

3.0 ALTERNATIVES

A fundamental principle of NEPA is that an agency should consider reasonable alternatives to a proposed action to ensure that the project objectives are met while minimizing environmental impacts. To satisfy this requirement, we have evaluated a range of alternatives to the proposed Creole Trail Project as well as alternatives to various components of the proposed project. The EIS addresses alternatives to the proposed actions before both the FERC and the Coast Guard. The proposed action before the FERC is to consider issuing to Creole Trail a section 3 authorization for the LNG import facilities and a section 7 Certificate for new natural gas pipelines.

The proposed action before the Coast Guard is to consider issuing Creole Trail an LOR finding the waterway suitable for LNG marine traffic, with certain conditions. These conditions are delineated, in part, in the Coast Guard's February 27, 2006 letter to FERC (attached as Appendix L-1). Specifically, these conditions require that all agencies that would be involved in navigation safety and maritime security aspects of LNG vessels transiting to and operating at the Creole Trail LNG terminal be adequately staffed, equipped, and funded to fully implement the safety and security measures. These measures include, but are not limited to, safety zones around the LNG carriers, escorts by armed law enforcement vessels, a variety of waterway and shoreline surveillance measures, and multi-agency cooperation and communication. Specific details of these measures are further delineated in the Coast Guard's February 28, 2006 letter to FERC which has been designated Sensitive Security Information as defined in Title 49 CFR Part 1520. Because any unauthorized disclosure of these details could be employed to circumvent the proposed security measures, they are not releasable to the public.

Alternatives discussed in this section include the No Action or Postponed Action alternatives; LNG terminal onshore and offshore system alternatives; LNG terminal site location alternatives; LNG terminal layout alternatives; DMPA alternatives; and pipeline route alternatives. Reasonable alternatives to the Coast Guard proposed action include: 1) issuance of a Coast Guard LOR finding the waterway suitable for LNG marine traffic without any conditions; 2) postponing the issuance of a Coast Guard LOR pending further analysis and study; and, 3) issuance of a Coast Guard LOR finding the waterway not suitable for LNG marine traffic (no action alternative).

The criteria used in evaluating potential alternatives included whether they offer a significant environmental advantage over the proposed action or its components; are technically and/or economically feasible and practical; and meet the project objectives, which are to:

- create access to new, competitively priced natural gas supplies from around the world;
- deliver up to 3.3 Bcfd of natural gas to southern Louisiana gas consumers and large markets in the east and midwest United States beginning in 2009; and
- provide service to shippers desiring to contract for the receipt, storage, and vaporization of LNG and the delivery of natural gas to United States markets.

By definition, various alternatives possess unique characteristics when compared to the proposed project; therefore, each alternative did not warrant the same degree of analysis. Rather, the analysis generally advanced from consideration of broad criteria (e.g., would the alternative serve the same market as the proposed action) to successively more detailed criteria (e.g., the amount of wetlands affected by an alternative compared to the proposed action) until it was clear that the alternative either was or was not preferred to the proposed action. The results of our analysis are presented below.

3.1 NO ACTION OR POSTPONED ACTION ALTERNATIVE

The Commission has three possible courses of action in processing an application. It may: (1) deny the proposal; (2) postpone action pending further study; or (3) authorize the proposal with or without conditions. For the Coast Guard's proposed action, the no action alternative would be issuance of an LOR which finds the waterway not suitable for LNG marine traffic. If the Commission denies the proposal (the No Action alternative), the short- and long-term environmental impacts identified in section 4.0 of this EIS would not occur. However, if the Commission selects the No Action alternative, the objectives of the project would not be met and Creole Trail would not be able to provide a new source of imported natural gas to markets that could be accessed through the proposed interconnections.

As described in section 1.1, projected natural gas demands exceed the currently available supply. Based on recent forecasts by the EIA, natural gas demand in the United States is expected to grow from more than 22 trillion cubic feet in 2003 to almost 31 trillion cubic feet in 2025 (EIA, 2005). The National Petroleum Council's (NPC) September 2003 publication, *Balancing Natural Gas Policy*, determined that traditional North American producing areas will provide 75 percent of long-term needs for natural gas in the United States, but will be unable to meet projected demand. The NPC study found that the overall level of indigenous production will be dependent on industry's ability to increase its production of non-conventional gas (i.e., gas from tight formations, shale, and coal-bed methane). The NPC study determined that LNG imports and arctic gas (from Alaska's North Slope and Canada's Mackenzie Delta) could meet up to 20 to 25 percent of demand by 2025. The report concluded that nine new LNG terminals and nine terminal expansions will be needed to provide up to 15 Bcfd, or 17 percent of United States natural gas supply, by 2025. Construction of new and expanded LNG capacity would offset demand shortfalls by providing access to supplies of natural gas outside the United States.

If the Commission was to select the Postponed Action alternative, the environmental impacts associated with the proposed project would be delayed, or if the applicant decided not to pursue the project, the impacts would not occur at all. However, delaying the proposed project could have significant economic impacts. A study completed by the Energy and Environmental Analysis Foundation, Inc. in July 2004 for the Interstate Natural Gas Association of America (INGAA) determined that natural gas consumers in the United States would pay an extra \$200 billion (in constant 2003 dollars) by 2020 if currently proposed LNG terminals and other natural gas pipeline infrastructure projects are delayed by a period of 2 years (INGAA, 2004).

Alternatives to the Coast Guard Action

Similar to the no action alternative to the FERC proposed action, the no action alternative for the Coast Guard would avoid any project related environmental effects in the waterway; however, it would also prevent LNG vessels from delivering LNG to the proposed an import terminal and the project objectives would not be met.

If the Coast Guard postpones issuance of an LOR pending further analysis and study, the effect is expected to be similar to FERC postponing its action. That is, although it is speculative to predict the resulting effects, postponing issuance of an LOR may lead to Creole Trail deciding to delay its entire project.

A reasonable alternative to the Coast Guard action of issuing an LOR which finds the waterway suitable for LNG marine traffic with certain conditions discussed previously is to issue an LOR without any conditions. This would avoid the environmental effects related to any moving safety and/or moored vessel security zones, or other related LNG safety and security activities, which the Coast Guard would determine to be necessary prior to the commencement of LNG vessels transiting the waterway. We are

unable to quantify the impacts at this time due to uncertainty in the scope, frequency, prevailing maritime security levels, and the number of resources that would be dedicated on a recurring or episodic basis; however, we do not anticipate any significant environmental impacts. The Coast Guard will ensure the appropriate NEPA environmental documentation for such actions is completed prior to the commencement of these activities. Also, the Coast Guard will cooperate in any required NEPA environmental analysis initiated by another agency for projects related to the introduction of LNG vessels such as any prerequisite channel deepening or dredging by the COE.

3.1.1 Energy Source Alternatives

It is purely speculative to predict the reactions of potential end users of the natural gas that would be supplied by the proposed Creole Trail Project, and the direct or indirect environmental impacts related to their actions, if the Commission was to select the No Action alternative. However, in the short term, not bringing LNG into the region would most likely result in natural gas shortages, increased costs, and increased reliance on other fuel sources (mainly fuel oil) to make up the difference, especially for use in electricity generation. Many natural gas power plants have the option of substituting fuel oil, should natural gas become unavailable or prohibitively expensive. However, the projected national increase in petroleum product consumption and cost between 2002 and 2025 is similar to that for natural gas. Consequently, there is unlikely to be a surplus of petroleum fuel that could readily provide a cost-effective alternative to natural gas without significant new discoveries of crude oil.

Natural gas combustion generates 34 to 52 percent less carbon dioxide (CO₂) than conventional fuels, such as oil or coal. Increased use of other fossil fuels with existing emission control technologies would lead to increased emissions of other combustion byproducts, including sulfur dioxide (SO₂), nitrogen oxides (NO_x), and hydrocarbons (see table 3.1.1-1). Thus, the use of other fossil fuels in place of natural gas would increase atmospheric pollution and waste volumes, and would incur secondary impacts associated with production (e.g., coal mining and oil drilling), transportation (e.g., oil tankers, rail cars, and pipelines), and refining.

Fossil Fuel Type	CO ₂ (lb/kWh)	SO _x (lb/kWh)	NO _x (lb/kWh)
Coal	2.1	0.013	0.0076
Oil	1.6	0.011	0.0021
Natural Gas	1.0	0.000007	0.0018

Source: Estimated emissions are based on total emissions and total electrical power production for each fossil fuel type, as reported in the EPA's Annual Energy Review 2003 (DOE 2003).
 CO₂ = carbon dioxide
 SO_x = sulfur oxides
 NO_x = nitrogen oxides
 lb/kWh = pounds per kilowatt hour

Other traditional long-term fuel source alternatives to natural gas for electric generation are nuclear power, hydropower production, and development of renewable energy sources. Because of permitting, cost considerations, nuclear waste disposal, time required for development of new nuclear-fueled generation, and potential public concerns, new sources of nuclear power are unlikely to appear in the near future. It is also unlikely that significant new hydropower sources could be permitted and brought online as a reliable alternative to the LNG provided by Creole Trail's proposed project, particularly in the Gulf and east coast regions.

Although technology is improving and costs are declining for renewable energy (e.g., wind, solar, geothermal, and biomass), the national electricity generated from non-hydropower renewable energy sources is projected to increase from 2.2 percent in 2002 to only 3.7 percent in 2025 (DOE, 2004). Consequently, the quantity of energy generated from non-hydropower renewable energy sources is not likely to provide a reasonable alternative to an increased natural gas supply.

Another alternative energy source to imported LNG would be domestically-produced natural gas. As previously noted, the NPC determined that traditional North American producing areas will provide 75 percent of long-term needs for natural gas in the United States, but will be unable to meet projected demand. While natural gas production is important to the overall supply of energy nationally, production levels are not expected to rise in the short term, except from the Arctic and from unconventional sources in the Rocky Mountain region. Given a projected increase in natural gas demand in the Rocky Mountain region itself, these unconventional sources would not provide a reasonable alternative to the Creole Trail Project. Likewise, natural gas from the Arctic is not a reasonable alternative because those supplies alone would be insufficient to meet projected increases in demand. In addition, should work on developing an Alaska gas pipeline begin in the near future, projected schedules for online service from this source indicate that at least 10 years would be required for pipeline development, construction, and initiation of service, extending beyond the proposed in-service date of the Creole Trail Project by at least 5 years.

3.1.2 Energy Conservation Alternatives

Energy conservation and increased efficiency in energy production have been a component of the national energy agenda since the Arab Oil Embargo in the mid-1970s. However, while energy conservation can play a critical role in the future of the United States energy sector, growth projections continue to indicate that the demand for energy, and specifically natural gas, will outstrip cost-effective programs designed to stimulate energy conservation. For example, the Oak Ridge National Laboratory analyzed data from the DOE's State Energy Program. The State Energy Program is a federally funded, state-based program administered by the DOE that provides financial and technical assistance for a variety of energy efficiency and renewable energy initiatives. The Oak Ridge National Laboratory determined that the program resulted in an estimated annual energy savings of approximately 41 trillion Btu (Schweitzer, 2003). To put this amount of energy in context, the United States consumed 98 quadrillion Btu of total energy in 2002, roughly 2,400 times the 41 trillion Btu of energy savings reported by the Oak Ridge National Laboratory. For further context, 41 trillion Btu per year of energy saved would offset the use of approximately 105 Bcf of natural gas, less than 10 percent of the annual volume that would be supplied by an LNG import project the size of the proposed Creole Trail terminal.

In Louisiana, the LADNR State Energy Office promotes the efficient use and management of energy in the state through the Energy Conservation Program. In fiscal year 1998-99, the Energy Conservation Program was expected to reduce energy usage in Louisiana by the equivalent of 85.44 million gallons of gasoline, which is roughly equivalent to the energy contained in 10.3 Bcf of natural gas. While this program is contributing to energy conservation in Louisiana, growth in energy demand and the need to meet that demand will continue to outpace this contribution.

In summary, we believe that existing energy conservation programs cannot fully offset the projected growth in demand for energy, and a corresponding demand for natural gas, in the Gulf region or nationally. Continued economic growth, particularly growth of electricity demand, throughout the United States will lead to increased natural gas use despite programs to encourage energy conservation. Thus, energy conservation alone would not preclude the need for the Creole Trail Project.

In light of the preceding analysis, we do not recommend the No Action or the Postponed Action alternatives.

3.2 SYSTEM ALTERNATIVES

System alternatives would make use of other existing, approved, or proposed LNG or natural gas facilities to meet the stated objectives of the proposed project. A system alternative would make it unnecessary to construct all or part of the proposed project, although some modifications or additions to the existing or proposed facilities may be necessary. These modifications or additions would result in environmental impacts that could be less than, similar to, or greater than those associated with construction of the proposed Creole Trail Project. Ultimately, the point of identifying and evaluating system alternatives is to determine whether potential environmental impacts associated with the construction and operation of the Creole Trail Project could be avoided or reduced by using another existing or proposed system.

To be considered a viable LNG system alternative, the existing, approved, or proposed facility, even when considering excess or potential expansion capacities, would need to provide (additional to the project's own requirements) LNG ship unloading, storage, and vaporization output similar to Creole Trail's proposal. Also, the alternative facility would need to be in a location that would serve the same natural gas markets as the proposed project.

As of March 2006, there were 5 operating LNG import terminals in the United States, and another 11 import terminals have been approved for construction in the United States by either the FERC or the Maritime Administration of the DOT (MARAD) and Coast Guard. Twenty-three more LNG import terminals (includes expansions of approved terminals) have also been proposed for construction in the United States (FERC, 2006).

Sixteen of the existing, approved, or proposed LNG terminal facilities are outside the Gulf of Mexico region. For this alternatives analysis, we did not consider these 16 projects, or proposed projects in the Bahamas, Canada, and Mexico, because these projects would serve different regional markets than the proposed Creole Trail Project. In addition, the 16 projects outside the Gulf of Mexico region could not make use of the existing pipeline infrastructure in the Gulf of Mexico region where available pipeline capacity is expected to increase as reserves decline.

The analysis below examines the existing, approved, and proposed LNG import terminal systems in the Gulf of Mexico region, and considers whether the potential expansion and use of those systems would offer an environmental advantage over the construction and operation of the Creole Trail LNG terminal while meeting the project objectives. The site locations of these LNG import terminals are depicted on figure 3.2-1. Table 3.2-1 provides the location and facility characteristics of recently approved and proposed LNG terminal facilities in the Gulf Coast area.

Non-Internet Public

ENVIRONMENTAL IMPACT STATEMENT FOR THE PROPOSED
CREOLE TRAIL LNG TERMINAL
AND PIPELINE PROJECT
Docket Nos. CP05-360-000, CP05-357-000,
CP05-358,000, CP05-359-000

Figure 3.2-1 Existing, Approved, and Proposed LNG Terminals in
the Gulf of Mexico

Public access for the above information is available only
through the Public Reference Room, or by e-mail at
public.referenceroom@ferc.gov.

