it is not considered further.

3.5 ALTERNATIVE PIPELINE ROUTES

Cameron Interstate's proposed pipeline route is collocated or parallel to existing rights-of-way for its entire length. To limit environmental impacts, the Pipeline Expansion would overlap existing rights-of-way to the greatest extent practical (about 74 percent of the route). We did not identify any environmental concerns that require the need to identify and evaluate alternative pipeline routes to minimize impacts, nor were any alternatives suggested during the public scoping period.

3.6 ALTERNATIVE PIPELINE EXPANSION ABOVEGROUND FACILITY SITES

We evaluated alternative sites for the proposed compressor station and also considered the need to evaluate potential alternative sites for the other aboveground facilities associated with the Pipeline Expansion. Our assessments considered information obtained from inspection of maps and aerial photography and from observations during site visits along the proposed route.

3.6.1 Compressor Station Site Alternatives

Cameron Interstate considered five 25-acre sites for construction and operation of the compressor station, initially considering the availability of land to purchase along with the horsepower requirements of each alternative. Specifically, the location of the compressor station along the pipeline route dictates how much horsepower Cameron Interstate would require to transport natural gas into the existing Cameron Interstate pipeline which would deliver the gas to the Terminal Expansion.

In our evaluation of alternative compressor station sites, we considered the following:

- land availability for purchase, including the landowners' interest in selling the property for use as a compressor station;
- emissions based on required horsepower;
- site access;
- length of required electrical distribution lines; and
- potential impacts on prime farmland, agricultural land, forested land, wetlands, floodplains, and noise sensitive areas (NSAs).

Using these key factors, we initially determined that the four alternative sites identified by Cameron Interstate provided a satisfactory range of options and compared each of those sites to the proposed site. Each alternative site is about 25 acres in size; the locations are as depicted in figure 3.6-1 and briefly described below.

