Lake Charles Liquefaction Project
Draft Environmental Impact Statement

FERC/EIS-0258D

Docket Nos.
CP14-119-000,
CP14-120-000,
and CP14-122-000

April
2015

Federal Energy Regulatory Commission
Office of Energy Projects
Washington, DC 20426

Lake Charles Liquefaction Project
Draft Environmental Impact Statement

Trunkline Gas Company, LLC, Lake Charles LNG Company, LLC, and Lake Charles LNG Export Company, LLC

FERC Docket Nos. CP14-119-000, CP14-120-000, and CP14-122-000
DOE Docket Nos. 11-59-LNG and 13-04-LNG
FERC/EIS-0258D, DOE/EIS-0491

Cooperating Agencies:

U.S. Department of Energy

U.S. Coast Guard

U.S. Fish and Wildlife Service

U.S. Army Corps of Engineers

U.S. Department of Transportation

FEDERAL ENERGY REGULATORY COMMISSION
WASHINGTON, D.C. 20426

OFFICE OF ENERGY PROJECTS

In Reply Refer To:
OEP/DG2E/Gas Branch 1
Trunkline Gas Company, LLC; Lake Charles LNG Company, LLC; and Lake Charles LNG Export Company, LLC
Docket Nos. CP14-119-000, CP14-120-000, and CP14-122-000

FERC/EIS-0258

TO THE PARTY ADDRESSED:

The staff of the Federal Energy Regulatory Commission (FERC or Commission) has prepared a draft environmental impact statement (EIS) for the Lake Charles Liquefaction Project, proposed by Trunkline Gas Company, LLC (Trunkline), Lake Charles LNG Company, LLC, and Lake Charles LNG Export Company, LLC in the above-referenced dockets. Trunkline requests authorization to construct, install, and operate new natural gas pipeline and compression facilities and meter stations; modify certain existing pipeline facilities; modify certain compressor and meter stations; and abandon one compressor unit in the states of Arkansas, Mississippi, and Louisiana (collectively referred to as the Non-Liquefaction Facilities). Lake Charles LNG Company, LLC and Lake Charles LNG Export Company, LLC (collectively referred to as Lake Charles LNG) jointly request authorization to site, construct, and operate new liquefaction facilities adjacent to an existing liquefied natural gas (LNG) terminal located in Calcasieu Parish, Louisiana, and to construct and operate certain facility modifications at the existing LNG terminal. The new liquefaction facilities would have a design production capacity of 16.45 million metric tons of LNG per annum.

Lake Charles LNG Company, LLC also requests authorization to abandon certain terminal facilities previously certificated under the Natural Gas Act (NGA) section 7; abandon services provided under its existing FERC Gas Tariff and Certificates of Public Convenience and Necessity; cancel its FERC Gas Tariff, including all rate schedules therein; and convert such certificated facilities and operation under NGA section 3, so that the entirety of the company’s facilities and operations are authorized solely under NGA section 3.

The draft EIS assesses the potential environmental effects of construction and operation of the Lake Charles Liquefaction Project in accordance with the requirements of the National Environmental Policy Act. The FERC staff concludes that approval of the proposed project would have some adverse environmental impacts; however, most of these impacts would be reduced to less-than-significant levels with the implementation of

Lake Charles LNG's and Trunkline's proposed mitigation and the additional measures recommended in the draft EIS.

The U.S. Army Corps of Engineers, U.S. Coast Guard, U.S. Department of Energy, U.S. Fish and Wildlife Service, and U.S. Department of Transportation participated as cooperating agencies in the preparation of the draft EIS. Cooperating agencies have jurisdiction by law or special expertise with respect to resources potentially affected by a proposal and participate in the National Environmental Policy Act analysis. Although the cooperating agencies provided input on the conclusions and recommendations presented in the draft EIS, the agencies will present their own conclusions and recommendations in their respective records of decision or determinations for the project.

The draft EIS addresses the potential environmental effects of the construction, modification, and operation of the following project facilities:

- three liquefaction trains, each with a production capacity sufficient to produce 5.48 million metric tons per annum of LNG for export (each train would contain metering and gas treatment facilities, liquefaction and refrigerant units, safety and control systems, and associated infrastructure);
- modifications and upgrades at the existing LNG terminal;
- about 0.5 mile of 48-inch-diameter feed gas line to supply natural gas to the liquefaction facility from existing gas transmission pipelines;
- approximately 17.9 miles of 24- and 42-inch-diameter natural gas pipeline;
- a new 98,685 horsepower (hp) compressor station;
- abandonment of a 3,000-hp compressor unit, installation of a 15,002-hp unit, and piping modifications at one existing compressor station;
- modification of station piping at three other existing compressor stations;
- five new meter stations and modifications and upgrades of five existing meter stations;
- modification of certain existing pipeline facilities; and
- construction of miscellaneous auxiliary and appurtenant facilities.

The FERC staff mailed copies of the draft EIS to federal, state, and local government representatives and agencies; elected officials; environmental and public interest groups; Native American tribes; potentially affected landowners; other interested individuals and non-governmental organizations; newspapers and libraries in the project area; and parties to this proceeding. Paper copy versions of this EIS were mailed to those specifically requesting them; all others received a compact disk version. In addition, the draft EIS is available for public viewing on the FERC's website (www.ferc.gov) using the eLibrary link. A limited number of hardcopies are available for distribution and public inspection at:

Federal Energy Regulatory Commission
Public Reference Room
888 First Street NE, Room 2A
Washington, DC 20426
(202) 502-8371

Any person wishing to comment on the draft EIS may do so. To ensure consideration of your comments on the proposal in the final EIS, it is important that the Commission receive your comments on or before **June 1, 2015**.