TABLE 3.2-1

Recently Approved and Proposed LNG Import Terminals in the Gulf of Mexico

Project Name / Applicant	Location	Sendout Capacity (Bcfd)	Number of Storage Tanks and Capacity
Approved Terminals			
Cameron LNG Project <i>Cameron LNG, LLC</i>	Hackberry, LA	1.5	Three 160,000 m ³ tanks
Sabine Pass LNG Project <i>Sabine Pass LNG, L.P.</i>	Sabine Pass, LA	2.6	Three 160,000 m ³ tanks
Golden Pass LNG Project <i>Golden Pass LNG Terminal, L.P.</i>	Sabine Pass, TX	1.0 (phase 1) 2.0 (phase 2)	Five 160,000 m ³ tanks
Freeport LNG Project <i>Freeport LNG Development L.P.</i>	Freeport, TX	1.5	Two 160,000 m ³ tanks
Cheniere Corpus Christi LNG Project <i>Corpus Christi LNG L.P.</i>	Corpus Christi, TX	2.6	Three 160,000 m ³ tanks
Vista del Sol LNG Terminal Project <i>Vista del Sol LNG Terminal L.P.</i>	Corpus Christi, TX	1.1	Three 155,000 m ³ tanks
Ingleside Energy Center LNG Project <i>Ingleside Energy Center, LLC</i>	Corpus Christi, TX	1.0	Two 160,000 m ³ tanks
Gulf Landing Project <i>Shell US Oil and Gas</i>	Gulf of Mexico, West Cameron Block 213, offshore LA	1.0 to 1.2	GBS, 200,000 m ³
Port Pelican Offshore Deepwater Port Project <i>ChevronTexaco</i>	Gulf of Mexico, Vermillion Block 140, offshore LA	2.0	GBS, 330,000 m ³
Proposed Terminals			
Port Arthur LNG Project <i>Port Arthur LNG, L.P.</i>	Port Arthur, TX	1.5 (phase 1) 1.5 (phase 2)	Six 160,000 m ³ tanks
Sabine Pass - Phase II <i>Sabine Pass LNG, L.P.</i>	Sabine Pass, LA	4.0	Three 160,000 m ³ tanks
Calhoun LNG Project <i>Calhoun LNG, L.P.</i>	Port Lavaca, TX	1.0	Two 160,000 m ³ tanks
Cameron LNG Expansion Project <i>Cameron LNG, LLC</i>	Hackberry, LA	2.65	Four 160,000 m ³ tanks
Freeport LNG II Project <i>Freeport LNG Development L.P.</i>	Freeport, TX	2.5	One 160,000 m ³ tank
LNG Clean Energy Project <i>Gulf LNG Energy, LLC</i>	Pascagoula, MS	1.0	Two 160,000 m ³ tanks
Casotte Landing LNG Project <i>Bayou Casotte Energy, LLC</i>	Pascagoula, MS	1.3	Three 160,000 m ³ tanks
Compass Port Project <i>ConocoPhillips</i>	Gulf of Mexico, offshore AL	1.0	GBS, 300,000 m ³
Beacon Port LNG Project <i>ConocoPhillips</i>	Gulf of Mexico, High Island Block 27, offshore LA	1.5	GBS, 300,000 m ³
Main Pass Energy Hub Project <i>Freeport-McMoRan Energy, LLC</i>	Gulf of Mexico, Main Pass Block 299, offshore LA	1.6	Two 300,000 m ³ tanks
Bcfd = billion cubic feet per day m ³ = cubic meters GBS = gravity-based structure			

3.2.1 Use of Other Existing, Approved, or Proposed Onshore LNG Terminals

There are four existing onshore LNG import terminals that provide unloading, storage, and delivery services in the continental United States. These facilities are operated by Trunkline LNG Company L.L.C. (Trunkline) at Lake Charles, Louisiana; Southern LNG Inc. (Southern) at Elba Island, Georgia; Cove Point LNG, L.P. (Cove Point) in Calvert County, Maryland; and Distrigas of Massachusetts (Distrigas) at Everett, Massachusetts. The Southern, Cove Point, and Distrigas facilities were built mainly to serve the local markets (southeast, mid-Atlantic, and New England, respectively). As noted above, because of their location and the existing infrastructure, any additional LNG delivered to these three existing import terminals would be to serve their local markets and would not meet the purpose of the proposed project. Further, none of these facilities has available capacity or the physical space to accommodate facility expansion for the additional storage and delivery of volumes proposed by Creole Trail. Therefore, we eliminated the Southern, Cove Point, and Distrigas terminals from further consideration.

The existing Trunkline LNG terminal in Lake Charles, Louisiana, is the largest operating LNG import terminal in the United States. Because of its location (approximately 20 miles north of the proposed Creole Trail LNG terminal), the Trunkline facility could serve the same markets targeted by the proposed project. However, the Commission has recently approved expansion of the Trunkline facility, including a second berth, another LNG storage tank (in addition to the three existing LNG storage tanks), and additional vaporization capability. These new facilities will increase the sendout capacity of the terminal to 1.2 Bcfd. Construction is underway at the site. After the expansion is complete, there would not be sufficient space within its 125-acre fenced site to accommodate the additional facilities that would be required to meet the storage and delivery output proposed by Creole Trail. Because the existing capacity of the Trunkline facility is 100 percent committed, any future significant expansion would require construction outside of the site boundary. Such an expansion is limited by existing or planned industrial facilities near the site; therefore, we have also eliminated the potential expansion of the Trunkline facility from further consideration as an alternative to the proposed Creole Trail LNG terminal.

The FERC-approved and proposed onshore LNG terminals are discussed below.

3.2.1.1 Cameron LNG Terminal

The Cameron LNG import terminal was originally approved by the FERC on September 11, 2003, but is yet to be constructed. The Cameron facility will be located on a site adjacent to the Calcasieu Ship Channel, approximately 15 miles north of the proposed Creole Trail LNG terminal site. As currently authorized, this project will consist of three 160,000 m³ full-containment LNG storage tanks, vaporization and processing facilities, a slip with two berths, and a 36-inch-diameter pipeline with a nominal output of 1.5 Bcfd. In December 2005, Cameron LNG, LLC filed and the FERC approved a request to initiate the FERC's Pre-filing process for a proposal to expand the storage and output capacity of the facility. The proposed expansion would include an additional 160,000 m³ full-containment LNG storage tank and other modifications to increase the facility's sendout capacity to 2.65 Bcfd.

Because of its location, the Cameron LNG import terminal could, if constructed, serve the same markets targeted by the Creole Trail Project. However, the Cameron LNG terminal site has been optimized to provide sufficient space for the proposed LNG facilities while minimizing the filling of onsite wetlands. Consequently, there is not sufficient space to accommodate the facilities necessary to meet the additional capacity proposed by Creole Trail without causing similar or greater impacts on wetlands. Additional expansion of the Cameron LNG facility would eliminate the need to construct Segment 2 of the proposed Creole Trail Pipeline through Calcasieu Lake. However, the authorized 36-inch-diameter natural gas pipeline from the Cameron LNG terminal was designed to handle the proposed

output of the terminal and does not have excess capacity to handle the additional volumes of natural gas that would be supplied by the Creole Trail Project. Therefore, significant expansion of the Cameron LNG pipeline would also be necessary to transport the additional 3.3 Bcfd output of the proposed Creole Trail Project. We also anticipate that expansion of the Cameron LNG import terminal would require excavation and dredging of a second slip and would increase LNG ship traffic further up the Calcasieu Ship Channel beyond the proposed Creole Trail LNG terminal site. We have concluded that additional expansion of this facility would not offer any environmental advantages over construction and operation of the Creole Trail facility. Consequently, we have eliminated it from further consideration.

3.2.1.2 Sabine Pass LNG Terminal

Construction of the Sabine Pass LNG import terminal has begun in Cameron Parish, Louisiana, approximately 25 miles to the west of the proposed Creole Trail LNG terminal site. As currently authorized, this project will consist of two marine berths capable of unloading up to 300 LNG ships per year, three LNG storage tanks, vaporization and processing facilities, and 16 miles of 42-inch-diameter sendout pipeline with a nominal output of 2.6 Bcfd. Sabine Pass LNG, L.P. has filed an application to expand the facility. The expansion (Phase II) would involve the addition of three LNG storage tanks as well as a new and expanded vaporization system. The Phase II expansion would increase the terminal's planned send-out capacity from 2.6 Bcfd to 4.0 Bcfd. The sponsor of the Sabine Pass LNG Project, Sabine Pass LNG L.P., is an affiliate of Creole Trail LNG L.P. The Sabine Pass LNG Project is targeting similar local and national markets as the proposed project and, therefore, is a potential alternative to the proposed project. However, Creole Trail LNG L.P. has stated that the Sabine Pass LNG terminal site could not accommodate all of the facilities planned for the Creole Trail LNG terminal in addition to the currently authorized and future planned development of the site. In particular, the Sabine Pass LNG land lease along the Sabine River likely would not prove suitable for the addition of a third and fourth tanker berth, which would need to be collocated with the existing berths for operational efficiency. Additionally, a state-sponsored wetland creation project is situated immediately to the south of the authorized Sabine Pass LNG berth. Consequently, we do not consider the Sabine Pass LNG project to be a viable system alternative to Creole Trail's proposed project.

3.2.1.3 Golden Pass LNG Terminal

The Golden Pass LNG terminal was approved by the Commission in July 2005 and site preparation work has begun. The facility will be in Jefferson County, Texas, approximately 25 miles west of the proposed Creole Trail LNG terminal project and approximately 2 miles from the Sabine Pass LNG terminal. As authorized, the Golden Pass LNG terminal will be constructed on 298 acres within a 477-acre parcel of land that is bounded by wetlands abutting State Highway 87 to the west and south, and the Sabine-Neches Waterway to the east and north. The project will be constructed in two phases, resulting in two LNG ship berths, five storage tanks, and two associated 36-inch-diameter sendout pipelines. Because of its location, the Golden Pass LNG terminal could potentially serve similar markets as targeted by the proposed project. However, the Golden Pass primary markets are ExxonMobil's Beaumont Refinery and the Texas interstate and intrastate markets. In addition, the Golden Pass LNG terminal, as designed, cannot provide the additional storage or delivery volumes proposed by Creole Trail LNG. Any additional future LNG delivered to the facility could not meet the purpose of the proposed project without construction of additional storage tanks, facilities, and infrastructure, all of which may be limited by site conditions. For these reasons, we did not consider the Golden Pass LNG terminal a viable alternative to the proposed project.

3.2.1.4 Freeport LNG Terminal

On June 16, 2004, the Commission approved the Freeport LNG Project as proposed by Freeport LNG Development LP. The terminal is under construction at this time. The terminal will consist of a single LNG ship berth capable of unloading up to 200 ships per year, two LNG storage tanks, and 9.6 miles of 36-inch-diameter send-out pipeline with a nominal output of 1.5 Bcfd. The project is presently 100 percent committed and would have to be expanded to meet project objectives. On May 26, 2005, Freeport LNG filed an application to expand the terminal by adding a second berth and another LNG tank, increasing the capacity by 2.5 Bcfd. A portion of this capacity is already committed. It is unlikely that the site could accommodate two additional ship berths and four tanks needed to import and transport the additional volumes (up to 3.3 Bcfd of natural gas) proposed by Creole Trail. This site also is approximately 150 miles west of the proposed project and was designed to serve only the Texas intrastate market. In order to serve the interstate market, at a minimum the planned pipeline would have to be extended about 50 miles northwestward to interconnect with the interstate pipeline system. Additionally, compression or looping of the two existing 30-inch-diameter interstate pipelines at this location may be needed to transport the gas to market. For these reasons, we eliminated this alternative from further consideration.

3.2.1.5 Cheniere Corpus Christi LNG Terminal

The Cheniere Corpus Christi project was approved by the Commission on April 13, 2005. The project will consist of two LNG ship berths capable of unloading up to 300 ships per year, three LNG storage tanks, and 23 miles of 48-inch-diameter send-out pipeline with a nominal output of 2.6 Bcfd. The LNG terminal will occupy about 366 acres of a total of approximately 722 acres of land and water at a site located east of Portland, Texas, on La Quinta Channel on the northern shoreline of Corpus Christi Bay.

While this terminal could be expanded by adding additional berths and LNG storage tanks, it is unlikely that the site could accommodate the additional two berths and four LNG tanks that would be needed to import and transport an additional 3.3 Bcfd of natural gas. Additionally, since pipeline transportation facilities from the Corpus Christi area north are limited, significant additional pipeline capacity would need to be constructed to transport the proposed volumes to the Creole Trail markets. For these reasons, we eliminated this alternative from further consideration.

3.2.1.6 Vista del Sol LNG Terminal

The Vista del Sol project was approved by the Commission on June 15, 2005. It will consist of one LNG ship berth, three LNG storage tanks, and approximately 25 miles of 36-inch-diameter send-out pipeline. The three LNG storage tanks will have a nominal output of 1.1 Bcfd. The marine terminal will be capable of receiving up to 100 LNG ships per year. The LNG terminal will be located on approximately 288 acres within a 311-acre site between the communities of Ingleside and Gregory, Texas, on the northern shoreline of Corpus Christi Bay.

While this terminal could be expanded by adding an additional berth and LNG storage tanks, it is unlikely that the site could accommodate the additional two berths and four LNG tanks that would be needed to import and transport an additional 3.3 Bcfd of natural gas. As with the Cheniere Corpus Christi project, since pipeline transportation facilities from the Corpus Christi area north are limited, significant additional pipeline capacity would need to be constructed to transport the proposed volumes from the Vista del Sol facility to the Creole Trail markets. For these reasons, we eliminated this alternative from further consideration.

3.2.1.7 Ingleside Energy Center LNG Terminal

The Ingleside Energy Center LNG Project was approved by the Commission on July 21, 2005. It will consist of one ship berth, two LNG storage tanks, a natural gas liquids extraction facility, and approximately 26 miles of 26-inch-diameter pipeline with interconnections to nine existing interstate and intrastate pipelines. The project will have an output of 1.0 Bcfd and unload up to 140 LNG ships per year. The approved site is located on an 82-acre site adjacent to Occidental's chemical manufacturing facility west of Ingleside, Texas, on La Quinta Channel on the northern shoreline of Corpus Christi Bay.

While this terminal could be expanded by adding additional berths and LNG storage tanks, it is unlikely that the site could accommodate the additional two berths and four LNG tanks that would be needed to import and transport the additional 3.3 Bcfd of natural gas proposed by Creole Trail. As with the two other approved Corpus Christi projects, the Ingleside Energy Center LNG terminal will be located about 300 miles from the Creole Trail Project area, and would not readily serve the same markets targeted by Creole Trail. For these reasons, we eliminated this alternative from further consideration.

3.2.1.8 Proposed Onshore LNG Terminals under Review

As listed in table 3.2-1, we are currently analyzing four proposed onshore LNG import terminal projects to be located in the Gulf of Mexico region (the proposed Sabine Pass - Phase II and Freeport LNG II Projects would occur at approved LNG terminals and are discussed in sections 3.2.1.2 and 3.2.1.4, respectively). Three of these planned projects would be sited at considerable distances from the Creole Trail LNG terminal site and, therefore, would not provide direct access to south Louisiana markets, an objective of the proposed Creole Trail Project. The Calhoun LNG Project would be approximately 225 miles from the Creole Trail site in Port Lavaca, Texas, and the LNG Clean Energy Project and the Casotte Landing LNG Project would both be about 300 miles away in Pascagoula, Mississippi. Each of these three facilities would deliver between 1.0 and 1.3 Bcfd of natural gas and would require significant expansion to accommodate the additional output capacity of the proposed Creole Trail Project. In addition, the two facilities proposed for construction in Pascagoula would primarily target local consumers or larger markets in Florida and the eastern United States. For these reasons, we did not consider the proposed Calhoun LNG Project, LNG Clean Energy Project, or Casotte Landing LNG Project as viable alternatives to the Creole Trail terminal.