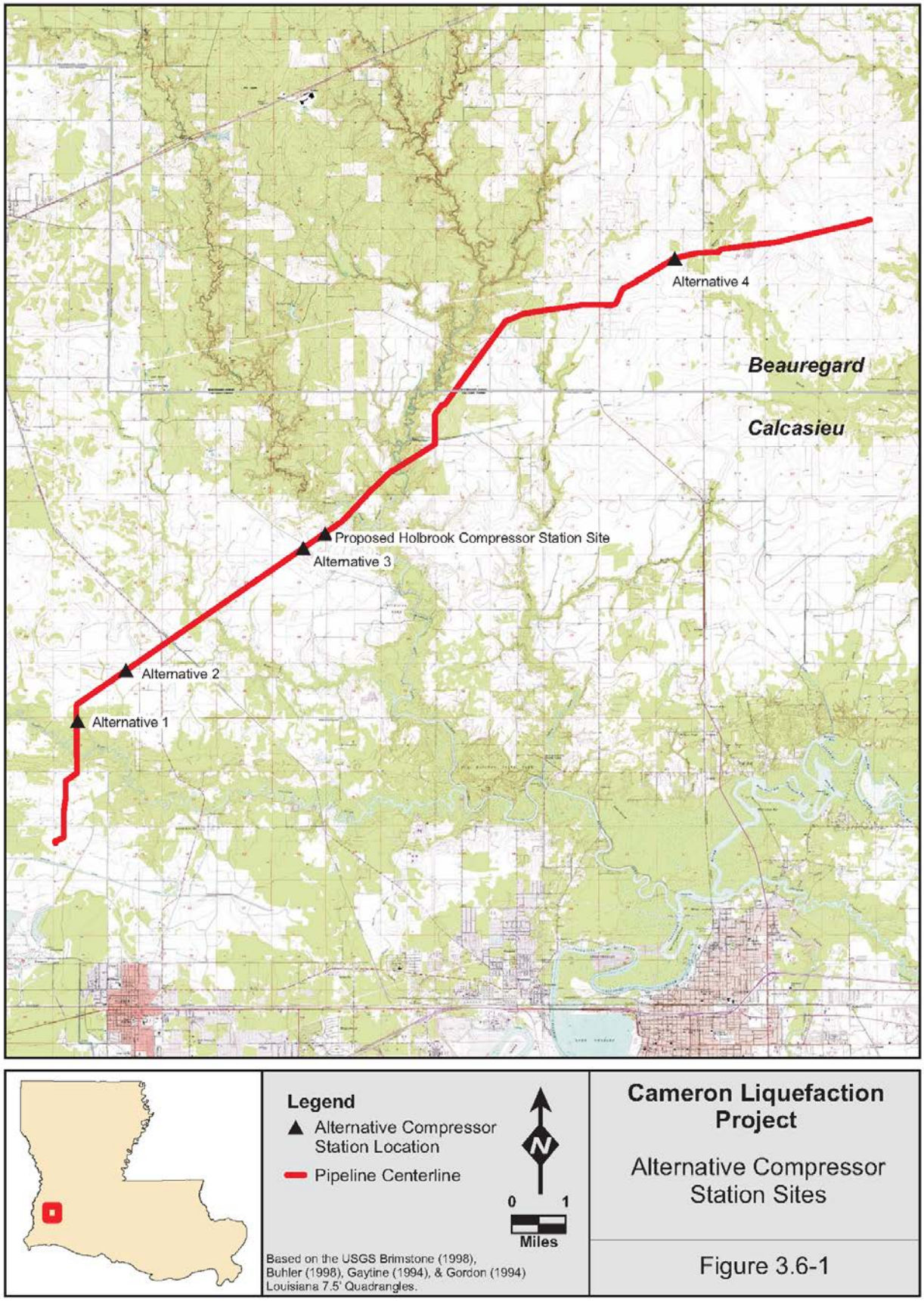

Alternative 4
Beauregard
Calcasieu
Proposed Holbrook Compressor Station Site
Alternative 3
Alternative 2
Alternative 1
Legend
Alternative Compressor Station Location
Pipeline Centerline
N
0
1
Miles
Based on the USGS Brimstone (1998), Buhler (1998), Gaytine (1994), & Gordon (1994) Louisiana 7.5' Quadrangles.
Cameron Liquefaction Project
Alternative Compressor Station Sites
Figure 3.6-1

Table 3.6.1-1 provides comparisons of the key evaluation factors considered:

- The proposed site at MP 8.4 is on the north side of Holbrook Park Road and is adjacent to the proposed pipeline route. Cameron Interstate would access this site by constructing a 1,500-foot-long access road to the site from Holbrook Park Road (adjacent to the proposed pipeline route).
- Compressor Station Alternative (CSA) 1 is at MP 2.6, on the east side of the proposed pipeline route. Cameron Interstate would access this site from an existing gravel road that extends along the southern boundary of the site.
- CSA-2 is at MP 3.9, on the north side of the proposed pipeline route. Cameron Interstate would access this site from a gravel road that extends along the southern boundary of the site.
- CSA-3 is at MP 7.6, on the south side of Holbrook Park Road and adjacent to the proposed pipeline route. Cameron Interstate would access this site from Holbrook Park Road.
- CSA-4 is at MP 17.1 on land directly adjacent to and south of the existing Ragley Compressor Station. The site is south of the proposed pipeline route, and Cameron Interstate would access the site from an area adjacent to the Ragley Compressor Station.

Through consultation with the landowners, Cameron Interstate determined it would be unable to acquire the land for two of the alternative sites. The landowner of CSA-2 denied Cameron Interstate access to the site for surveying, and Cameron Interstate reported that it could not negotiate acceptable purchase terms of the property. In addition, Cameron Interstate could not negotiate acceptable purchase terms with the landowner of CSA-3. Because the lands for CSA-2 and CSA-3 are not available to Cameron Interstate for purchase, they are not considered practical alternatives, and were eliminated from further consideration. The following summarizes the key environmental comparisons among the remaining three sites – proposed site, CSA-1, and CSA-4 – based on the information presented in table 3.6.1-1.

Emissions: CSA-1 and the proposed site would require the most horsepower and would therefore have more total emissions over the life of the Project than CSA-4. However, Cameron Interstate would be required to meet regulatory requirements for emissions at any site selected and the difference in emissions among the alternatives is not considered significant.

Access road construction: The proposed site would require construction of 1,500 feet of new access road, whereas CSA-1 and CSA-4 would require short driveways from existing roads. However, Cameron Interstate would construct the access road adjacent to the proposed pipeline route to reduce impacts, such as habitat fragmentation and impacts on visual resources.

Construction of electrical distribution line: electrical power is present at the existing Ragley Compressor Station, thus CSA-4 would not require construction of a new electrical distribution line. CSA-1 would require about 1.2 miles of new electrical distribution line, which is about one-third less than the distance required for the proposed site. The impacts of construction and operation of either electrical distribution line would be along existing corridors and we believe these impacts would be minor (primarily limited to the placement of poles).