For your convenience, there are four methods you can use to submit your comments to the Commission. In all instances, please reference the project docket numbers (CP14-119-000, CP14-120-000, and CP14-122-000) with your submission. The Commission encourages electronic filing of comments and has expert staff available to assist you at (202) 502-8258 or efiling@ferc.gov.

1) You can file your comments electronically using the eComment feature on the Commission's website (www.ferc.gov) under the link to Documents and Filings. This is an easy method for submitting brief, text-only comments on a project.

2) You can file your comments electronically by using the eFiling feature on the Commission's website (www.ferc.gov) under the link to Documents and Filings. With eFiling, you can provide comments in a variety of formats by attaching them as a file with your submission. New eFiling users must first create an account by clicking on "eRegister." If you are filing a comment on a particular project, please select "Comment on a Filing" as the filing type.

3) You can file a paper copy of your comments by mailing them to the following address:

   Kimberly D. Bose, Secretary
   Federal Energy Regulatory Commission
   888 First Street NE, Room 1A
   Washington, DC 20426

4) In lieu of sending written or electronic comments, the Commission invites you to attend a public comment meeting its staff will conduct in the project area to receive comments on the draft EIS. We encourage interested groups

and individuals to attend and present oral comments on the draft EIS. A transcript of the meeting will be available for review in eLibrary under the project docket numbers. **The meeting will begin at 7:00 p.m. and is scheduled as follows**:

Date	**Location**
May 7, 2015	Holiday Inn Lake Charles – W. Sulphur 330 Arena Road Sulphur, Louisiana 70665 (337) 527-0858

Any person seeking to become a party to the proceeding must file a motion to intervene pursuant to Rule 214 of the Commission's Rules of Practice and Procedures (Title 18 Code of Federal Regulations Part 385.214).[1] Only intervenors have the right to seek rehearing of the Commission's decision. The Commission grants affected landowners and others with environmental concerns intervenor status upon showing good cause by stating that they have a clear and direct interest in this proceeding that no other party can adequately represent. **Simply filing environmental comments will not give you intervenor status, but you do not need intervenor status to have your comments considered.**

Questions?

Additional information about the project is available from the Commission's Office of External Affairs, at **(866) 208-FERC,** or on the FERC website (www.ferc.gov) using the eLibrary link. Click on the eLibrary link, click on "General Search," and enter the docket number(s) excluding the last three digits in the Docket Number field (i.e., CP14-119, CP14-120, and CP14-122). Be sure you have selected an appropriate date range. For assistance, please contact FERC Online Support at FercOnlineSupport @ferc.gov or toll free at (866) 208-3676; for TTY, contact (202) 502-8659. The eLibrary link also provides access to the texts of formal documents issued by the Commission, such as orders, notices, and rulemakings.

In addition, the Commission offers a free service called eSubscription that allows you to keep track of all formal issuances and submittals in specific dockets. This can reduce the amount of time you spend researching proceedings by automatically providing you with notification of these filings, document summaries, and direct links to the documents. Go to www.ferc.gov/docs-filing/esubscription.asp.

[1] See the previous discussion on the methods for filing comments.

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TECHNICAL ACRONYMS AND ABBREVIATIONS

AAE	Approval of Emissions
ACHP	Advisory Council on Historic Preservation
ACW	additional construction workspace
AEGL	Acute Exposure Guideline Level
Alturas	Alturas LLC
AMSL	above mean sea level
Annova	Annova LNG Common Infrastructure, LLC, Annova LNG Brownsville A, LLC, Annova LNG Brownsville B, LLC, and Annova LNG Brownsville C, LLC
AOI	area of impact
API	American Petroleum Institute
AQCR	air quality control region
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
ATWS	additional temporary workspace
BA	Biological Assessment
BACT	Best Available Control Technology
Barca	Barca LNG LLC
BCC	Birds of Conservation Concern
Bcf/d	billion cubic feet per day
BCR	Bird Conservation Region
BG LNG	BG LNG Services LLC
BGEPA	Bald and Golden Eagle Protection Act
BLEVE	boiling-liquid expanding vapor explosion
Boardwalk	Boardwalk Pipeline Partners, L.P.
CAA	Clean Air Act
Cameron LNG	Cameron LNG, LLC
CE FLNG	CE FLNG, LLC
CEII	critical energy infrastructure information
CEQ	Council on Environmental Quality
Certificate	Certificate of Public Convenience and Necessity
CFR	Code of Federal Regulations
CH_4	methane
CI ICE	compression ignition internal combustion engines
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
Coast Guard	U.S. Coast Guard
COE	U.S. Army Corps of Engineers
Columbia Gulf	Columbia Gulf Transmission, LLC
Commission	Federal Energy Regulatory Commission
Corpus Christi	Corpus Christi Liquefaction, LLC
CSA	Compressor Station Alternative site
CUP	Coastal Use Permit
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
CZMP	Coastal Zone Management Program
dB	decibels