The last of the currently proposed LNG terminals in the Gulf of Mexico region is the Port Arthur LNG Project in Jefferson County, Texas. The Port Arthur LNG terminal site is about 25 miles to the west of the proposed Creole Trail LNG terminal site and in close proximity to the approved Sabine Pass LNG and Golden Pass LNG terminal sites. The Port Arthur LNG terminal would be constructed in two phases, resulting in two ship berths, six LNG storage tanks, and about 73 miles of pipeline, and would deliver up to 3.0 Bcfd of natural gas to a market similar to that proposed by Creole Trail. However, the Port Arthur LNG terminal, as proposed, would require significant expansion to accommodate the receipt, storage, and sendout capacity of the proposed Creole Trail LNG terminal. Such expansion would likely include construction of LNG storage tanks, vaporization equipment, and pipeline, and possibly an additional berth. The required expansion would also add approximately 300 more LNG shipments per year through the Sabine-Neches Waterway. The environmental impacts associated with such an expansion of the Port Arthur facility would likely be similar to those associated with construction and operation of the proposed Creole Trail LNG terminal. Consequently, the expansion of the proposed Port Arthur facility would offer no environmental advantage and to the proposed project.

3.2.2 Use of Approved or Proposed Offshore LNG Terminals

To avoid many of the environmental issues and safety concerns associated with locating an LNG facility onshore, many companies have considered locating LNG import terminals at ports located offshore. As defined in the Deepwater Port Act of 1974 (as amended by the Maritime Transportation Security Act of 2002 to include natural gas facilities), deepwater ports include structures that are located in federal waters off of the coast of the United States and are used as a port or terminal for the transportation, storage, and further handling of oil or natural gas. This legislation further requires MARAD and the Coast Guard to regulate the licensing, siting, construction, and operation of deepwater ports for natural gas. Offshore LNG import facilities located in state waters fall under the jurisdiction of the FERC.

There are basically two different types of structures that can be used as an offshore LNG import terminal. These include: (1) fixed structures that have ship docking and unloading facilities, regasification units, and other associated equipment on pile-based platforms or concrete structures and foundations located directly on the seafloor; and (2) floating units comprised of storage tanks, offloading, and vaporization facilities. Both designs would allow docking and unloading of LNG ships and vaporization of LNG for delivery to onshore markets via undersea pipelines.

3.2.2.1 Gravity Based Structures

A gravity based structure (GBS) would place LNG storage tanks, offloading, and vaporization facilities on platforms with foundations that are anchored directly to the seafloor. LNG could be offloaded from conventional LNG ships, placed in storage tanks, and then vaporized for delivery as natural gas to the onshore market via an undersea pipeline. The use of a GBS would be limited to areas with suitable substrates and where water depths range from 55 to 85 feet. Safety zones surrounding these types of offshore LNG facilities would exclude certain ship traffic from operating in their vicinity and the GBS would need to be located outside of shipping lanes. Offshore GBS facilities could be built to store between 290,000 and 400,000 m³ of LNG with send-out capacities ranging between 0.8 and 2.8 Bcfd.

In addition, because a GBS is fabricated in a graving dock (or dry dock) at an onshore location, the GBS design is not completely devoid of adverse onshore impacts, such as impacts to wetlands and other sensitive land uses. The onshore graving dock must be of sufficient size and depth to fabricate the GBS, and in an area with access to a 45- to 50-foot-deep channel to float the GBS. This requires that the graving dock area be large enough to accommodate the GBS and be excavated deep enough to allow the GBS to be floated out after construction is completed. One side of the graving dock must be directly adjacent to a waterbody, and that side must be removable to flood the dock and float the GBS so that it may be towed from the dock to its final destination. GBS units for the currently proposed projects range from 210 to 248 feet wide by 500 to 1,110 feet long. The fabrication site for the GBS would require between 50 and 100 acres, and availability of adequate infrastructure to facilitate construction.

MARAD recently issued Records of Decision as the first steps to authorizing the construction and operation of two deepwater LNG import terminals in the Gulf of Mexico that utilize GBS structures in their designs. These two projects, the Gulf Landing and Port Pelican Deepwater Ports would be located off the coast of Louisiana, about 40 miles and 80 miles from the proposed Creole Trail terminal site, respectively.

The Gulf Landing LNG terminal would use two GBSs, each approximately 1,110 feet by 248 feet that would be anchored to the sea bottom in about 55 feet of water. Each GBS would consist of a large concrete structure designed and fabricated to provide a secure foundation for the LNG tanks, and a supportive deck for all of the regasification equipment, utilities, and other related equipment. Berthing

facilities would be able to accept up to 135 LNG ships per year. Up to 1.2 Bcfd of vaporized natural gas would be transported from the facility into the existing interstate natural gas pipeline system through five segments of 16- to 36-inch-diameter offshore pipeline totaling about 75.6 miles.

The Port Pelican LNG terminal would also use two GBSs that would be anchored to the sea bottom in about 83 feet of water. Up to 2.0 Bcfd of vaporized natural gas would be transported from the facility into the existing interstate natural gas pipeline system by constructing a new, 42.6-mile-long, 42-inch-diameter pipeline to the existing Tiger Shoal “A” platform, then using existing pipeline infrastructure to the Henry Hub.

For either of these projects to accommodate the volumes proposed by Creole Trail, an additional two to three GBSs would be required, each affecting between 150 and 300 acres of shoreline area for construction at the graving docks and 50 and 60 acres of additional seafloor habitat to anchor the GBS to the seafloor. In addition, new pipeline requirements could include construction of between 45 to more than 75 miles of on-shore and off-shore pipelines to provide the added takeaway capacity of the expanded facilities. The environmental impact associated with construction of the GBSs on land and installation and operation of the GBS at sea, combined with construction of additional onshore and offshore pipelines, would likely be equal to or greater than the impacts associated with the proposed project. Therefore, we conclude that expansion of either the Gulf Landing or Port Pelican GBS facilities would not result in an environmentally preferable alternative to the Creole Trail Project.

Two other LNG terminals that are proposed for the Gulf of Mexico area would utilize GBS structures in their designs. These two LNG import terminals are Compass Port (offshore Alabama) and Beacon Port (offshore Louisiana). As in the preceding discussion regarding the approved Gulf Landing and Port Pelican GBS facilities, neither of these two proposed GBS projects could accommodate the additional volumes proposed by Creole Trail without significant expansion, including the construction of additional GBSs at onshore graving dock sites and the construction of additional onshore and offshore pipelines. The environmental impacts associated with these activities would likely be equal to or greater than the impacts associated with the proposed project. Therefore, we conclude that none of the approved or proposed offshore LNG projects that utilize a GBS design present an alternative that is environmentally preferable to the proposed Creole Trail Project.

3.2.2.2 Reuse of Existing Oil/Gas/Mining Platforms

Another offshore alternative would convert existing offshore oil, gas, or mining platforms for use as a fixed offshore LNG terminal. These platforms could be fitted with docking, unloading, storage, and vaporization equipment but, depending on the specific design, the storage capacity may not be significant. Similar to the GBS design, LNG could be unloaded from a conventional LNG ship, vaporized at the platform, and sent as natural gas to the onshore market via an undersea pipeline.

The Main Pass Energy Hub Project (proposed by Freeport-McMoRan Energy LLC) includes development of a deepwater LNG terminal on a series of existing connected platforms about 16 miles off the coast of southeast Louisiana. This project would be about 37 miles off the coast of Venice, Louisiana, and about 300 miles from the proposed Creole Trail LNG terminal site. The facility would make use of existing platforms and other infrastructure in the Gulf of Mexico, including a nearby salt dome for underground storage of up to 28 Bcf of natural gas. Existing platforms would be reconfigured to provide unloading, storage, and vaporization facilities for LNG. About 192 miles of offshore pipeline and about 5 miles of onshore pipeline would be constructed to deliver up to 1.6 Bcfd of natural gas to existing pipeline infrastructure in southern Alabama. The Main Pass Energy Hub, as proposed, would be unable to accommodate the additional 3.3 Bcfd sendout capacity of the proposed Creole Trail Project without

major expansion that may not be viable. Thus, we eliminated the facility as a possible alternative to the proposed project.

Reuse of other existing platforms would involve identifying decommissioned production facilities and determining whether these facilities were appropriate for conversion to import LNG, both of which are beyond the scope of this analysis. If such a facility were available, the time required to redesign the proposed LNG import terminal to utilize the specific configuration of existing offshore platforms would not meet the purpose of the proposed project to begin delivery of up to 3.3 Bcfd beginning in 2009.

3.2.2.3 LNG Regasification Vessels

Several companies have proposed the installation of vaporization equipment on conventional LNG carrier ships. These ships would be able to dock at a floating unloading buoy and riser system where LNG could be vaporized onboard the LNG ship and injected directly into offshore pipelines that interconnect with onshore natural gas transmission systems. The vaporization equipment located on the ships would use technology that is similar to land-based LNG terminals. Because LNG is vaporized on board the LNG ship, this approach eliminates the need for fixed LNG storage.

In March 2005, a fifth LNG import terminal began operations in the United States. Excelerate Energy, L.L.C. (Excelerate) recently began operating its Gulf Gateway Deepwater Port facility approximately 116 miles off the coast of Louisiana. This facility utilizes new, specially designed LNG tankers with onboard regasification equipment to directly input 0.3 to 0.7 Bcfd of natural gas into the pipeline grid via a submerged turret loading (STL) buoy. Excelerate has ordered the construction of three LNG ships (one of which is now operating) that will also include onboard vaporization equipment. Because there is no storage component to the Gulf Gateway Deepwater Port, a significant number of additional specialized tankers, as well as additional STL buoys and up to an additional 116 miles of new submerged offshore sendout pipeline(s) would be required to accommodate the sendout capacity of the proposed project. This system alternative has been eliminated from further consideration because it would be unable to deliver the volumes of natural gas proposed by Creole Trail.

3.2.2.4 Floating, Storage, and Regasification Unit (FSRU)

Floating, storage, and regasification units (FSRU) are another approach being considered for importing LNG into the United States. In essence, an FSRU consists of an oversized LNG carrier vessel that is outfitted with LNG vaporizers and docking/unloading equipment. The FSRU would be up to 1,200 feet long, 180 to 215 feet wide, and would be able to store between 250,000 and 350,000 m³ of LNG; over twice the capacity of a typical LNG ship. After the LNG is unloaded, it could be vaporized as needed for deliveries and the natural gas could be transported to onshore markets through an undersea pipeline. Depending on the vaporizers and the size of the pipeline, these units could have a natural gas sendout capacity ranging from 0.7 to 1.5 Bcfd. Companies are currently proposing to use this design to import natural gas to markets in California and the Long Island Sound area; however, none are currently proposed for the Gulf of Mexico region.

3.2.2.5 Discussion of Offshore Alternatives

We have examined both site-specific approved and planned offshore LNG terminals design strategies, with either a fixed or floating design or utilizing transport and regasification vessels, to determine if they could provide an LNG import, vaporization, and delivery service similar to the Creole Trail land-based terminal design.

By constructing an LNG terminal offshore, some of the environmental impacts associated with the proposed land-based LNG terminal could be avoided (e.g., permanent fill of coastal wetlands, ship traffic in the Calcasieu Ship Channel). Although an offshore LNG import terminal would generally increase the distance of the facility from populated areas, there are operational and environmental tradeoffs associated with offshore LNG technology. Offshore LNG terminals need to be away from shipping fairways and operational oil and gas platforms. In addition, a safety zone would be established that would preclude commercial or recreational fishing within a range of between 1,640 and 3,280 feet of the offshore terminal. An offshore terminal must be self-contained, providing its own power, water, communications, and other utilities. This would translate to significant additional construction and operational costs; estimates released to the public indicate that the capital costs for constructing an offshore terminal that includes significant LNG storage would be at least twice as expensive as a similar sized onshore facility. Additionally, a recent congressional report suggested that offshore LNG facilities may be more vulnerable to terrorist attack compared to an onshore facility (Parfomak, 2003).

Any LNG import terminal that is located in an offshore setting would have greater exposure to the effects of meteorological and oceanographic forces such as high winds, waves, and currents than would a land based LNG terminal. The potential for severe weather equates with a need for increased storage volume at offshore terminals to maintain a predictable, constant flow of natural gas to shore. A key technical issue for the successful operation of an LNG terminal in this environment includes designing the LNG transfer system (i.e., unloading arms) to compensate for the relative motion between the terminal and LNG ship during unloading operations. Although storage and unloading technologies similar to those that would be used with an offshore LNG terminal have been applied for many years at onshore LNG terminals and at offshore petroleum product facilities (LNG Express, 2002), the technologies needed to transfer a cryogenic liquid under the potentially harsher conditions in an offshore setting have yet to be demonstrated. This challenge would be greater for offloading to a FSRU where the stresses on a transfer system could be even greater than what would be experienced at a fixed structure. For a GBS, an artificial breakwater must be constructed to protect the docked LNG vessel as well as the terminal itself. This breakwater can be combined with the GBS; however, the GBS must then be much larger to withstand the physical forces of wind, waves, and currents at the terminal site. This protective function is more easily and economically achieved in a protected harbor onshore.

The use of an offshore facility does not avoid the need for some onshore facilities. Temporary onshore facilities would be needed to construct the fixed or floating structures, which would then be transferred to the offshore terminal. As discussed in section 3.2.2.1, the fabrication of a GBS would occur in a graving dock, which would impact the area near the graving dock site. The degree of impact would depend on whether the graving dock site would be in a disturbed or undisturbed area. FSRUs could likely be constructed at existing shipyards. Permanent onshore facilities would also be required for terminal support activities.

A specific concern regarding the use of GBS LNG terminals is the optional use of seawater intake systems for vaporization. Although this vaporization design is economically attractive it requires very large volumes of seawater for vaporization increasing the potential for fish eggs and larvae to be entrained and killed during the process. Additionally, this vaporization process discharges significant amounts of cool water back to the water source resulting in locally decreased water temperature, increased turbidity, and increased dissolved oxygen content in marine waters within about 300 feet of the terminal. Although the GBS terminal would also serve as an artificial reef, potentially resulting in minor beneficial impacts on the populations of commercial and recreational fish species, a safety zone would preclude commercial or recreational fishing near the offshore terminals. Creole Trail proposes to use closed loop SCVs which avoids or reduces the need for large volumes of water withdrawal and discharge, and potential impacts on aquatic species and water quality.

Specific tradeoffs associated with the use of LNG transport and regasification vessels are that it would require a dedicated LNG fleet with vaporization equipment on all of the vessels. This fleet does not currently exist. Further, since the STL buoy must be in waters between 130 and 490 feet deep, this could significantly increase the length of offshore pipeline and related environmental impacts. Additionally, it takes 6 to 10 days to unload a ship at a maximum design rate of about 0.5 Bcfd, and no fixed LNG storage would be provided.