TABLE 3.6.1-1
Evaluation Factors Considered for Alternative Compressor Station Sites

Evaluation Factor	Proposed Site	CSA-1	CSA-2	CSA-3	CSA-4
Approximate MP	8.4	2.6	3.9	7.6	17.1
Site Parcel (acres)	25	25	25	25	25
Land Use Area (acres) [a]					
Forested	16	20	20	23	-
Prime Farmland	15	15	23	19	25
Agriculture/Crop Land/Pasture	-	-	-	-	25.0
Waterbodies	No	No	No	Yes	No
Wetlands (acres)	5	10	8	5	12
Floodplain	About 28% of site within 100-year floodplain	Entire site within 100-year floodplain	Entire site within 500-year floodplain	None	None
Land Availability	Yes	Yes	No	No	Yes
Site Access [b]	Holbrook Park Road	Gravel Road	Gravel Road	Holbrook Park Road	Ragley CS Road
NSAs					
Distance to Nearest NSA (feet)	3,200	3,300	4,200	7,200	1,430
Number NSAs within 1-Mile Radius	2	18	14	0	18
Total Horsepower Required	56,280	56,820	52,085	56,280	52,085
Relative Horsepower Required [c]	100%	101%	92%	100%	92%
Distance to Electric Service (miles)	3.5	1.2	1.4	3.5	Present at Site

[a] For the purposes of this analysis, it was assumed that the entire site area would be used for construction and operation and that there would not be any difference between temporary and permanent impact acreages.

[b] Cameron Interstate would construct a 1,500-foot-long road adjacent to its right-of-way from Holbrook Park Road to its compressor station.

[C] Horsepower requirements relative to that required for the proposed site. For example, CSA-4 would require approximately 92% of the horsepower required for the proposed site.

Prime farmland: The proposed site and CSA-1 would affect the same amount of prime farmland, both of which are about 10 acres less than CSA-4.

Agricultural land: The proposed site and CSA-1 would not affect agricultural land, whereas CSA-4 would affect 25 acres of agricultural land.

Forested land: CSA-1 would affect the most amount of forest land, about 4 acres more than the proposed site. CSA-4 would not affect forest land. The forest land affected by the proposed site is pine plantation.

Wetlands: CSA-4 would affect the most wetlands, about 2 acres more than CSA-1 and 7 acres more than the proposed site, although the wetlands at CSA-4 are within agricultural land and are not high-quality wetlands. The proposed site would avoid high-quality palustrine forested (PFO) wetlands along the Little River.

Floodplains: CSA-1 is entirely within the 100-year floodplain and CSA-4 is outside of any floodplains. About 28 percent of the proposed site is within the 100-year floodplain; however, we concluded that there would not be an increase in flooding due to implementation of the Project (see Section 4.1 of this EIS).

NSAs: both CSA-1 and CSA-4 have 18 NSAs within 1 mile of the sites, which are 14 more NSAs than for the proposed site.

Although the potential impacts associated with emissions, access road construction, and construction of an electrical distribution lines would be greater at the proposed Holbrook Compressor Station site, we believe those differences would be minor. Although CSA-4 is not within a floodplain, we determined that site would be the least preferable due to higher potential impacts on prime farmland, agricultural land, NSAs, and wetlands. The impacts of the proposed site and CSA-1 on prime farmland and agricultural land would be similar; however, the proposed site would have less impact on forest land, wetlands, and NSAs. In addition, CSA-1 is entirely within a floodplain area. Therefore, we believe that none of the alternatives provide a significant environmental advantage and the proposed site is environmentally acceptable.

3.6.2 Other Aboveground Facilities

Other aboveground facilities associated with the Pipeline Expansion include two pig receivers, two pig launchers, one new interconnection at Trunkline, new interconnections and metering ancillary facilities at the four existing interconnections, and new metering at the existing Cameron LNG Terminal. Cameron Interstate proposed to construct these aboveground facilities either within existing pipeline rights-of-way or within a developed portion of the existing Cameron LNG Terminal. The areas proposed for these facilities were previously disturbed and are maintained as industrial areas. As noted throughout section 4.0, the potential impacts of construction and operation of the Pipeline Expansion would be minimal, and we do not believe that there are alternative sites that would provide a significant environmental advantage to the proposed aboveground facility sites.