dBA	A-weighted scale
Delfin	Delfin LNG LLC
DOD	U.S. Department of Defense
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
DOTD	Louisiana Department of Transportation and Development
EFH	essential fish habitat
EI	environmental inspector
EIS	environmental impact statement
ELS	Excelerate Liquefaction Solutions, LLC
Entergy	Entergy Gulf States Louisiana, LLC
Eos	Eos LNG LLC
EPA	U.S. Environmental Protection Agency
EPAct 2005	Energy Policy Act of 2005
ERP	emergency response plan
ERPG	Emergency Response Planning Guidelines
ESA	Endangered Species Act of 1973
ESD	emergency shutdown
FAA	Federal Aviation Administration
FEED	front-end engineering design
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FGT	Florida Gas Transmission Company, LLC
First Flight	First Flight Holdings, LLC
FLEX	FLNG Expansion and FLNG Liquefaction
FLSO	floating liquefaction storage and offloading unit
FME	Freeport – McMoRan Energy LLC
FMP	fishery management plans
Freeport LNG	Freeport LNG Development, LP
ft^3	cubic feet
FTA	Free Trade Agreement
FWS	U.S. Fish and Wildlife Service
Gasfin	Gasfin Development USA, LLC
GHG	greenhouse gases
GIS	geographic information systems
GMFMC	Gulf of Mexico Fishery Management Council
Golden Pass LNG	Golden Pass LNG, LLC
gpm	gallon per minute
GPP	Golden Pass Products, LLC
Greenfield	Greenfield Logistical Solutions of Louisiana LLC
Gulf Coast	Gulf Coast LNG Exports, LLC
Gulf LNG	Gulf LNG Liquefaction Company, LLC
Gulf South	Gulf South Pipeline Company
GWP	global warming potential
H&K	Hoover & Keith, Inc.
H_2O	water
H_2S	hydrogen sulfide
HAP	Hazardous Air Pollutants
HAZOP	hazard and operability review

HCA	high consequence area
HDD	horizontal directional drill
HDD Contingency Plan	Horizontal Directional Drill Contingency Plan
HFC	hydrofluorocarbons
Hg	mercury
hp	horsepower
IEA	International Energy Agency
INGAA	Interstate Natural Gas Association
IPCC	Intergovernmental Panel on Climate Change
ISA	International Society for Automation
Juniper GTL	Juniper GTL, LLC
KMLP	Kinder Morgan Louisiana Pipeline LLC
kV	kilovolt
kW	kilowatt
LAC	Louisiana Administrative Code
Lake Charles LNG	Lake Charles LNG Export Company, LLC and Lake Charles LNG Company, LLC
LCE	Lake Charles Exports, LLC
LCLNG Export Meter Station	Lake Charles LNG Export Meter Station
LDAR	leak detection and repair
LDEQ	Louisiana Department of Environmental Quality
L_{dn}	day-night sound level
LDNR	Louisiana Department of Natural Resources
LDWF	Louisiana Department of Wildlife and Fisheries
L_{eq}	equivalent sound level
LFL	lower flammable limit
LFS	Liquefaction Facility Site
LLNG	Louisiana LNG Energy LLC
LNG	liquefied natural gas
LNHP	Louisiana Natural Heritage Program
LOI	Letter of Intent
LOR	Letter of Recommendation
LPDES	Louisiana Pollutant Discharge Elimination System
LPG	liquid petroleum gas
m^3	cubic meters
MACT	Maximum Achievable Control Technology
Magnolia	Magnolia LNG
MAOP	maximum allowable operating pressure
MARAD	U.S. Maritime Administration
Marine Center	Louisiana Marine Fisheries Enhancement, Research, and Science Center
MBTA	Migratory Bird Treaty Act
MCL	Maximum Contaminant Level
MDEQ	Mississippi Department of Environmental Quality
MEP	Midcontinent Express Pipeline
MLV	mainline valve
MOU	Memorandum of Understanding
MP	milepost
mph	miles per hour

MRL	mixed refrigerant liquid
MSA	Magnuson-Stevens Fishery Conservation and Management Act
MTPA	million metric tons per annum
MTSA	Maritime Transportation Security Act
MW	megawatt
N_2O	nitrous oxide
NAAQS	national ambient air quality standards
NEPA	National Environmental Policy Act of 1969
NESHAP	National Emissions Standards for Hazardous Air Pollutants
NFPA	National Fire Protection Association
NGA	Natural Gas Act
NGL	natural gas liquid
NGPL	Natural Gas Pipeline Company of America
NHPA	National Historic Preservation Act
NO_2	nitrogen dioxide
NOAA	National Oceanic and Atmospheric Administration
NOAA Fisheries	National Oceanic and Atmospheric Administration, National Marine Fisheries Service
NOI	Notice of Intent to Prepare an Environmental Impact Statement for the Planned Lake Charles Liquefaction Project, Request for Comments on Environmental Issues, and Notice of Public Scoping Meeting
Non-Liquefaction Facilities	Two new pipelines, a new compressor station, five new meter stations, and modifications to existing pipeline facilities, compressor stations, and meter stations in Louisiana, Arkansas, and Mississippi
NO_x	nitrogen oxide
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NSA	noise sensitive area
NSPS	New Source Performance Standards
NSR	New Source Review
NWI	National Wetlands Inventory
NWR	National Wildlife Refuge
OEP	Office of Energy Projects
OPS	Office of Pipeline Safety
OSHA	Occupational Safety and Health Administration
P&ID	piping and instrumentation diagrams
PAH	polycyclic aromatic hydrocarbons
Pangea	Pangea LNG (North American) Holdings, LLC
Pb	lead
PCB	polychlorinated biphenyls
PFC	perfluorocarbons
Phase III ERP/PEIS	Phase III Early Restoration Plan and Early Restoration Programmatic Environmental Impact Statement
PHMSA	Pipeline and Hazardous Materials Safety Administration
Plan	Upland Erosion Control, Revegetation, and Maintenance Plan
PM_{10}	particulate matter less than 10 microns in aerodynamic diameter
$PM_{2.5}$	particulate matter less than 2.5 microns in aerodynamic diameter