Some offshore terminal sites would require the construction and operation of pipelines on the seafloor. Construction methods for offshore pipelines include jetting, subsea plowing, and dredging. Excavating a shallow trench to bury the pipeline using any of these methods would have both direct and indirect impacts. Direct impacts would include the disturbance of bottom substrates and habitats located in the area of the trench. Other impacts could include the disturbance of substrates adjacent to the trench as a result of sidelaying the trench spoil, and impacts associated with anchor strikes and cable sweep resulting from the need to stabilize and position pipe-lay barges and other equipment. Indirect impacts would include the suspension and transport of disturbed sediments in the water column and the resettlement of suspended sediments on the seabed. Laying the pipeline directly on the seafloor could also displace and/or replace existing substrates and, in some cases, create a potential barrier to invertebrate movements (Glaholt et al., 2000). Although the use of the HDD method can help mitigate impacts, pipeline construction in nearshore or shallow waters can impact particularly sensitive habitats (e.g., seagrasses, coastal marsh).

3.2.2.6 Conclusions on Offshore Technology

Based on the above discussion, we conclude that, although offshore technologies provide an alternative means for the import of LNG, the existing and proposed offshore technologies would not provide the same capability as the proposed Creole Trail LNG terminal, and would likely result in a similar or greater level (although different) of environmental impacts. Further, selection of an offshore alternative to the proposed project would require a complete redesign of the entire facility such that meeting the operational, economic, and timing objectives of the proposal would likely be infeasible. Therefore, we do not consider offshore facilities to be environmentally preferable and practicable alternatives to the Creole Trail LNG terminal project.

3.3 ONSHORE LNG TERMINAL SITE ALTERNATIVES

The examination of alternative sites for an LNG terminal typically involves a comprehensive process that considers environmental, engineering, construction, economic, safety, and regulatory factors. The first step includes identification of the most suitable region within the United States for an LNG terminal based on natural gas demand, existing infrastructure, and other market factors. The second step includes identification of specific ports within the selected region and evaluation of these ports to determine if they could accommodate LNG ships and meet project objectives traffic. The final steps include the evaluation of suitable sites within those ports to identify the preferred LNG terminal site. Creole Trail used this process to identify potential sites for the proposed LNG terminal. We reviewed Creole Trail's site selection process and results, and supplemented its analysis with our own analysis, including the use of additional information from other projects in the Gulf of Mexico. The results of this analysis are presented below.

3.3.1 Regional Selection

The first phase of the site selection process involved consideration of deepwater accessible ports that are in proximity to major natural gas consumption centers in the United States. Ports on the east and west coasts of the United States were eliminated due to the size and seasonal characteristics of their

regional natural gas markets and the lack of significant pipeline infrastructure with the capacity to reach other markets.

Citing a lack of significant existing pipeline infrastructure and undesirable size and seasonal characteristics of markets in the eastern Gulf of Mexico, Creole Trail focused its evaluation on potential alternatives in the western Gulf of Mexico. However, we evaluated the potential to site the proposed project in the eastern Gulf of Mexico. Two potential sites in Florida at Panama City and Pensacola, and a third site in Mississippi at Gulfport/Biloxi, are in areas where the channel depth is less than 40 feet, which is the minimum required for LNG ships. In these areas, dredging would be required to increase the depth of the existing shipping channels as well as to create LNG ship berths and maneuvering areas (turning basins). A fourth potential area in Florida, Tampa/St. Petersburg, does not have sufficient pipeline takeaway capacity to accommodate the volumes of natural gas proposed by Creole Trail. In addition, since Florida is one of the nation's largest consumers of natural gas and yet produces only a minor amount of natural gas, the existing pipeline infrastructure in Florida is designed and operated to transport natural gas into the state from other areas of the Gulf of Mexico rather than out of the state and into the interstate market. If ports in Florida were to be used for LNG import, either a major new pipeline would be required or the existing system would need to be significantly expanded and redesigned to transport gas out of the state. Similarly, the existing pipeline infrastructure near Mobile Bay, Alabama, and Pascagoula, Mississippi, offer less total available takeaway capacity than the proposed project area. Therefore, we eliminated the Gulf Coast regions of Florida, Alabama, and Mississippi from further consideration.

Potential sites along the Mississippi River in Louisiana (Venice to Baton Rouge) were also considered because they offer greater takeaway capacity than Gulf Coast sites further to the east. However, LNG ships would need to travel from 8 to 200 river miles from the Gulf of Mexico to potential terminal sites near Venice and Baton Rouge, respectively. This stretch of the Mississippi River has a high existing level of marine traffic. By comparison, LNG ships servicing the proposed Creole Trail site would only need to travel about 3 miles inland from the Gulf of Mexico by way of the Calcasieu Ship Channel, which has a relatively lower existing level of marine traffic. Because of the greater inland distance LNG ships would need to travel on the Mississippi River and the associated increased potential for LNG shipments to affect existing ship traffic on the river, potential sites along the Mississippi River were not given further consideration.

As discussed in section 3.2.1, a number of LNG terminals have been approved or are proposed along the central and southern Gulf Coast of Texas, including projects in the Matagorda Bay and Corpus Christi Bay areas. These facilities are not considered viable or preferred alternatives to the proposed project, in part due to their distance (300 miles or more) from the proposed project area and, thus, their inability to readily serve natural gas consumers in south Louisiana, the proposed market for this project. For similar reasons, we did not consider the central and southern Gulf Coasts of Texas as a regional alternative to the proposed project.

Based on the above regional review and proposed project objectives, the evaluation of alternative LNG terminal locations was focused on ports in southwest Louisiana and southeast Texas.

3.3.2 Port Selection

The second step in the LNG site selection process was the identification of specific ports within southwest Louisiana and southeast Texas that could meet the objectives of the proposed project. Preliminary screening of ports in these areas was based on the following criteria:

- Ports with minimum channel depths of 40 feet were considered essential because LNG ships with drafts of up to 40 feet would call on the proposed LNG terminal;
- Wider ship channels were preferred to maximize maneuverability and minimize potential disruption to existing ship traffic;
- Ship channels with lower existing ship traffic were preferred to minimize potential affects that LNG ship passage could have on existing traffic in the port.
- LNG ships require an air draft of at least 180 feet, therefore, ports offering less than 180 feet of air draft were excluded from consideration; and
- Ports with easy access to multiple existing interstate and intrastate pipelines with sufficient capacity were preferred to accommodate the 3.3 Bcfd delivery volume for the proposed Creole Trail LNG terminal.

Based on the results of the regional selection process and applying the above criteria, the Ports of Galveston, Texas City, and Houston (all in Galveston Bay, Texas), Sabine Pass and the Ports of Beaumont and Port Arthur (all in Texas, along the Texas – Louisiana border), and the Calcasieu Pass area in Cameron Parish, Louisiana, were evaluated as potential site alternatives to the proposed Creole Trail LNG terminal.

Galveston Bay, Texas, is about 100 miles southwest of the proposed Creole Trail LNG terminal site and contains the deepwater (greater than 40 feet) Ports of Galveston, Texas City, and Houston. Based on proximity, these ports could potentially serve south Louisiana gas consumers. However, the Port of Galveston does not have easy access to major interstate pipelines. Existing easy access is only to small diameter intrastate pipelines that serve specific markets within Texas. Therefore, access to the larger interstate natural gas pipeline systems would require construction of new pipeline(s) that would likely need to be placed offshore in Galveston Bay to avoid construction in the highly developed Greater Houston area. In addition, because this port is at the approach to Galveston Bay, it has a very high volume of ship traffic as the approach also serves the Ports of Texas City and Houston. Similar to the Port of Galveston, the Port of Texas City also has easy access only to small diameter pipelines and would require construction of new offshore pipeline(s) to accommodate the volumes proposed by Creole Trail and to access interstate markets. The Port of Houston is a 25-mile-long complex of public and private facilities located about 30 miles from the Gulf of Mexico. The port is ranked first in the United States in foreign waterborne commerce and is the sixth busiest port in the world. It also has the highest surrounding population density of the ports we evaluated. For the reasons discussed above, the deepwater ports in Galveston Bay were not analyzed further in the port selection process.

The shipping channel at the Port of Beaumont, Texas, is maintained at a depth of 40 feet; however, air draft is only 136 feet through the channel. Because LNG ships require a minimum air draft of 180 feet, the Port of Beaumont would be unable to accommodate the proposed project and, therefore, was eliminated from further consideration.

Based on the port selection criteria, potential site selection focused on Sabine Pass and Port Arthur, both in Texas, and the Calcasieu Pass area in Cameron Parish, Louisiana.

3.3.3 Site Selection

Creole Trail applied preliminary technical, commercial, and environmental criteria to evaluate potential LNG terminal sites within the prospective port regions identified in the preceding section. This process resulted in the identification of the five sites described in table 3.3.3-1.

Port Region – Potential Site	Comments
1. Port Arthur – Canal	Property located directly in front of a turning basin
2. Port Arthur – Pleasure Island	Property located across from Mesquite Point and legally described as “Dennis Gahagan League, Lot 6, 7, 8.”
3. Sabine Pass – Texas	Property in Division A of the Dennis Gahagan League, A-123, Jefferson County, Texas
4. Calcasieu Pass North Site – Louisiana	Proposed Creole Trail LNG terminal site
5. Calcasieu Pass South Site - Louisiana	Property located along the west side of the Calcasieu Ship Channel, approximately 1.5 miles south of the proposed terminal site

Creole Trail visited these sites and gathered additional information from the site owners and/or from public information. The following criteria were then applied to each site:

- Channel Characteristics – The shipping channel must be a minimum of 40 feet deep and 150 feet wide, with a minimum air draft of 180 feet for the operation of a typical LNG vessel (this criterion was more broadly applied in the evaluation of potential ports; here the criterion was applied to specific sites of interest within each port because channel characteristics can vary within a given port);
- Zoning/Low Population Areas – To avoid or minimize adverse environmental impacts, potential sites that are zoned industrial or located in an industrial setting were preferred. Avoidance of populated areas was also preferred, which would avoid many of the safety issues commonly associated with LNG terminals; and
- Availability of Land – Sufficient acreage of available land was critical to accommodate the proposed facilities, and to meet the safety requirements of 49 CFR Part 193 and NFPA 59A. Sufficient land would also be necessary for installation of the sendout pipeline.

All of the prospective sites met the zoning/land use criteria. However, Creole Trail determined that the channel and turning basin at the Port Arthur – Canal site is too narrow and that the potential site is too small to accommodate the proposed project facilities. Therefore, the site was eliminated from further consideration. Creole Trail also determined that the Port Arthur–Pleasure Island site was not commercially available so it was also removed from further consideration.

The two sites on the Calcasieu Ship Channel in Cameron Parish, Louisiana, and the Sabine Pass, Texas site met all of the preliminary criteria above and were carried to the final phase of the site selection process. In this final phase, Creole Trail developed the following five major objectives, each with detailed criteria, to assess the suitability of each site:

- Major Objective No. 1 – Site-Specific Factors

- a. Ease of acquisition – Preference was given to parcels in industrial areas or dredge disposal areas.
 - b. Sufficient area – The selected site must provide sufficient area for the land-based components of the proposed terminal and the marine berth, and provide for the required spacing between equipment and tanks specified by NFPA 59A.
 - c. Infrastructure – The selected site must include a reliable source of power and suitable roads, as well as barge access for delivery of materials during construction.
- Major Objective No. 2 – Marine Operations
 - a. Vessel traffic volume – Sites located in areas with less existing ship traffic were preferred because transit of LNG vessels is subject to certain restrictions that may affect the traffic of other vessels.
 - b. Channel access – The economics of the proposed project would be improved by sites at which LNG vessels could more expeditiously reach the terminal, unload, and depart. A shorter channel transit would also lessen potential effects on existing vessel traffic.
 - c. Maneuvering area amplitude and proximity – Typical LNG vessels require a minimum maneuvering area diameter of 1,200 feet in width and 40 feet in depth; sites offering these maneuvering capabilities in close proximity would be preferred.
- Major Objective No. 3 – Pipeline Access
 - a. Distance to pipeline system – Sites that were proximal to existing pipeline systems would be more favorable.
 - b. Takeaway Capacity – Existing pipeline infrastructure near the sites must have a minimum aggregate capacity available of 3.3 Bcfd and a consistent demand to support the volumes of the proposed project.
- Major Objective No. 4 – Ease of Permitting
 - a. Public perception – Avoiding visibility from residential areas would minimize opposition to development, enabling a less difficult permitting process.
 - b. Environmental consequences – In order to minimize any environmental impact caused by the proposed project, potential sites must be located within a previously disturbed area, including dredge disposal sites, or areas already zoned for development.
 - c. Compatibility with region/port development plans – The site must be compatible with the planned development of adjacent properties.
 - d. Land use zoning – To support the above two criteria, the preferred site must be located within a site zoned for industrial development. A site already zoned for

industrial development would help to ensure that any environmental impacts are confined to previously industrialized areas.

- e. Distance to populated areas – Avoiding populated areas would ensure compliance with the requirements of NFPA 59A and 49 CFR Part 193.
- Major Objective No. 5 – Project Economics
 - a. Capital cost – A relative comparison of anticipated capital costs was developed based on local conditions for each site.
 - b. Operational cost – A relative comparison of anticipated operational costs was developed based on the knowledge of industrial development of each area. In general, it was expected that maintenance contractors and resources would be more available in industrialized areas, which would result in a lower operating expenses.

Creole Trail developed a ranking system to quantify the feasibility of each site. Based on the objectives of the proposed project, Creole Trail developed “weight factors” to reflect the relative importance of each of the major objectives and each detailed criterion to the overall suitability of the site, where higher percentages represented higher importance. Weight factors for the five major objectives ranged from 15 percent for Site Specific Factors and Ease of Permitting, to 25 percent for Marine Operations and Project Economics. Weight factors for the individual criteria within each major objective category ranged from 10 percent (e.g., compatibility with current zoning) to 60 percent (e.g., demand/takeaway capacity). Raw scores ranging from 0 to 6 were then assigned to each criterion on a per site basis, where “6” indicated that the site satisfied the criterion extremely well and “0” indicated that the site did not satisfy the criterion at all. A final numeric representation of the feasibility of each site was then calculated by multiplying the weight factors and raw scores for each criterion, and then adding those results. Based on this analysis, Creole Trail concluded that the two sites located along the Calcasieu Ship Channel in Cameron Parish, Louisiana, were preferable to the Sabine Pass, Texas site.

We evaluated Creole Trail’s site selection process and agree with this conclusion. In comparing the two Cameron Parish sites to the Sabine Pass site, we also noted that the Sabine Pass site would require LNG ships to travel by inland waterway for a distance of about 8 miles, whereas the Calcasieu Pass – North site (Creole Trail’s proposed LNG terminal site) is about 3 miles from the Gulf of Mexico, and the Calcasieu Pass – South site is slightly more than 1 mile from the Gulf. In addition, the Sabine Pass site is in a non-attainment area for air emissions, whereas Cameron Parish is in attainment. The attainment status of the area in which an LNG terminal would be sited would affect permitting and project construction and operating costs. Because there are fewer sources of air emissions in Cameron Parish, the construction of an LNG terminal in Cameron Parish would not likely affect the ambient air quality standards in the area (section 4.11.1).