3.7 ALTERNATIVE COMPRESSOR STATION DESIGN

3.7.1 Use of Electric-Powered Compressors and Purchased Power

Cameron Interstate explored the use of electric-powered compressors and purchased power as an alternative to the proposed natural gas-fired compressors as requested by the Sierra Club in its scoping comments. Cameron Interstate stated that to achieve the same deliverable flow rate as the proposed 12 natural gas-fired compressors (56,820 horsepower), this design option would require 70,000 horsepower and nine generation units.[24] These nine units would require approximately 52-MW of electricity to operate. Cameron Interstate also reported that to provide the required 52-MW of electricity, the local electric provider, Beauregard Electric Co-Op, would have to install approximately 3.5 miles of additional 230-kV electric distribution lines from a tie-in on LA-27 to the proposed Holbrook Compressor Station site. That would require clearing a new right-of-way adjacent to the proposed Cameron Interstate pipeline right-of-way from LA-27 to the Holbrook Compressor Station site. In addition to the new electric distribution line, a new switchyard would be required in or near the Holbrook Compressor Station site.

Cameron Interstate also stated that using electric-driven units versus reciprocating gas-driven units would increase the cost of operating the compressor station by more than $7 million per year, or approximately 60 percent greater based on current market rates for electric power. This cost differential would result in a higher service rate to be passed along to the customers. In addition, Cameron Interstate noted that the reciprocating drivers proposed for the Holbrook Compressor Station would provide the highest level of service possible and were designed to meet the customer's gas flow requirements. Electric drivers are not variable speed controlled and would not provide the flexibility and quality of service required for the station.

Cameron Intestate reported that Beauregard Electric purchases power from the Big Cajun II Power Plant, a local coal-fired power plant. Cameron Interstate provided emission data associated with the increased power generation from the Big Cajun II Power Plant that would be required to operate the Holbrook Compressor Station and determined that those emissions would be greater than the emissions from the proposed 12 natural gas-fired compressors for all but one constituent: VOCs would be substantially greater using the natural gas-fired compressor option.

Table 3.7-1 presents a comparison of the emissions for the power options for the Holbrook Compressor Station.

Based on our review of the Project area maps, it is likely that the 3.5-mile-long transmission line would require minimal tree clearing, maintenance, and additional right-of-way. Based on emissions data from the power options, the use of purchased power for operating the Holbrook Compressor Station does not appear to offer a significant environmental advantage over the proposed natural gas-fired compressors. Therefore, we have removed this alternative from further consideration.

[24] Docket No. CP13-27, Accession No. 20130423-5004(28332904).

TABLE 3.7-1 Comparison of Emissions from Compressor Power Sources During Holbrook Compressor Station Operations		
	Estimated Emissions (tpy)	
Constituent	**Big Cajun II Power Plant [a]**	**Natural Gas-Fired Compressors**
NO_x	536	384.3
CO	1,420	20.7
PM_{10}	247	0.3
SO_2	2,975	1.2
VOC	9.3	199.9

Abbreviations:
PM_{10} = Particulate matter with an aerodynamic diameter less than or equal to 10 microns
SO_2 = Sulfur dioxide
VOC = Volatile organic compound

[a] Increase in emission due to providing power to the Holbrook Compressor Station.

3.7.2 Other Design Options

Based on Sierra Club scoping comments, we requested that Cameron Interstate explore design options for the Holbrook Compressor Station, including use of fewer, larger, more efficient turbines; selective catalytic reduction (SCR) to reduce nitrogen oxide emissions; and an oxidation catalyst to reduce monoxide emissions. Cameron Interstate indicated that it had examined the use of larger turbine driven compressors as an alternative to the proposed design of the Holbrook Compressor Station[25]. To achieve comparable horsepower requirements with the proposed reciprocating drivers, Cameron Interstate would install eight turbine-driven compressors which would decrease the flexibility and reliability of Cameron Interstate's service. The turbines would not have variable speed control like the reciprocating drivers, further reducing the flexibility and quality of service provided. Cameron Interstate further stated that the larger turbine driven machines would also require more than 35 percent more fuel, resulting in more than $4 million dollars in additional annual fuel expense. As a result, we do not believe there is a significant advantage to the use of larger gas-fired turbines to generate power at the Holbrook Compressor Station.

Cameron Interstate consulted with LDEQ regarding its air permit application, including development of a methodology for determining the best available control technology (BACT) for the compressors. In this BACT analysis, SCR and use of an oxidation catalyst were considered as pollution control methods. However, the BACT analysis concluded that SCR and use of an oxidation catalyst were not feasible pollution control options due to economic, environmental, and energy impacts. As these alternative designs would not have a significant environmental advantage, we have removed them from further consideration.

[25] Docket No. CP13-27, Accession No. 20130423-5004(28332904).