Port Arthur	Port Arthur LNG, LLC and Port Arthur Pipeline, LLC
Procedures	Wetland and Waterbody Construction and Mitigation Procedures
PSD	Prevention of Significant Deterioration
psi	pounds per square inch
psig	pounds per square inch gauge
PSM	Process Safety Management
Rio Bravo	Rio Grande LNG, LLC and Rio Bravo Pipeline Company, LLC
RPT	rapid phase transition
Sabine Pass LNG	Sabine Pass LNG, LP
Sasol	Sasol North America, Inc.
SCT&E LNG	Southern California Telephone and Energy LNG, LLC
SEP	surface emissive power
SER	significant emission rate
SF_6	sulfur hexafluoride
SHPO	State Historic Preservation Office
SI ICE	stationary spark ignition internal combustion engines
SIL	significant impact levels
SIP	State Implementation Plan
SO_2	sulfur dioxide
SONRIS	Strategic Online Natural Resources Information System Database
SOWELA	Southwest Louisiana Technical Community College
SO_x	sulfur oxide
SPAR	Spill Prevention and Response
SPCC	Spill Prevention, Control, and Countermeasure
SSA	sole source aquifer
SSURGO	Soil Survey Geographic database
SWLA	Southwest Louisiana
SWPPP	Stormwater Pollution Prevention Plan
TCD	temporary construction dock
TETCO	Texas Eastern Gas Transmission
Texas LNG	Texas LNG Brownsville LLC
TGP	Tennessee Gas Pipeline Company
tpy	tons per year
Transco	Transcontinental Gas Pipeline Company, LLC
Trunkline	Trunkline Gas Company, LLC
UFL	upper flammable material
USC	United States Code
USDA	U.S. Department of Agriculture
USGCRP	U.S. Global Change Research Program
USGS	U.S. Geological Society
Venture Global	Venture Global Calcasieu Pass, LLC
VFD	Variable Frequency Drives
VOC	volatile organic compounds
Waller Point	Waller Point LNG
WesPac	WesPac Midstream LLC
Westlake Chemical	Westlake Chemical Corporation's
WSA	Waterway Suitability Assessment

EXECUTIVE SUMMARY

INTRODUCTION

On March 25, 2014, the companies then known as Trunkline LNG Export, LLC and Trunkline LNG Company, LLC jointly filed an application with the Federal Energy Regulatory Commission (Commission or FERC) pursuant to section 3(a) of the Natural Gas Act (NGA) and part 153 of the Commission's regulations. On September 19, 2014, both companies amended their names to Lake Charles LNG Export Company, LLC and Lake Charles LNG Company, LLC, respectively. The amended names are used in this draft environmental impact statement (EIS), and the two entities are often referred to collectively as "Lake Charles LNG."

In Docket No. CP14-120-000, Lake Charles LNG requests authorization to site, construct, and operate new liquefaction facilities adjacent to the existing liquefied natural gas (LNG) terminal (Trunkline LNG Terminal) located in Calcasieu Parish, Louisiana, and to construct and operate certain facility modifications at the existing LNG terminal to facilitate the storage and subsequent export of LNG. Additionally, Lake Charles LNG Company, LLC filed in Docket No. CP14-122-000 an application pursuant to sections 3 and 7(b) of the NGA for authorization to abandon certain facilities at the existing LNG terminal; abandon services provided under its FERC Gas Tariff and its previous Certificates of Public Convenience and Necessity (Certificate); cancel its FERC Gas Tariff; and convert the previously certificated facilities and operation under NGA section 3 so that the entirety of the company's facilities and operations are authorized solely under NGA section 3.

Also on March 25, 2014, Trunkline Gas Company, LLC (Trunkline), filed an application with the FERC for a Certificate pursuant to sections 7(b) and 7(c) of the NGA and Part 157 of the Commission's regulations. In Docket No. CP14-119-000, Trunkline requests authorization to construct, install, and operate new natural gas pipeline, compression, meter station, and appurtenant facilities; modify certain existing pipeline facilities; modify station piping at four existing compressor stations; modify various meter stations; and abandon one existing compressor unit, all within the states of Louisiana, Arkansas, and Mississippi. These facilities are collectively referred to as the Non-Liquefaction Facilities; Lake Charles LNG's and Trunkline's proposed projects are collectively referred to as the Lake Charles Liquefaction Project.