Creole Trail further compared the North site (the proposed Creole Trail LNG terminal site) and the South site, and found that approximately 70 percent of the south site was wetland, and that they could not be avoided readily if the site were developed. In addition, the South site is bordered to the north by an Omega Protein facility. It has an airstrip that might need to be moved if the South site was developed. Airstrip relocation costs were estimated to be about \$1,000,000, including the cost of land and the removal of the old airstrip. This issue could be a fatal flaw to the South site if Omega Protein were to refuse to abandon or relocate its airstrip. Selection of the South site would also require relocation of a road (LA 27/82), which crosses the site. The estimated 3-mile realignment of LA 27/82 would cost an estimated \$10 million to \$12 million depending on the level of environmental assessment necessary to

comply with NEPA. Lastly, the Calcasieu ship pilot's association expressed strong concern regarding the short stopping distance of approximately 1 mile from the entrance to the Calcasieu Ship Channel to the South site; LNG ship operations would be further limited at the South site by existing marine operations at the adjacent Omega Protein facility. For these reasons, Creole Trail selected the North site as the proposed location for the Creole Trail LNG terminal.

In our environmental review and approval of the Cameron (Hackberry) LNG project (Docket No. CP02-374-000), we evaluated five alternatives to that LNG terminal site, which is along the Calcasieu Ship Channel approximately 15 miles north of the proposed Creole Trail LNG terminal site. One of these alternative sites is the South site discussed in the preceding paragraph (referred to as the Mudd Lake site in the Hackberry EIS). The other four alternative sites are along the Calcasieu Ship Channel or the Calcasieu River Industrial Canal between 14 and 25 miles north of the proposed Creole Trail LNG terminal site. These four alternative sites could offer an environmental advantage over the proposed Creole Trail LNG terminal site by eliminating the need for proposed pipeline Segment 2 to cross Calcasieu Lake. Therefore, we also considered these four sites as potential alternatives to the proposed Creole Trail LNG terminal site.

The Erwin site is about 1 mile north of the town of Hackberry, Louisiana, along the west side of the Calcasieu Ship Channel. The site is small (106-acres) and is bounded to the west by LA 27/82. The site is also occupied by active and abandoned oil and gas wells and associated storage tanks. A wetland survey of this site was not conducted; however, National Wetland Inventory maps indicate the entire parcel was historically estuarine emergent or open-water wetland. The proposed Creole Trail LNG terminal facilities would occupy about 123 acres; therefore, it is very unlikely that the Erwin site could accommodate the proposed terminal even if it were reconfigured. In addition, development of the Erwin site could also require realignment of LA 27/82 at a significant cost to the project. For these reasons, we do not consider the Erwin site to be a viable alternative to the proposed site.

The Hackberry North site is immediately north of the approved Cameron LNG (Hackberry) terminal site. From an environmental impact perspective, development of the North Hackberry site would be comparable to an expansion of the approved Cameron LNG facility which, as discussed in section 3.2.1.1, would not be environmentally preferable to the proposed Creole Trail LNG terminal site. In addition, if we were to select the Hackberry North site and both it and the Cameron LNG terminal were developed, more than 600 LNG ships per year would travel to essentially the same location along the Calcasieu Ship Channel. Therefore, the Hackberry North site is not considered a viable alternative to the proposed site.

The Parish Boundary site is on the west side of the Calcasieu Ship Channel, between the Cameron Parish and Calcasieu Parish boundary, and about one-half mile north of the approved Cameron (Hackberry) LNG terminal site. This alternative site encompasses 132 acres; therefore, it is unlikely that the site could accommodate the proposed terminal, even if it were reconfigured. As with the Hackberry North site, development of both the Cameron LNG project and the Parish Boundary sites would likely create significant marine traffic issues in the area. For these reasons, the Parish Boundary site is not a viable alternative to the LNG terminal site proposed by Creole Trail.

The Industrial Canal site is near the operating Trunkline LNG facility in Calcasieu Parish, about 25 miles north of Creole Trail's proposed LNG terminal site. During the previous assessment of the Industrial Canal site, the Commission was informed by the Port of Lake Charles that the site was unavailable for development. In addition, the 116-acre site would be unlikely to accommodate the proposed terminal, even if it were reconfigured. Due to its size limitations and unavailable status, the Industrial Canal site is not a viable alternative to the proposed site.

3.3.4 Conclusions Regarding Onshore Location Alternatives

The identification and evaluation of potential LNG terminal sites is a complicated process that weighs the relative advantages and disadvantages of individual sites against each other and against the objectives of the proposed project. Creole Trail undertook this process and, based on the project's objectives to deliver new and diverse natural gas reserves to south Louisiana and broader United States markets, focused its search on potential sites in southwestern Louisiana and northeastern Texas, ultimately arriving at the proposed LNG terminal site some 3 miles inland from the Gulf of Mexico. We reviewed Creole Trail's assessment and, in addition, considered a number of other alternatives including ports in Galveston Bay, Texas, and four sites located along the Calcasieu Ship Channel or the Calcasieu River Industrial Canal between 14 and 25 miles north of the proposed Creole Trail LNG terminal site.

Alternative sites along the eastern shore of Calcasieu Lake were not considered because there is no existing shipping channel that could provide LNG ships with access to the eastern shore. The main body of Calcasieu Lake is, on average, about 6 feet deep. Therefore, millions of cubic yards of sediment would need to be dredged to create and maintain a shipping channel that could accommodate LNG ships. Construction and maintenance of such a channel would significantly affect oyster resources and other fisheries in the lake, and the transit of LNG ships across the lake would disrupt other users of the resource.

Based on our analysis, we conclude that there are no practical alternative sites which meet the proposed project objectives and that offer a clear environmental advantage to the proposed Creole Trail LNG terminal site. We also note that, to date, we have received no indication of strong opposition to the proposed site or recommendations for other sites to be considered from the public, agencies, or other stakeholders. Rather, the proposed LNG terminal has received generally strong support from the public and local and state elected officials. As discussed in section 2.1.1, the COE would require replacement of the dredge material disposal capacity of DMPA "O" that would be lost if the site is developed. Potential alternative DMPA sites are described in section 3.5.

3.4 FACILITY LAYOUT ALTERNATIVES

The proposed facility layout was evaluated to ascertain whether changing the proposed location of major components would minimize environmental impacts. The major facility components we considered changing were the locations of the LNG ship berth, the LNG process area, and the LNG storage tanks. Alternatives for these facilities were considered because different locations might reduce the impacts caused by dredging the berth and might reduce the permanent and temporary impacts on wetlands caused by constructing and operating the LNG terminal.

Location alternatives for these major project elements are limited, in large part, by the shape of the proposed site; the physical size of the components; the necessity for the LNG ship berth to connect to the Calcasieu Ship Channel; thermal radiation exclusion zone requirements; and other operational preferences such as locating the LNG storage tanks in close proximity to the process area to minimize the length of cryogenic pipeline.

Based primarily on the shape of the Calcasieu Ship Channel shoreline along the proposed site, the surface elevations of the site near the ship channel, and the size of the proposed berth, we did not identify any alternative berth locations that would significantly reduce the amount of excavation and dredging necessary to create the berth. In addition, the proposed berth location and configuration were designed in consultation with local pilots and confirmed in computer simulations to ensure safe berthing and minimize disruption to other traffic using the ship channel (section 4.12.5). Lastly, based on the distribution and size of existing wetlands at the proposed LNG terminal site (section 4.4.1) and

considering the other factors that limit the location of the berth, LNG process area, and LNG storage tanks, we did not identify any alternative locations for these facilities that would significantly reduce the construction or operational impacts to wetlands.

3.5 DREDGED MATERIAL PLACEMENT AREA ALTERNATIVES

As discussed in section 2.3.1.3, Creole Trail would dredge about 4.1 million yd³ of material during construction of the LNG terminal. The majority of this volume would be generated during construction of the proposed LNG ship berth which would largely occupy COE DMPA “O.”

According to Louisiana Revised Statutes 49:214.30H(1), 49:214.30(H)(2), and 49:214.32(F)(1) (2004), dredged material generated by the Creole Trail Project would have to be put to beneficial use for wetland protection, creation, and/or enhancement. Creole Trail would also be required to comply with the permit conditions attached to the COE’s section 404 permit and the LADEQ’s section 401 permit. Creole Trail is evaluating the potential to combine the beneficial use requirement, necessary wetland mitigation, and replacement of the portion of COE DMPA “O” that would no longer be available into one consolidated mitigation site.

Creole Trail is considering the following alternatives to accomplish its objectives and is coordinating with several federal and state agencies, local authorities, and landowners to select an appropriate site. The sites Creole Trail is considering are depicted on figure 3.5-1. As discussed in section 2.1.1, another site referred to as “Area M” may be exchanged with a portion of DMPA “O” as a result of recent legislation. Area M is a currently approved DMPA for the COE and is located immediately across the Calcasieu River from DMPA “O,” northeast of the proposed LNG terminal site. The resolution for the replacement of DMPA “O” capacity would be determined in coordination with the appropriate agencies and would be included in Creole Trail’s final ARMP. We have recommended in section 4.4.3 that Creole Trail file a copy of the final ARMP with the Secretary for review and written approval by the Director of OEP.

- DMPA Alternative 1 is immediately west of the proposed marine berthing facility on the property that would be leased by Creole Trail. This area could accommodate the lost storage capacity of COE DMPA “O” but would not provide an opportunity for wetland mitigation or an area sufficiently sized to accommodate the dredged material generated from the marine berth. Therefore, Creole Trail does not consider this to be the preferred alternative to meet the overall combined project goals.
- DMPA Alternative 2 is immediately southwest and west of the proposed LNG terminal property in and around Oyster Lake. This area has been suffering from coastal erosion and subsidence and consists primarily of broken marsh and open water, and the landowners have requested restoration. To access this area, a sufficiently sized dredged material pipeline would need to be constructed to the marsh restoration site to allow for transfer of dredged material from the proposed project and to provide permanent dredge material access to the site for the COE. Although wetlands or marsh habitat would be affected by the dredge pipeline installation and the restoration activities, Creole Trail believes that Alternative 2 provides a significant benefit to the environment by restoring the wetland (marsh) functions and values lost by coastal subsidence and erosion. Further, Creole Trail states that this alternative provides a long-term, sustainable location for dredged material placement for both Creole Trail and the COE. This alternative is near the marine terminal and the Calcasieu Ship Channel (1.5 to 2.5 miles west). Alternative 2 is Creole Trail’s preferred alternative and negotiations with the landowners are underway.

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Figure 3.5-1 Dredged Material Placement Area Alternatives

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through the Public Reference Room, or by e-mail at
public.referenceroom@ferc.gov.

- DMPA Alternative 3 is on the east side of the Calcasieu Ship Channel, immediately east and southeast of the East Fork and within and west of the Cameron Prairie National Wildlife Refuge. This area consists of an eroding and subsiding marsh that is dominated primarily by open water with very little emergent vegetation. Creole Trail indicates that the area would be large enough to accommodate the lost portion of COE DMPA “O” and the dredged material from the marine berth. Based on past discussions with the Louisiana resource agencies, this area has been identified as one that the LADWF and FWS would like to see restored and protected. As with Alternative 3, a sufficiently-sized dredged material pipeline would be constructed to the marsh restoration site in a fashion such that it would serve as a permanent dredge material access site for the COE. Creole Trail considers Alternative 3 to be feasible.
- DMPA Alternative 4 is in the nearshore Gulf of Mexico, west of the Calcasieu jetty. This area is an existing dredged material placement area established by the COE for maintenance from the Calcasieu Ship Channel and by Cameron Parish for maintenance material from the original Calcasieu River at the loop around Monkey Island. This area is the preferred option of Cameron Parish. Also, this option would be consistent with the strategic goals of Cameron Parish and the State of Louisiana to continue to protect the beach front, reduce coastal erosion, and to supplement the accretion that is already occurring in this area, and would provide other benefits to the marine ecosystem in the area. This option would need to be combined with other wetland mitigation alternatives to accommodate any wetland mitigation associated with the proposed terminal and/or any other DMPA alternative impacts.
- DMPA Alternative 5 is along the north and west shorelines of the West Cove of Calcasieu Lake. The FWS identified this area as an important shoreline that is eroding and subsiding. The shoreline needs protection to prevent the loss of State Highway 27 to the west and to prevent further loss of coastal marsh. However, the LADWF has indicated that placing dredged material along this shoreline as well as operation of the equipment necessary to construct this option could severely damage the oysters and finfish fisheries in the lake. Based on LADWF comments, Creole Trail does not consider this to be a viable option.
- DMPA Alternative 6 is within Black Lake. This alternative was also recommended by the FWS as a beneficial use area. Although this alternative would meet the beneficial use criteria for the dredged material, it is more than 13 miles north of the marine berth dredging activities which Creole Trail believes places it outside the feasible limits of pumping dredge material for beneficial uses. Therefore, Creole Trail does not consider this to be a feasible alternative.

Creole Trail is continuing to work with the appropriate agencies, officials, and landowners to develop an acceptable plan to accomplish the proposed dredging at the LNG terminal site while satisfying the beneficial use requirement, necessary wetland mitigation, and replacement of the portion of COE DMPA “O” that would be lost by construction of the proposed berth. Through this process, Creole Trail will develop a final ARMP in which it will include a plan to meet the above objectives and to support its application for the COE Section 404 permit, LADEQ Section 401 permit, and LADNR Coastal Use Permit. See section 4.4.3 for further information about the ARMP and the potential DMPA sites.

3.6 PIPELINE ALTERNATIVES

3.6.1 System Alternatives

System alternatives are those that could replace all or part of the proposed Creole Trail pipelines by making use of existing or proposed natural gas pipeline facilities. Our analysis of pipeline system alternatives included examination of the use of existing pipeline systems, as well as approved and proposed pipeline systems associated with other LNG projects in the area, to meet the objectives of the proposed Creole Trail pipelines. These objectives include the transportation of up to 3.3 Bcfd of vaporized LNG from the proposed terminal to multiple existing interstate and intrastate pipeline connections in southwest Louisiana.

3.6.1.1 Use of Existing Pipeline Systems

In contrast to traditional natural gas production areas which typically cover a large geographic footprint, LNG receipt terminals represent a point source of high volumes of natural gas supply. Existing pipelines in the immediate vicinity of the proposed Creole Trail LNG terminal are, for the most part, characterized as gathering systems designed to bring offshore production into centralized processing hubs for eventual delivery into mainline transmission systems. Rather than interconnect at locations within the traditional field gathering portions of the existing pipeline infrastructure, Creole Trail has proposed interconnections primarily on the mainline portions of the existing transmission systems. These planned interconnections generally occur downstream of existing compression and/or pipeline capacity constraints, and represent connectivity with over 12 Bcfd of market access. This ability to connect to multiple pipelines is important in that it increases the overall system reliability and deliverability to the markets. Given the current nature and original design purpose of this existing gathering infrastructure, no single existing pipeline system in southwest Louisiana has sufficient design capacity to transport the 3.3 Bcfd of regasified LNG from the proposed LNG terminal location. Therefore we conducted no further evaluation of existing pipeline systems as alternatives to the proposed pipelines.