The purpose of the EIS is to inform FERC decision-makers, the public, and the permitting agencies about the potential adverse and beneficial environmental impacts of the proposed project and its alternatives, and recommend mitigation measures that would reduce adverse impacts to the extent practicable. We[1] prepared this EIS to assess the environmental impacts associated with construction and operation of the project as required under the National Environmental Policy Act of 1969, as amended. Our analysis was based on information provided by Lake Charles LNG and Trunkline, and further developed from data requests, field investigations, scoping, literature research, and contacts with or comments from federal, state, and local agencies, and individual members of the public.

The FERC is the lead agency for the preparation of the EIS. The U.S. Army Corps of Engineers, U.S. Coast Guard, U.S. Department of Energy, U.S. Fish and Wildlife Service (FWS), and U.S. Department of Transportation (DOT) are participating in the National Environmental Policy Act review as cooperating agencies.[2]

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1 "We," "us," and "our" refer to the environmental staff of the FERC's Office of Energy Projects.

2 A cooperating agency is an agency that has jurisdiction over all or part of a project area and must make a decision on a project, and/or an agency that provides special expertise with regard to environmental or other resources.

PROPOSED ACTION

The Lake Charles Liquefaction Project consists of two main components: 1) the development of natural gas liquefaction and LNG export capabilities through construction of a new liquefaction facility and modifications to the existing Trunkline LNG Terminal in Calcasieu Parish, Louisiana; and 2) the construction of facilities necessary to provide natural gas supplies to the proposed liquefaction facility, including two new pipelines (Mainline Connector and Mainline 200-3 Loop), a new compressor station (Compressor Station 203-A), five new meter stations, and modifications to existing pipeline facilities, compressor stations, and meter stations. The project would be able to produce 5.48 million metric tons per annum of LNG for export. Capacity for the proposed project is contracted by BG LNG.

Subject to the receipt of FERC authorization and all other applicable permits, authorizations, and approvals, Lake Charles LNG anticipates starting construction of the liquefaction facility and modifications to the existing LNG terminal in 2015, and placing the first new liquefaction train into service in 2019. The three proposed liquefaction trains would be placed into service 6 months apart. Trunkline would begin construction of the proposed Non-Liquefaction Facilities in 2017 and initiate service in late 2018, prior to startup of the first liquefaction train.

PUBLIC INVOLVEMENT

On April 6, 2012, the FERC began its pre-filing review of the Lake Charles Liquefaction Project and established pre-filing Docket No. PF12-8-000 to place information related to the project into the public record. The cooperating agencies agreed to conduct their environmental reviews of the project in conjunction with the Commission's environmental review process.

On September 14, 2012, the FERC issued a *Notice of Intent to Prepare an Environmental Impact Statement for the Planned Lake Charles Liquefaction Project, Request for Comments on Environmental Issues, and Notice of Public Scoping Meeting* (NOI). This notice was sent to about 315 interested parties including federal, state, and local officials; agency representatives; conservation organizations; Native American tribes; local libraries and newspapers in the project area; and property owners in the vicinity of planned project facilities. Publication of the NOI established a 30-day public comment period for the submission of comments, concerns, and issues related to the environmental aspects of the proposed project. On March 21, 2013, the FERC issued a supplemental NOI for the project to describe additional non-liquefaction facilities that were added after the initial NOI was issued. This notice was sent to about 340 interested parties. Publication of the supplemental NOI established an additional 30-day public comment period for these newly proposed facilities.

On October 3, 2012, the FERC conducted a public scoping meeting in Sulphur, Louisiana and an interagency meeting in Baton Rouge, Louisiana to provide an opportunity for the public and federal, state, and local agencies to learn more about the project and provide comments on environmental issues to be addressed in the EIS. Substantive environmental issues identified through this public review process are addressed in this EIS. The transcripts of the public scoping meeting and all written comments are part of the FERC's public record for the project and are available for viewing under the pre-filing docket number.

ENVIRONMENTAL IMPACTS AND MITIGATION

We evaluated the potential impacts of construction and operation of the project on geology; soils; water resources; wetlands; vegetation; wildlife and aquatic resources; threatened, endangered, and special status species; land use, recreation, and visual resources; socioeconomics; cultural resources; air quality and noise; reliability and safety; and cumulative impacts. Where necessary, we are recommending additional mitigation measures to minimize or avoid these impacts. Sections 5.1 and 5.2 of the EIS contain our conclusions and a compilation of our recommended mitigation measures, respectively.

Construction of the project would disturb 1,522.2 acres, including extra temporary workspaces, a contractor yard, and access roads. During operation, 453.5 acres would be required for operation of the new and expanded project facilities. Of the remaining 1,068.7 acres, 743.5 acres would be allowed to revert to preconstruction land use type. The other 325.2 acres consist of the additional construction workspaces (ACW) that would be used during construction of the proposed liquefaction facility. Lake Charles LNG would clear and elevate these areas to create suitable workspace for the proposed construction activities. Lake Charles LNG would not retain the ACWs following construction, but the modified condition of this land would make it suitable for potential future development. Therefore, in accordance with landowner conditions, Lake Charles LNG would not restore the ACWs to preconstruction condition. The permanent filling of the ACWs would result in permanent impacts on forest, wetlands, open land, industrial/commercial land, and open water.

Construction of the liquefaction facility and modifications to the existing LNG terminal would result in permanent impacts on about 285.9 acres of forest, industrial/commercial land, open land, and open water. All affected acres would be permanently converted to industrial land. The proposed 11.4-mile-long Mainline Connector pipeline would require greenfield construction; however, all 6.5 miles of the Mainline 200-3 Loop pipeline would be collocated with an existing Trunkline pipeline, and the permanent easement would overlap the existing easement by 25 feet. Construction of the Non-Liquefaction Facilities would affect agricultural, forest, open land, industrial/commercial, open water, pine plantation, and residential land uses.

Important issues identified as a result of our analyses, scoping comments, and agency consultations include impacts on water quality, wetlands, vegetation, wildlife and aquatic resources, threatened and endangered species, land use, traffic and housing, air quality and noise, safety, and the cumulative impacts of projects in the vicinity of the proposed Lake Charles Liquefaction Project.

Water Resources

The Industrial Canal/Turning Basin is designated as essential fish habitat and a Navigable Waterway under section 10 of the Rivers and Harbors Act. The primary impacts on water quality within this area would be from dredging and the suspension of sediments in the water column. These effects would be minor since they would be temporary and limited to the immediate area. Lake Charles LNG's proposed use of a hydraulic dredge with a suction cutter head would also minimize turbidity and water quality impacts. Information in recent sampling plans prepared by Tetra Tech, Inc. on behalf of Alcoa indicates that sediments within the Industrial Canal/Turning Basin contain contaminants, but that the underlying clay is not affected. Lake Charles LNG would comply with their U.S. Army Corps of Engineers permit, including any special requirements/procedures for handling contaminated sediments. A surface water and sediment sampling study is being conducted within the Industrial Canal/Turning Basin. We are recommending Lake Charles LNG file the results of the study prior to the end of the draft EIS comment period.

Fourteen waterbodies would be filled during construction of the liquefaction facility, and one waterbody would be armored and realigned. Impacts on these surface waters would be mitigated through implementation of Lake Charles LNG's Compensatory Mitigation Plan. Impacts from stormwater runoff would not be significant because stormwater would be managed in accordance with the Louisiana Department of Environmental Quality and the U.S. Environmental Protection Agency requirements.

Lake Charles LNG is not proposing to change the frequency or size of LNG carriers that currently call on the existing LNG terminal. To ensure compliance with U.S. laws and regulations governing ballast water discharges, Lake Charles LNG would review applicable documentation that the visiting LNG carrier's operation is in accordance with the federal standards and practices. Therefore, we conclude that significant impacts on surface waters would not occur as a result of ballast water discharge.

A total of 106 waterbodies would be crossed or otherwise affected (e.g., matted or filled) by construction of the Non-Liquefaction Facilities. The Calcasieu River, which would be crossed as part of the Mainline 200-1 modifications, is designated as an Outstanding Natural Resource Water by the Louisiana Department of Environmental Quality, a Louisiana Natural and Scenic River by the Louisiana Department of Wildlife and Fisheries (LDWF), and a Navigable Waterway under section 10 of the Rivers and Harbors Act. None of the waterbodies impacted by the Non-Liquefaction Facilities are listed as National Wild and Scenic Rivers, designated as essential fish habitat, or contain federally or state-listed species.

Trunkline proposes to conduct six horizontal direction drill (HDD) operations that would encompass 22 waterbodies, including the Calcasieu River. Use of the HDD method would avoid disturbance of the stream beds, banks, and riparian vegetation. In the event of an inadvertent release of drilling mud during an HDD crossing, Trunkline would implement its HDD Contingency Plan. The remaining waterbodies would be crossed by the open-cut method. To minimize surface water impacts, Trunkline would implement the measures in the FERC's *Wetland and Waterbody Construction and Mitigation Procedures* (Procedures) except where we found site-specific alternative measures justified.

With implementation of the HDD method, Compensatory Mitigation Plan, FERC Procedures, project-specific plans, Lake Charles LNG's and Trunkline's proposed additional mitigation measures included in the EIS, and our recommendations, we conclude that impacts on water resources would be adequately minimized.

Wetlands

Construction of the liquefaction facility would result in the permanent loss of 215.4 acres of wetlands within the liquefaction facility site and ACWs. The majority of the wetlands affected would be forested wetlands or forested wetland mosaics (pimple-mounds). Construction of the Non-Liquefaction Facilities would affect 38.9 acres of wetlands, the majority of which (36.6 acres) would be a result of pipeline construction, but it would not result in the permanent drain or fill of wetlands during operation. The remainder would be associated with construction and operation of six meter stations. Trunkline would minimize impacts by collocating the Mainline 200-3 Loop and using the HDD method as described above. Additionally, Trunkline revised its plans for the Mainline Connector to reduce wetland impacts and reconfigured the layout of Compressor Station 203-A to avoid a wetland within the site. Trunkline would further reduce impacts on wetlands by implementing the Procedures, except where we found alternative measures are warranted. In addition, Lake Charles LNG and Trunkline would mitigate wetland impacts associated with construction and operation of the project as part of their project-specific Compensatory Mitigation Plan. We are recommending that Lake Charles LNG and Trunkline file a copy of the final Compensatory Mitigation Plan and documentation of U.S. Army Corps of Engineers approval of the plan prior to the end of the draft EIS comment period.