3.6.1.2 Use of Approved or Proposed Pipeline Systems

As discussed previously, there are four onshore LNG terminal projects in the general Creole Trail Project vicinity that have either been approved (Sabine Pass LNG, Golden Pass LNG, Cameron LNG) or proposed (Port Arthur LNG). In addition, there are two offshore LNG projects in the vicinity that have either been approved (Gulf Landing LNG) or proposed (Beacon Port LNG). All of these projects include construction and operation of new onshore pipelines for transportation to connect with existing interstate transport facilities.

In addition, Kinder Morgan Louisiana Pipeline, LLC (Kinder Morgan) recently filed a Pre-filing request with the FERC to construct and operate a new pipeline system. Based on the general information that is currently available, the project would involve construction of a total of about 140 miles of 24- to 42-inch-diameter pipeline extending from the Sabine Pass LNG terminal, which is under construction in southwestern Cameron Parish, Louisiana, to various delivery points in Cameron, Calcasieu, Jefferson Davis, Acadia, and Evangeline Parishes of southern Louisiana. The proposed project would provide a peak send-out capacity of not less than about 3.4 Bcfd.

All of these systems have been designed to transport the volumes of natural gas from their respective terminals, and the Kinder Morgan project would transport gas from the Sabine Pass LNG terminal. To transport the additional 3.3 Bcfd proposed by Creole Trail, these systems would require significant modification, including either construction of additional pipelines, larger diameter pipelines, additional looping, or compression, which would result in the same or greater levels of environmental

impact as the proposed action. Further, it may not be possible for the existing pipelines along the routes of the approved or proposed pipelines to accept the added 3.3 Bcfd at their various proposed interconnect locations. Therefore, we did not further consider the use of pipelines associated with approved or proposed LNG projects in the area as alternatives to the proposed Creole Trail pipelines.

3.6.2 Route Alternatives

In evaluating pipeline alternatives, we reviewed both route alternatives and route variations. Route alternatives generally follow a different alignment for a significant portion of the proposed route, whereas route variations are typically slight deviations from the proposed route considered to avoid or reduce project impacts on specific, localized resources that may include cultural resource sites, residences, sensitive habitats, or site-specific terrain conditions.

In its route alternatives analysis, Creole Trail used aerial photography, topographic relief maps, National Wetland Inventory (NWI) maps, and U.S. Geological Survey (USGS) quadrangle maps in an effort to identify a proposed pipeline alignment that minimizes environmental impacts while meeting the project objectives. Creole Trail also met with federal and state resource and regulatory agencies to identify and review potential pipeline route variations. This process identified five routes that were considered as alternatives to parts of proposed Segment 2, and three routes that were considered as alternatives to parts of proposed Segment 3. The route alternatives are discussed in the following sections and depicted on figures 3.6.2-1 through 3.6.2-4. Nine route variations identified by Creole Trail in an August 31, 2005 supplemental filing are discussed in section 3.6.3.

Various criteria were considered in evaluating whether or not the route alternatives were environmentally preferable to the proposed route. These criteria included: the length of each alternative and associated amount of land disturbance for construction; the length adjacent to existing right-of-way; the amount of wetlands and open water that would be affected; the number of perennial streams and Natural and Scenic Streams that would be crossed; the length of construction in the National Wildlife Refuges; the number of other recreational or designated land use crossings; the number of residences within 50 feet of the construction work area; and the number of threatened or endangered species that occur in the area. These criteria are compared between each alternative and its corresponding section of the proposed pipeline routes on tables 3.6.2-1 through 3.6.2-8.

3.6.2.1 Segment 2 Route Alternatives

Alternative 1 (Segment 2 MP 0.0 – MP 3.8)

Alternative 1 would involve a 5.8-mile-long deviation from Creole Trail's proposed route (see figure 3.6.2-1). Alternative 1 was examined because of its potential to allow for a perpendicular approach to Calcasieu Lake and to minimize impacts in the vicinity of the existing jetty structure. Alternative 1 would originate at the proposed Creole Trail LNG terminal and travel east crossing the Calcasieu Ship Channel, where it would extend approximately 3.2 miles. At this point, Alternative 1 would turn north and cross approximately 0.9 mile of the Cameron Prairie National Wildlife Refuge before entering Calcasieu Lake and converging with the proposed route near MP 3.8 of Segment 2.

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Figure 3.6.2-1 Segment 2 Route Alternatives 1 - 5

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Table 3.6.2-1 compares the impacts of Alternative 1 to the corresponding section of the proposed route. Because it is approximately 2.0 miles longer, Alternative 1 would require about 32.7 more acres of construction right-of-way than the corresponding section of Segment 2, and would affect about 62.0 more acres of wetland than the corresponding section. Due to its direct approach to the south shore of Calcasieu Lake, Alternative 1 would cross about 0.4 fewer mile of open water than its corresponding section of the proposed route, thereby reducing the total length of open water construction in Calcasieu Lake from 17.2 miles to 16.8 miles. Alternative 1 would parallel existing right-of-way for about 2.5 miles, or 43 percent of its length, whereas the corresponding section of Segment 2 would parallel existing right-of-way for about 1.0 mile, or 26 percent of its length.

Environmental Factor	Proposed Route	Alternative 1
Total Length (miles)	3.8	5.8
Acres Disturbed for Construction ^a	62.2	94.9
Length Adjacent to Existing Rights-of-Way (miles)	1.0	2.5
Acres of Wetlands Disturbed ^b	16.7	78.7
Waterbody Crossings (no.) ^c	3	4
Natural and Scenic Streams Crossed (no.)	0	0
Length in Open Water (Calcasieu Lake) (miles)	1.1	0.7
Length in National Wildlife Refuge (miles)	0.0	0.9
Other Recreational/Designated Land Use Crossings (no.)	0	0
Residences within 50 feet of Construction Work Area ^d	0	0
Threatened or Endangered Species ^e	11	11

^a Based on a 135-foot-wide construction right-of-way in all areas, including wetlands.
^b Proposed route based on field surveys; alternative route estimated from National Wetland Inventory Map data.
^c Based on 1:24,000 U.S. Geological Survey topographic maps.
^d Proposed route based on field surveys; alternative route estimated from aerial photography.
^e Based on FWS consultations for the proposed route. See section 4.7 for a discussion of threatened and endangered species.

Alternative 1 would cross four waterbodies, or one more than the proposed route. None of the waterbodies that Alternative 1 or the proposed route would cross are listed as natural or scenic streams. An important difference between Alternative 1 and the proposed route is that Alternative 1 would cross about 0.9 mile of the Cameron Prairie National Wildlife Refuge whereas the corresponding section of Segment 2 would avoid the Cameron Prairie National Wildlife Refuge. Neither the proposed route nor Alternative 1 would cross any other identified recreational or special land use areas and neither route would be within 50 feet of any residence.

Eleven federally listed threatened or endangered species potentially occur in the area of the proposed route. Due to its proximity to the proposed route, the same threatened or endangered species could potentially occur in the area of Alternative 1 and would be similarly affected by either the alternative or the proposed route.

The FWS has stated that it would not permit pipeline construction across National Wildlife Refuges based on Department of Interior guidance. Therefore, while Alternative 1 would reduce the impact to Calcasieu Lake and would parallel more existing right-of-way, the FWS policy and the increased impact to wetlands of Alternative 1 lead us to conclude that Alternative 1 is not reasonable.

Alternative 2 (Segment 2 MP 0.0 – MP 7.8)

Alternative 2 would be an approximate 6.7-mile-long deviation from the proposed route that would extend northeast from the proposed LNG terminal, cross the Calcasieu Ship Channel and St. Johns Island prior to entering Calcasieu Lake, and converge with the proposed route near MP 7.8 of Segment 2 (see figure 3.6.2-1).

Alternative 2 would be about 1.1 miles shorter than the 7.8-mile-long corresponding section of Segment 2, but would increase the length of open water construction in Calcasieu Lake by approximately 0.2 mile. Because it is shorter, Alternative 2 would require about 18 fewer acres of construction right-of-way than the corresponding section of Segment 2 (see table 3.6.2-2). However, construction of Alternative 2 would affect about 76.1 more acres of wetland than the corresponding section of the Segment 2 route. Further, Alternative 2 would cross the Calcasieu Ship Channel diagonally whereas the proposed route would cross the channel at a perpendicular angle and parallel to existing pipeline rights-of-way. The proposed route would parallel existing right-of-way for about 1.0 mile, whereas Alternative 2 would not parallel existing right-of-way.

Environmental Factor	Proposed Route	Alternative 2
Total Length (miles)	7.8	6.7
Acres Disturbed for Construction ^a	127.6	109.6
Length Adjacent to Existing Rights-of-Way (miles)	1.0	0.0
Acres of Wetlands Disturbed ^b	16.7	92.8
Waterbody Crossings (no.) ^c	3	2
Natural and Scenic Streams Crossed (no.)	0	0
Length in Open Water (Calcasieu Lake) (miles)	4.8	5.0
Length in National Wildlife Refuge (miles)	0.0	0.0
Other Recreational/Designated Land Use Crossings (no.)	0	0
Residences within 50 feet of Construction Work Area ^d	0	0
Threatened or Endangered Species ^e	11	11

^a Based on a 135-foot-wide construction right-of-way in all areas, including wetlands.
^b Proposed route based on field surveys; alternative route estimated from National Wetland Inventory Map data.
^c Based on 1:24,000 U.S. Geological Survey topographic maps.
^d Proposed route based on field surveys; alternative route estimated from aerial photography.
^e Based on FWS consultations for the proposed route. See section 4.7 for a discussion of threatened and endangered species.

Alternative 2 would cross two waterbodies, or one less than the proposed route. None of the waterbodies that Alternative 2 or the proposed route would cross are listed as natural or scenic streams. Neither the proposed route nor Alternative 2 would cross a National Wildlife Refuge or other identified recreational or special land use area. Neither route would be within 50 feet of any residence.

Eleven federally listed threatened or endangered species potentially occur in the area of the proposed route. Due to its proximity to the proposed route, the same threatened or endangered species could potentially occur in the area of Alternative 2 and would be similarly affected by either the alternative or the proposed route.

Creole Trail initially examined Alternative 2 as the preferred route. However, because Alternative 2 would cross a portion of the lake considered one of the most significant oyster utilization

areas in all of Calcasieu Lake and based on user group and agency preferences as provided to Creole Trail, Creole Trail shifted the proposed route to its current location. In its comments on the draft EIS, the LADWF reiterated its position that this alternative is not acceptable due to the significant impacts it would have on the oyster grounds of Calcasieu Lake. Considering that the currently proposed route would affect fewer areas of significant oyster utilization and fewer acres of wetlands, and would result in a perpendicular crossing of the Calcasieu Ship Channel parallel to existing pipeline rights-of-way, we conclude that Alternative 2 is not preferable to the corresponding section of proposed Segment 2.

Alternative 3 (Segment 2 MP 0.0 – Segment 3 MP 1.4)

Prior to the removal of the Hackberry Lateral from the project, Alternative 3 was proposed as a 25.6-mile-long deviation that would originate at the Creole Trail LNG terminal site, interconnect with the Dominion Hackberry Salt Dome Storage Caverns, and then tie back into the proposed pipeline route near MP 1.4 of Segment 3 (see figure 3.6.2-1). Although the Hackberry Lateral and connection to the proposed Dominion Hackberry Salt Dome Storage Caverns have been withdrawn from the project, Alternative 3 was still evaluated as an alternative to the corresponding portions of Segments 2 and 3.

Alternative 3 would extend northward from the proposed LNG terminal site, parallel to the west of the Calcasieu Ship Channel and an existing abandoned brine line. The route would cross the West Fork and St. Johns Island. After 1.2 miles, Alternative 3 would cross the West Cove of Calcasieu Lake, requiring an open water crossing for about 3.7 miles. Once the route exits the West Cove of Calcasieu Lake, it would cross the Sabine National Wildlife Refuge for approximately 1.4 miles. Then it would continue west-northwest for about 6.6 miles, crossing State Highway 27, then a network of drainage channels to Black Lake. From the storage caverns the route would extend across about 1.1 miles of Black Lake before turning north and continuing for an additional 8.3 miles to the intersection with the proposed route near MP 1.4 of Segment 3.

The greatest advantage of Alternative 3 would be the reduction of impacts on Calcasieu Lake (see table 3.6.2-3). By avoiding the main body of Calcasieu Lake, Alternative 3 would cross only 4.9 miles of open water compared to 17.1 miles of open water for the proposed route. Alternative 3 would be about 1.1 mile shorter and would disturb about 18 fewer acres during construction than the proposed route. Alternative 3 would also parallel existing right-of-way for about 5.2 miles whereas the corresponding section of the proposed route would parallel existing right-of-way for about 1.0 mile.

Because a relatively larger portion of Alternative 3 would be constructed on land versus the corresponding open water construction of the proposed route, Alternative 3 would affect about 246.5 more acres of wetland and would cross 20 more waterbodies than the proposed route. None of the waterbodies that Alternative 3 or the proposed route would cross are listed as natural or scenic streams. Both the proposed route and Alternative 3 would cross the Gulf Intracoastal Waterway. Creole Trail proposes to construct its proposed route across the Gulf Intracoastal Waterway using the HDD method. An HDD of approximately the same length as the proposed HDD might also be feasible to cross the Gulf Intracoastal Waterway along the alternative route. Based on aerial photographs, topographic maps, and NWI maps, the land requirements and environmental impacts for the HDD along the alternative route would likely be similar to those associated with the proposed route.

TABLE 3.6.2-3

Environmental Comparison of Alternative 3 and the Proposed Creole Trail Pipeline Route

Environmental Factor	Proposed Route	Alternative 3
Total Length (miles)	26.7	25.6
Acres Disturbed for Construction ^a	436.9	418.9
Length Adjacent to Existing Rights-of-Way (miles)	1.0	5.2
Acres of Wetlands Disturbed ^b	36.4	282.9
Waterbody Crossings (no.) ^c	6	26
Natural and Scenic Streams Crossed (no.)	0	0
Length in Open Water (Calcasieu Lake and Black Lake) (miles)	17.1	4.9
Length in National Wildlife Refuge (miles)	0.0	1.4
Other Recreational/Designated Land Use Crossings (no.) ^d	1	1
Residences within 50 feet of Construction Work Area ^e	0	4
Threatened or Endangered Species ^f	12	12

^a Based on a 135-foot-wide construction right-of-way in all areas, including wetlands.

^b Proposed route based on field surveys; alternative route estimated from National Wetland Inventory Map data.

^c Based on 1:24,000 U.S. Geological Survey topographic maps.

^d Both the proposed route and Alternative 3 would cross the Creole Nature Trail National Scenic Byway.

^e Proposed route based on field surveys; alternative route estimated from aerial photography.

^f Based on FWS consultations for the proposed route. See section 4.7 for a discussion of threatened and endangered species.