With the implementation of the FERC Procedures, proposed mitigation measures, and our recommendations, we conclude that impacts on wetlands due to construction and operation of the Non-Liquefaction Facilities would be minor. Construction of the liquefaction facility would result in the loss of a relatively large portion of the forested wetlands in the immediate area, but would be mitigated through the project-specific Compensatory Mitigation Plan.

Vegetation Resources

Construction and operation of the liquefaction facility (including use of the ACWs) would require the clearing of 568.3 acres of vegetation, resulting in the loss or conversion of 261.7 acres of forested uplands, 158.6 acres of forested wetlands, 56.9 acres of non-forested wetlands, and 91.1 acres of herbaceous upland. Impacts on herbaceous upland vegetation would be permanent; however, they would not be significant because similar vegetative communities occur within the surrounding area.

Construction of the liquefaction facility would result in the unmitigated loss of 261.7 acres of upland forest. Additional forested communities are also located in the project vicinity; however, construction of the project would result in the loss of a relatively large portion of forested communities in the immediate area. Impacts on wetland vegetation would be mitigated to less than significant levels through the implementation of Lake Charles LNG's Compensatory Mitigation Plan.

Construction of the Non-Liquefaction Facilities would affect about 381.5 acres of vegetation, including agricultural vegetation, pine plantation, forested wetland, non-forested wetland, herbaceous upland, and upland forest. The primary impacts on vegetation from construction would be the cutting and clearing of existing vegetation within the construction work areas. Impacts resulting from operation of the facilities would include conversion of some forested or scrub-shrub vegetation to herbaceous vegetation due to maintenance of the pipeline rights-of-way, and conversion of vegetation within new or expanded aboveground facilities to non-vegetated industrial land. Impacts on agricultural, scrub-shrub, and herbaceous vegetation within the pipeline rights-of-way and additional temporary workspaces would be temporary and short term because these areas would revegetate within one to two growing seasons. Additionally, we are recommending that Lake Charles LNG and Trunkline coordinate with the Natural Resources Conservation Service and LDWF to develop a project-specific noxious weed control plan.

The project would affect two vegetation communities of special concern in Louisiana, Bayhead Swamp and Bottomland Hardwood Forest. Of the 4.5 acres of Bayhead Swamp located within the proposed pipeline easements, 2.7 acres would be permanently converted to emergent wetland to facilitate pipeline inspections and maintenance, and 1.8 acres would be allowed to naturally revegetate. Trunkline would minimize impacts on Bayhead Swamp communities by using the HDD method to install the pipelines beneath the potential communities adjacent to Bayou Lacassine and Arceneaux Bayou. Bottomland Hardwood Forest communities occupy a total of 29.6 acres within the liquefaction facility site, along the Mainline Connector, and at three meter stations. Of this, 22.8 acres would be permanently converted to industrial use, 1.7 acres would be converted to emergent wetland due to routine maintenance of the pipeline right-of-way, and the remaining 5.1 acres would be allowed to revegetate to pre-existing conditions.

To minimize impacts of the Non-Liquefaction Facilities on vegetative communities, Trunkline would conduct much of the work within or adjacent to existing maintained rights-of-way and facility sites, and would construct and operate the facilities in accordance with our *Upland Erosion Control, Revegetation, and Maintenance Plan* (Plan) and Procedures. With the implementation of the proposed mitigation measures and our recommendations, we conclude that construction and operation of the Non-Liquefaction Facilities would not have a significant impact on vegetation communities in the project area.

Wildlife and Aquatic Resources

The greatest impact on wildlife habitat would result from the permanent conversion of forested land within the liquefaction facility site and ACWs. Lake Charles LNG would provide compensatory mitigation for permanent impacts on forested wetland that would be permanently converted to upland. Although this and other proposed mitigation measures would lessen impacts on wildlife, we have determined that construction and operation of the liquefaction facility would have long-term impacts on wildlife species due to the loss of forested habitat.

We expect impacts due to noise, light, and human activity during operation of the liquefaction facility to be negligible because wildlife in the area are acclimated to similar effects from activities at the existing LNG terminal and other nearby industrial facilities. Birds could also be affected by flaring at the liquefaction facility. Startup flares would be used during the startup of each liquefaction train. Use of the marine and emergency flares would only occur occasionally. The FWS has not raised flaring as an issue of concern and we are not aware of any reported significant impacts of flaring on migratory birds in the project area. As a result, we conclude that the temporary flaring at the liquefaction facility would not have a significant impact on migratory birds passing through the area.

During construction and operation of the Non-Liquefaction Facilities, most impacts on wildlife would be short-term and limited to the construction period. With the implementation of our Plan and Procedures, and due to the fact that abundant similar habitat is available for wildlife adjacent to the affected areas, we conclude that construction and operation of the Non-Liquefaction Facilities would not have a significant impact on local wildlife populations or habitat.

The vegetative communities in the project area provide potential habitat for migratory bird species. According to the FWS, the liquefaction facility site is expected to provide nesting habitat for bird species of concern. Lake Charles LNG's compensatory mitigation would offset some of this habitat loss. Additionally, the FWS recommended that no habitat alteration work be performed during the migratory bird nesting period. We are recommending that Lake Charles LNG and Trunkline confirm, prior to the end of the draft EIS comment period, that they would not conduct any clearing between March 1 and July 31 unless approved in writing by the FWS.