Alternative 3 would cross about 1.4 mile of the Sabine National Wildlife Refuge whereas the corresponding section of Segment 2 would avoid the refuge. Both routes would cross Creole Trail National Scenic Byway. We reviewed aerial photographs and determined that Alternative 3 would be within 50 feet of four residences. Based on field surveys by Creole Trail, the corresponding section of Segment 2 would not be within 50 feet of any residence.

Twelve federally listed threatened or endangered species potentially occur in the area of the proposed route. Due to its proximity to the proposed route, the same threatened or endangered species could potentially occur in the area of Alternative 3 and would be similarly affected by either the alternative or the proposed route.

Alternative 3 would reduce impacts to Calcasieu Lake. However, Creole Trail was informed during meetings with federal and state resource and regulatory agencies that Alternative 3 was not environmentally preferable for the following reasons:

- Wetlands between West Cove and the previously-proposed interconnection to the Dominion Hackberry Salt Dome Storage Caverns are in distress and would not likely recover from impacts associated with pipeline construction;
- Alternative 3 would affect Black Lake and its associated wetlands, which are also sensitive. Black Lake wetlands are part of an ongoing wetland restoration effort and the pipeline would negatively affect those restoration activities;
- Alternative 3 would affect substantial oyster reefs and fisheries in West Cove; and
- FWS stated that it would not approve the alternative based on its internal guidance to not permit pipelines across National Wildlife Refuges.

For the reasons discussed above, we do not find Alternative 3 to be a reasonable alternative to the corresponding segment of the proposed route. We also note that in its comments on the draft EIS, the LADWF reiterated its position that this alternative is not acceptable due to the significant impacts it would have on oyster grounds.

Alternative 4 (Segment 2 MP 18.6 – Segment 3 MP 1.4)

Alternative 4 would be an approximate 10.8-mile-long deviation from Creole Trail’s proposed route. Alternative 4 would originate near MP 18.6 of Segment 2, in the open waters of Calcasieu Lake, and extend westward about 4.5 miles, crossing a designated dredge spoil area on the west side of the Calcasieu Ship Channel. After crossing State Highway 27 (a Scenic Byway), Alternative 4 would continue westward paralleling the Gulf Intracoastal Waterway along its south side. At this point, Alternative 4 would turn northward and cross the Gulf Intracoastal Waterway. It would continue about 6.3 miles to converge with the proposed pipeline route near MP 1.4 of Segment 3 (see figure 3.6.2-1). Creole Trail primarily evaluated this alternative because of the potential to collocate the proposed Creole Trail pipelines with the approved Cameron LNG pipeline. Alternative 4 would parallel existing pipeline right-of-way for about 5.6 miles whereas none of the corresponding section of the proposed route would parallel existing right-of-way.

Alternative 4 would be about 2.6 miles longer than the corresponding section of the proposed route but would decrease the length of open water construction in Calcasieu Lake by about 0.6 mile. Due to this increased pipeline length, Alternative 4 would require 42.5 more acres of construction right-of-way compared to the proposed route (see table 3.6.2-4). Alternative 4 would affect 49.2 more acres of wetland and cross a well-established wetland drainage network associated with Bayou Choupique. An additional HDD would also be required to avoid impacts on Bayou Choupique. This HDD would have additional land requirements for workspaces and would probably affect more wetlands.

Environmental Factor	Proposed Route	Alternative 4
Total Length (miles)	8.2	10.8
Acres Disturbed for Construction ^a	134.2	176.7
Length Adjacent to Existing Rights-of-Way (miles)	0.0	5.6
Acres of Wetlands Disturbed ^b	19.6	68.8
Waterbody Crossings (no.) ^c	3	10
Natural and Scenic Streams Crossed (no.)	0	0
Length in Open Water (Calcasieu Lake and Mud Lake) (miles)	1.3	0.7
Length in National Wildlife Refuge (miles)	0.0	0.0
Other Recreational/Designated Land Use Crossings (no.) ^d	1	1
Residences within 50 feet of Construction Work Area ^e	0	1
Threatened or Endangered Species ^f	2	2

^a Based on a 135-foot-wide construction right-of-way in all areas, including wetlands.
^b Proposed route based on field surveys; alternative route estimated from National Wetland Inventory Map data.
^c Based on 1:24,000 U.S. Geological Survey topographic maps.
^d Both the proposed route and Alternative 4 would cross the Creole Nature Trail National Scenic Byway.
^e Proposed route based on field surveys; alternative route estimated from aerial photography.
^f Based on FWS consultations for the proposed route. See section 4.7 for a discussion of threatened and endangered species.

Both the proposed route and Alternative 4 would cross the Gulf Intracoastal Waterway. Creole Trail proposes to construct its proposed route across the Gulf Intracoastal Waterway using the HDD

method. An HDD of approximately the same length as the proposed HDD might also be feasible to cross the Gulf Intracoastal Waterway along the alternative route. Based on aerial photographs, topographic maps, and NWI maps, the land requirements and environmental impacts for the HDD along the alternative route would likely be similar to those associated with the proposed route.

Alternative 4 would cross 10 waterbodies whereas the proposed route would cross 3 waterbodies. None of the waterbodies that Alternative 4 or the proposed route would cross are listed as natural or scenic streams. Neither the proposed route nor Alternative 4 would cross a National Wildlife Refuge although each would cross the Creole Trail National Scenic Byway. Based on aerial photographs, no residences would be within 50 feet of the proposed route, but one residence would be within 50 feet of Alternative 4.

Two federally listed threatened or endangered species potentially occur in the area of the proposed route. Due to its proximity to the proposed route, the same two threatened or endangered species could potentially occur in the area of Alternative 4 and would be similarly affected by either the alternative or the proposed route.

Alternative 4 would parallel the proposed sendout pipeline associated with the Cameron LNG facility and would cross the LNG terminal property. When evaluating this alternative with respect to the placement of the Cameron LNG terminal and pipeline facilities, Creole Trail concluded that there was physically not enough land or room to safely and efficiently parallel or cross the Cameron LNG facilities.

Although Alternative 4 would reduce impacts to Calcasieu Lake, it would be 2.6 miles longer than the proposed route, would result in overall increased environmental impact on the wetland resources in the region, and would be within 50 feet of a residence. For these reasons and in consideration of Creole Trail's safety concerns, we conclude that Alternative 4 is not preferable to the corresponding section of the proposed pipeline route.

Alternative 5 (Segment 2 MP 19.7 – MP 21.7)

Alternative 5 would originate in the open waters of Calcasieu Lake just south of Choupique Island near MP 19.7 of Segment 2 and extend northward across the western edge of Choupique Island for about 1.4 miles. The alternative would then turn westward for approximately 1.4 miles, crossing the Calcasieu Ship Channel to converge with the proposed pipeline route near MP 21.7 of Segment 2 (see figure 3.6.2-1).

Alternative 5 would be about 0.8 mile longer than the corresponding section of the proposed route and would increase the length of open water construction in Calcasieu Lake by about 0.1 mile. Due to this increased pipeline length, Alternative 5 would require about 13.1 acres of additional construction right-of-way than the proposed route (see table 3.6.2-5). Alternative 5 and the proposed route would each cross one waterbody, neither of which is listed as natural or scenic streams. Neither the proposed route nor Alternative 2 would cross a National Wildlife Refuge or other listed recreational or designated land use area. Neither route would be within 50 feet of any residence.

Wetland impacts on Choupique Island could be reduced by constructing Alternative 5 on uplands created by historic dredge material disposal. However, based on NWI maps, Alternative 5 would affect approximately 23.5 more acres of wetland than the corresponding section of Segment 2. Based on aerial photography, crossing Choupique Island may also affect upland trees and shrubs, potentially increasing impacts on wildlife resources. Pipeline construction along the western edge of Choupique Island could also potentially affect tidal fringe wetlands; these communities may be considered essential fish habitat by NOAA Fisheries. Further, Creole Trail was informed by the COE that a pipeline constructed along

Alternative 5 might have to be buried to a depth up to 10 feet on Choupique Island to ensure that the pipeline would not be affected if the area was utilized for dredge material placement in the future.

Environmental Factor	Proposed Route	Alternative 5
Total Length (miles)	2.0	2.8
Acres Disturbed for Construction ^a	32.7	45.8
Length Adjacent to Existing Rights-of-Way (miles)	0.0	0.0
Acres of Wetlands Disturbed ^b	12.6	36.1
Waterbody Crossings (no.) ^c	1	1
Natural and Scenic Streams Crossed (no.)	0	0
Length in Open Water (Calcasieu Lake and Mud Lake) (miles)	0.4	0.5
Length in National Wildlife Refuge (miles)	0.0	0.0
Other Recreational/Designated Land Use Crossings (no.)	0	0
Residences within 50 feet of Construction Work Area ^d	0	0
Threatened or Endangered Species ^e	2	2
Cultural Resource Sites	0	3

^a Based on a 135-foot-wide construction right-of-way in all areas, including wetlands.
^b Proposed route based on field surveys; alternative route estimated from National Wetland Inventory Map data.
^c Based on 1:24,000 U.S. Geological Survey topographic maps.
^d Proposed route based on field surveys; alternative route estimated from aerial photography.
^e Based on FWS consultations for the proposed route. See section 4.7 for a discussion of threatened and endangered species.

Two federally listed threatened or endangered species potentially occur in the area of the proposed route. Due to its proximity to the proposed route, the same two threatened or endangered species could potentially occur in the area of Alternative 5 and would be similarly affected by either the alternative or the proposed route.

Archival record search and consultation determined that three cultural resource sites would likely be affected by construction of Alternative 5. The corresponding section of Segment 2 would avoid three different cultural resource sites by HDD.

In summary, we do not believe that Alternative 5 presents an environmental advantage over the corresponding section of Segment 2 and, in fact, may result in greater environmental impact to the region due to construction across Choupique Island. Therefore, we do not consider Alternative 5 to be an environmentally preferable alternative to the proposed route.

3.6.2.2 Segment 3 Route Alternatives

Alternative 6 (Segment 3 MP 15.5 – MP 26.3)

Alternative 6 would be an approximate 10.7-mile-long deviation from proposed pipeline Segment 3. Alternative 6 would originate near MP 15.5 of Segment 3 and extend northeasterly until rejoining the proposed route near MP 26.3 (see figure 3.6.2-2). Alternative 6 was considered because it would parallel the approved Cameron LNG pipeline route as well as the proposed Port Arthur LNG and Liberty pipelines. If the Port Arthur and Liberty pipelines are constructed, Alternative 6 would be collocated with existing right-of-way for its entire length (10.7 miles), compared to about 3.4 miles of the corresponding

section of the proposed route. Alternative 6 would be approximately 0.1 mile shorter than the corresponding section of Segment 3 but would affect about 2.8 more acres of wetlands than the proposed route (see table 3.6.2-6). Neither Alternative 6 nor the proposed route would cross open water or a National Wildlife Refuge. Alternative 6 would be within 50 feet of one residence whereas the proposed route would not be within 50 feet of any residence.

Environmental Factor	Proposed Route	Alternative 6
Total Length (miles)	10.8	10.7
Acres Disturbed for Construction ^a	176.7	175.1
Length Adjacent to Existing Rights-of-Way (miles)	3.4	10.7
Acres of Wetlands Disturbed ^b	5.5	8.3
Waterbody Crossings (no.) ^c	22	10
Natural and Scenic Streams Crossed (no.) ^d	0	0
Length in Open Water (miles)	0.0	0.0
Length in National Wildlife Refuge (miles)	0.0	0.0
Other Recreational/Designated Land Use Crossings (no.) ^e	0	1
Residences within 50 feet of Construction Work Area ^f	0	1
Threatened or Endangered Species ^g	2	2

^a Based on a 135-foot-wide construction right-of-way in all areas, including wetlands.
^b Proposed route based on field surveys; alternative route estimated from National Wetland Inventory Map data.
^c Based on 1:24,000 U.S. Geological Survey topographic maps.
^d Alternative 6 would cross the Beckwith Branch and the Hickory Branch of the West Fork of the Calcasieu River, both of which have been proposed to be listed as state scenic streams.
^e Alternative 6 would crossing the Crown Point Distinctive Area.
^f Proposed route based on field surveys; alternative route estimated from aerial photography.
^g Based on FWS consultations for the proposed route. See section 4.7 for a discussion of threatened and endangered species.

The proposed route would cross 12 more waterbodies than Alternative 6. None of the waterbodies that would be crossed by Alternative 6 or the proposed route are currently listed as natural or scenic streams. However, during evaluation of this alternative, Creole Trail was informed by the LADWF, Natural and Scenic Stream Division, that Beckwith Branch and Hickory Branch of the West Fork of the Calcasieu River have been proposed to be listed as state scenic streams (although they have not been confirmed as scenic streams for 2005). Alternative 6 would cross both the Beckwith Branch and Hickory Branch, whereas Creole Trail's proposed route would cross only the West Fork of the Calcasieu River below the confluence of the Beckwith and Hickory Branches.

Additionally, Alternative 6 (and the other approved or proposed pipelines) would cross the Crown Point Distinctive Area, which would not be crossed by the proposed route. Although this area is not a state or federal management area, it is a natural area under special management that could be avoided. If Alternative 6 were used, then the proposed dual 42-inch-diameter Creole Trail pipelines would be collocated with three other pipelines through this natural area.

Two federally listed threatened or endangered species potentially occur in the area of the proposed route. Due to its proximity to the proposed route, the same two threatened or endangered species could potentially occur in the area of Alternative 6 and would be similarly affected by either the alternative or the proposed route.

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Figure 3.6.2-2 Segment 3 Route Alternative 6

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Overall, while Alternative 6 would be slightly shorter than the proposed route, the proposed route would have fewer impacts on wetlands, would avoid the potential scenic streams and the Crown Point Distinctive Area, would reduce impacts on existing residences, and would have one less major waterbody crossing. The benefits associated with reducing the pipeline length by 0.1 mile do not outweigh the benefits of reduced impacts on the identified resources along the proposed route. Therefore, we do not find Alternative 6 to be a preferable alternative.

Alternative 7 (Segment 3 MP 32.6 – MP 49.9)

Alternative 7 would be a 15.7-mile-long deviation originating near MP 32.6 of Segment 3 and extending easterly until converging with the proposed route near MP 49.9 (see figure 3.6.2-3). Alternative 7 was examined because it would be about 1.6 mile shorter than the corresponding section of Segment 3.

Both the proposed route and Alternative 7 would parallel existing right-of-way for a substantial portion of their length. Alternative 7 would parallel an existing electric transmission line and a roadway for approximately 14 miles, or 89 percent of the route. The corresponding section of the proposed route would parallel existing pipeline right-of-way for about 14.8 of the 17.3 miles, or for about 85 percent of the route. Neither route would involve open water construction (see table 3.6.2-7).

Environmental Factor	Proposed Route	Alternative 7
Total Length (miles)	17.3	15.7
Acres Disturbed for Construction ^a	283.1	256.9
Length Adjacent to Existing Rights-of-Way (miles)	14.8	14.0
Acres of Wetlands Disturbed ^b	16.4	23.7
Waterbody Crossings (no.) ^c	24	35
Natural and Scenic Streams Crossed (no.) ^d	2	2
Length in Open Water (miles)	0.0	0.0
Length in National Wildlife Refuge (miles)	0.0	0.0
Other Recreational/Designated Land Use Crossings (no.) ^e	1	1
Residences within 50 feet of Construction Work Area ^f	2	3
Threatened or Endangered Species ^g	2	2

^a Based on a 135-foot-wide construction right-of-way in all areas, including wetlands.
^b Proposed route based on field surveys; alternative route estimated from National Wetland Inventory Map data.
^c Based on 1:24,000 U.S. Geological Survey topographic maps.
^d Both the proposed route and Alternative 7 would cross Barnes Creek and Calcasieu River, Natural and Scenic Rivers.
^e The proposed route would cross the Barnes Creek Savannah Natural Area. Alternative 7 would cross the Nature Conservancy's CC Road Savannah Preserve.
^f Proposed route based on field surveys; alternative route estimated from aerial photography.
^g Based on FWS consultations for the proposed route. See section 4.7 for a discussion of threatened and endangered species.

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Figure 3.6.2-3 Segment 3 Route Alternative 7

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Because it would be shorter, Alternative 7 would disturb about 26.2 fewer acres than the proposed route. However, Alternative 7 would affect 7.3 more acres of wetland than the proposed route. Most of the affected wetland would be forested wetland. Alternative 7 would also cross 11 more waterbodies than the proposed route. Both the proposed and alternative routes would cross Barnes Creek and the Calcasieu River, both of which are designated by the LADWF as natural and scenic rivers. Creole Trail proposes to construct its proposed route across both of these waterbodies using the HDD method. As proposed, each HDD would require two 3,000 square foot ATWS in forested uplands. Based on aerial photographs, topographic maps, and NWI maps, HDDs of approximately the same length as the proposed HDDs might also be feasible to cross the waterbodies along the alternative route. The land requirements and environmental impacts for HDDs along the alternative route would likely be similar to those associated with the proposed route.

Two federally listed threatened or endangered species potentially occur in the area of the proposed route. Due to its proximity to the proposed route, the same two threatened or endangered species could potentially occur in the area of Alternative 7 and would be similarly affected by either the alternative or the proposed route. Both Alternative 7 and the proposed route would cross an area that is known to provide potential habitat for the federally listed red-cockaded woodpecker. Creole Trail has conducted surveys on accessible tracts along the proposed route and has not found any tree cavities that might be used for nesting. However, regardless of whether Alternative 7 or the corresponding portion of the proposed route were constructed, additional surveys and FWS consultation would be required to evaluate the potential impact project construction might have on the red-cockaded woodpecker and its habitat. See section 4.7.1 for further discussion of this issue.

Neither Alternative 7 nor the corresponding section of Segment 3 would cross a National Wildlife Refuge. However, both routes would cross designated natural areas. As discussed further in section 4.8.3.5, proposed Segment 3 would cross the Barnes Creek Savannah Natural Area between MPs 36.1 and 36.5. Segment 3 would be adjacent to an existing pipeline right-of-way for the length of its crossing through this natural area. The designated natural area is not a single, contiguous property tract, but rather comprises several tracts in the same general area owned by a single landowner. As envisioned by Creole Trail, Alternative 7 would be constructed south of the existing powerline that it would parallel and would not cross any portion of this natural area. However, Alternative 7 would cross about 0.3 mile of the Nature Conservancy's CC Road Savannah Preserve, just to the south of the Barnes Creek Savannah Natural Area. Alternative 7 would be adjacent to an existing power line right-of-way for the length of its crossing through this natural area. The impacts of constructing the Creole Trail Pipeline through either of the natural areas would be comparable and would be minimized by constructing parallel to existing rights-of-way.

In summary, Alternative 7 would be shorter than the corresponding segment of the proposed route. However, the alternative would affect more forested wetland, would require an additional 11 waterbody crossings, and would be within 50 feet of 1 more residence than the proposed route. As a result, we conclude that Alternative 7 is not preferable to the corresponding section of the proposed route.

Alternative 8 (Segment 3 MP 40.2 – MP 76.4)

Alternative 8 would originate near MP 40.2 of Segment 3 west of the Calcasieu River and extend eastward for about 31.9 miles, paralleling a Transco pipeline right-of-way, and then turn south for 6.9 miles to converge with Segment 3 near MP 76.4 (see figure 3.6.2-4). The total length of the Alternative 8 deviation is about 38.8 miles, about 2.6 miles longer than the corresponding length of Segment 3. Alternative 8 was examined for its potential to maximize the use of the existing Transco right-of-way, thereby reducing environmental impacts that would result from constructing in previously undisturbed areas. Alternative 8 would follow existing right-of-way for about 32.3 miles, or 83 percent of its length,

whereas the corresponding section of Segment 3 would follow existing right-of-way for approximately 24.6 miles, or 68 percent of its length (see table 3.6.2-8).

Environmental Factor	Proposed Route	Alternative 8
Total Length (miles)	36.2	38.8
Acres Disturbed for Construction ^a	592.4	634.9
Length Adjacent to Existing Rights-of-Way (miles)	24.6	32.3
Acres of Wetlands Disturbed ^b	16.0	121.7
Waterbody Crossings (no.) ^c	30	28
Natural and Scenic Streams Crossed (no.) ^d	1	1
Length in Open Water (miles)	0.0	0.0
Length in National Wildlife Refuge (miles)	0.0	0.0
Other Recreational/Designated Land Use Crossings (no.)	0	0
Residences within 50 feet of Construction Work Area ^e	3	3
Threatened or Endangered Species ^f	2	2

^a Based on a 135-foot-wide construction right-of-way in all areas, including wetlands.
^b Proposed route based on field surveys; alternative route estimated from National Wetland Inventory Map data.
^c Based on 1:24,000 U.S. Geological Survey topographic maps.
^d Both the proposed route and Alternative 8 would cross the Calcasieu River.
^e Proposed route based on field surveys; alternative route estimated from aerial photography.
^f Based on FWS consultations for the proposed route. See section 4.7 for a discussion of threatened and endangered species.

Alternative 8 would require about 42.5 more acres for construction and would affect about 105.7 more acres of wetland than the proposed route. The proposed route would include 30 waterbody crossings, or 2 more than Alternative 8, and each route would cross the Calcasieu River which is designated by the LADWF as a natural and scenic river. As discussed in the preceding section regarding Alternative 7, Creole Trail proposes to construct the pipeline across the Calcasieu River using the HDD method. An HDD might also be feasible to cross the Calcasieu River along Alternative 8. The land requirements and environmental impacts for an HDD along the alternative route would likely be similar to those associated with the proposed route. Neither the proposed route nor Alternative 8 would require open water construction. Further, neither route would cross a National Wildlife Refuge or other listed recreational or designated land use area.

Two federally listed threatened or endangered species potentially occur in the area of the proposed route. Due to its proximity to the proposed route, the same two threatened or endangered species could potentially occur in the area of Alternative 8 and would be similarly affected by either the alternative or the proposed route. Both the proposed route and Alternative 8 would be within 50 feet of three residences.

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Figure 3.6.2-4 Segment 3 Route Alternative 8

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In summary, while Alternative 8 would be collocated within an existing right-of-way for a greater proportion of its length than the proposed route, the proposed route would be 2.6 miles shorter and would significantly reduce impacts on wetlands. Therefore, we conclude that Alternative 8 is not preferable to the corresponding section of the proposed route.

3.6.3 Route Variations

In an August 31, 2005 supplemental filing, Creole Trail proposed variations to the originally filed pipeline routes at nine locations. Table 3.6.3-1 identifies the proposed route variations and the reasons for incorporating them into the proposed routes. Both the originally filed routes and the proposed variations are shown on the pipeline facility maps included in Appendix B.

The proposed variations would lengthen the dual pipelines (Segments 2 and 3) by a total of about 3,835 feet, 91 percent of which would be associated with the route variations near MP 28.3 and at the existing FGT facility near MP 74, both along Segment 3. Most of the proposed variations would be minor route realignments that would avoid a cultural resource site and reduce impacts on existing buildings and Bear Creek as indicated on table 3.6.3-1. Two of the proposed route variations, Route Variations 2 and 8, are discussed further below.

Route Variation 2 is necessary to alleviate pipeline congestion near the Thomas Spears residence. Mr. Spears, a property owner near MP 28.4 on Segment 3, was concerned about the pipeline route on his property due to the presence of a number of pipelines and other utilities in an existing right-of-way just to the north of the Spears' residence. In addition, two other natural gas pipelines and associated facilities are proposed for construction parallel to the existing right-of-way. Creole Trail's originally proposed route would deviate away from the existing right-of-way, run just south of the Spears' residence for several hundred feet, and then turn northeast to rejoin the existing right-of-way. As a result, the residence would be surrounded by pipeline facilities. We requested that Creole Trail consider route variations to mitigate this impact.

In response to our request, Creole Trail identified three possible route variations. The first potential variation would move the pipeline about 530 feet further south to avoid the Spears' property, but would affect about 1,500 to 1,900 feet of wetland. The second potential variation would move the pipeline approximately 1,600 feet south of the original alignment, cross an additional 2,000 feet of agricultural land, and reduce impacts on wetlands by about 1,200 feet compared to the originally filed alignment. The third potential variation would move the route north into the existing right-of-way, then use four HDD operations to install the dual pipelines under the existing and proposed pipelines in a northeast direction, then back under the existing facilities in a southeast direction to rejoin the original route.

After evaluating the three potential variations described above, Creole Trail proposed the second variation (identified as Variation 2 in table 3.6.3-1) to alleviate the congestion near the Spears property. Creole Trail contacted the affected landowners (three landowners along the originally proposed route and three newly affected landowners), and as of July 20, 2005 had completed surveys on all but one of the affected properties. Based on our review of the information provided by Creole Trail, Variation 2 would eliminate impacts on the Spears property, reduce the total wetland impacts, and avoid the need for additional costly and time-consuming HDD installations that would be associated with the third potential variation. Therefore, we conclude that Variation 2 would be the environmentally preferred variation and we have found this route variation to be acceptable.

Route Variation 8, which is associated with the FGT M&R station, would add about 791 feet of dual pipeline but would eliminate the need for an approximately 750-foot-long interconnecting pipeline to

the existing FGT facilities. About 95 percent of the additional dual pipeline would occur on developed FGT property, which would reduce impacts on forested uplands by about 4.9 acres as compared to the originally proposed route. Our analysis also indicates that the proposed variations to the original HDD crossings at the south shore of Calcasieu Lake (Route Variation 1) and at the Calcasieu River (Route Variation 5) would result in overall similar or slightly reduced environmental impacts compared to the original alignment. Route Variation 1 would reduce the length of on-land open-trench construction by about 1,100 feet and affect about 3.4 fewer acres of wetlands than the originally proposed route. Route Variation 5 would eliminate two crossings of the existing Trunkline pipeline and would reduce impacts on wetlands and forested upland. The additional HDD crossings proposed for Serpent Bayou and Bayou Plaquemine Brule would reduce impacts on those waterbodies and adjacent wetlands.

In summary, we conclude that the proposed route variations listed in table 3.6.3-1 are acceptable. Creole Trail may incorporate the proposed route variations into its pipeline project.

In addition to the relocation of the FGT M&R station (Route Variation 8 in table 3.6.3-1), Creole Trail also proposes minor relocations of six of the proposed M&R facilities to improve facility layouts for piping configuration, shorten the distance to tie-ins, or reduce workspace requirements. These proposed modifications would:

- move the Sabine M&R station about 100 feet northwest from Segment 2 to Segment 3;
- move the Varibus M&R station about 200 feet southwest and shorten the distance to the Varibus pipeline system tie-in;
- move the Gulf South M&R station about 50 feet northeast and center the M&R station on the Gulf South pipeline system;
- move the TETCO M&R station about 150 feet south to the opposite side of the construction right-of-way to achieve a better layout for the site piping configuration;
- move the Tennessee Gas M&R station about 150 feet south to the opposite side of the construction right-of-way, to achieve a better layout for the site piping configuration, reduce the size of property to be purchased, and allow for better site access; and
- combine the proposed TETCO/Egan and Texas Gas M&R stations into a single location and reduce total workspace requirements.

The proposed aboveground facility modifications would result in similar or fewer environmental impacts than the originally proposed facilities. We conclude that the proposed changes to the M&R station locations are reasonable and Creole Trail may incorporate them into the proposed project.

TABLE 3.6.3-1

Proposed Creole Trail Pipeline Route Variations

Segment/ Variation Number	Begin MP	End MP	Length (feet)		Reason	Comments
			Original Filed Route	Route Variation		
Segment 2						
1	1.0	4.1	16,010	16,120	Relocation of the HDD entry and exit at Calcasieu Lake.	Proposed route variations would move the onshore HDD exit point further inland, thereby reducing the length of on-land trench construction by about 1,100 feet (3.4 acres) and affecting about 3.4 less acres of wetland than the original filed route. Construction of the modified route would affect about 8.9 more acres of the bottom of Calcasieu Lake; however, the modified route would not affect any reefs or areas of thick shell.
Segment 3						
2	27.3	29.1	9,345	12,035	Route variation developed at FERC request to minimize impacts associated with several existing and proposed pipeline facilities on a residence.	Route variation would affect about 3.1 less acres of wetland than the originally filed route. About 84 percent of the revised route would occur in open agricultural land.
3	35.4	35.4	345	360	Minor variation to avoid cultural resource area.	Proposed route variation would occur within original construction right-of-way.
4	39.4	39.7	1,640	1,690	Variation developed based on discussions during interagency site visit to avoid crossing Bear Creek at a bend in the creek.	Proposed variation would reduce the number of times that Bear Creek would be crossed from three to one. Construction of proposed realignment would affect 0.38 acre more forested wetland than the originally filed route.
5	41.7	42.7	5,530	5,648	Realignment of HDD crossing at Calcasieu River to avoid crossing existing Trunkline pipeline twice.	Variation would affect about 0.31 less acre of wooded upland and about 0.17 less acre of wetland than originally filed route.
6	48.1	48.3	780	830	Minor route variation to avoid existing buildings.	Proposed variation would occur within original proposed permanent right-of-way.
7	54.9	55.3	2,200	2,175	Additional HDD crossing at Serpent Bayou based on discussions during interagency site visit.	Proposed HDD would reduce construction right-of-way by about 4.2 acres and would reduce impacts on forested wetlands by 0.69 acre. Additional temporary work space needed for HDD would be within agricultural land.
8	73.7	74.5	4,075	4,866	Reroute of pipeline through existing FGT property.	Proposed variation would add about 791 feet of dual pipeline, about 95 percent of which would occur on developed FGT property. Proposed variation would eliminate the need for an approximately 750-foot-long interconnecting pipeline to FGT facilities and would move the original proposed FGT M&R facility onto developed FGT property. Variation would reduce construction right-of-way in forested uplands by about 4.9 acres.
9	89.3	89.9	2,914	2,950	Realignment of pipeline and additional HDD crossing at Bayou Plaquemine Brule developed based on discussions during interagency site visit to minimize impacts on adjacent wetlands.	Proposed realignment and HDD would reduce construction right-of-way by about 4.3 acres in forested areas and about 2.5 acres in agricultural areas. Variation would affect about 3.5 less acres of forested/emergent wetlands than the originally filed route.