The LDWF identified records of two colonial waterbird rookeries within 1 mile of the project. The LDWF provided guidelines for preconstruction site visits and, if warranted, distance and timing restrictions. The FWS recommended that Lake Charles LNG and Trunkline contact the FWS and LDWF if surveys identify undocumented rookeries during nesting season and provided guidelines for spatial buffers. No rookeries were identified within the project area during environmental field surveys conducted to date. We are recommending that Lake Charles LNG and Trunkline confirm that if construction would commence during the colonial waterbird nesting season, they would follow the FWS and LDWF recommendations. With our recommendations and the implementation of the measures recommended by the FWS and LDWF, we conclude that impacts on migratory birds, including colonial waterbirds, would be avoided or sufficiently minimized.

Construction of the two temporary construction docks and berthing dock modifications would require dredging a 22.1-acre area in the Industrial Canal/Turning Basin, driving sheet piles, and installing the docks and berthing structure modifications. Potential impacts from these activities include increased sedimentation, turbidity, and noise levels, which could adversely affect aquatic resources. The aquatic resources present within the project area are likely accustomed to regular fluctuations in noise and turbidity levels from industrial activity and maintenance dredging within the Industrial Canal/Turning Basin. Lake Charles LNG's use of a cutter head suction dredge would minimize resuspension of sediments. Due to the small volume of materials to be dredged (approximately 26,000 cubic yards), short duration of dredging activities (30 days), and limited deepening of the existing open water habitat, we have determined that dredging impacts on aquatic resources would be localized, temporary, and minor. However, to evaluate potential impacts from sound waves during pile driving in the final EIS, we are recommending that, prior to the end of the draft EIS comment period, Lake Charles LNG file a description of the proposed in-water pile installation process, anticipated underwater sound pressure levels, and proposed measures to minimize impacts on aquatic resources in the vicinity of pile driving activities.

During construction of the proposed pipelines, use of the HDD method to cross several waterbodies would avoid or minimize impacts on fisheries, fish habitat, and other aquatic resources. Use of the open-cut crossing method for the remaining waterbodies would result in temporary loss or modification of aquatic habitat and would temporarily affect water quality. However, due to the relatively small number of crossings, limited construction workspace and duration, and implementation of the proposed mitigation measures, we anticipate that construction of the pipelines would have only temporary, localized impacts on aquatic resources. Operation of the pipeline facilities would not affect aquatic resources.

Based on the largely temporary nature of project-related impacts and the National Marine Fisheries Service's response to communications from Lake Charles LNG, we have determined that the project would not have a significant adverse impact on essential fish habitat. We are requesting that the National Marine Fisheries Service consider the EIS as our Essential Fish Habitat Assessment.

Threatened and Endangered Species

Twenty-two federally listed threatened and endangered species, two species that are candidates for listing under the Endangered Species Act, two species proposed for listing, and designated critical habitat for one species may occur within the parishes and/or counties affected by the project. The FWS confirmed that project activities within Trunkline's existing facilities and easements in Louisiana would be covered under Trunkline's existing Blanket Clearance, which, with certain conditions, authorizes Trunkline to perform minor and routine pipeline construction and maintenance activities under the FERC's jurisdiction within Louisiana. Because the Blanket Clearance only covers activities conducted in 2014, we have recommended that, prior to construction, Trunkline file an updated Blanket Clearance or updated documentation from the FWS that the previous stipulations and determinations of effect are still current.

We determined that the project would have no effect on 21 of the 22 federally listed species or critical habitat, is not likely to cause the jeopardy of the 2 proposed species, and would not contribute to the trend toward federal listing for the 2 candidate species. One federally listed endangered species, the red-cockaded woodpecker, has the potential to be located in the Kisatchie National Forest, 0.1 mile southwest of the Pollock Compressor Station. The FWS concurred that by adhering to the stipulations in Trunkline's Blanket Clearance for proposed work at the Pollock Compressor Station, the project is not likely to adversely affect the red-cockaded woodpecker. Therefore, we have determined that the project *may affect, but is not likely to adversely affect*, the red-cockaded woodpecker. However, because the Blanket Clearance only covers activities conducted in 2014, we are recommending that, prior to construction, Trunkline file an updated Blanket Clearance and/or updated documentation from the FWS that the previous determinations of effect are still current.

As required by section 7 of the Endangered Species Act, we request that the FWS accept the information provided in this EIS as the Biological Assessment for the project. The project would have no effect on listed species under the jurisdiction of the National Marine Fisheries Service; therefore, no formal section 7 consultation between the FERC and National Marine Fisheries Service is required.

Land Use

The new liquefaction facility would be constructed immediately adjacent to the existing LNG terminal. Lake Charles LNG currently leases 46 acres within the proposed liquefaction facility site from the Lake Charles Port Authority, and plans to acquire 80 acres within the site from Alcoa. The remainder of the land required for the liquefaction facility and ACWs would be leased from the Lake Charles Port Authority. Aside from the Lake Charles Port Authority properties, no federal, state, or local agency owned or managed lands would be affected by the liquefaction facility. Construction activities, particularly at ACWs A and D, might be visible from nearby residences; therefore, we are recommending that Lake Charles LNG file visual screening plans prior to construction for ACWs A and D to minimize visual impacts on these residences. The lands necessary for construction and operation of the Non-Liquefaction Facilities would be composed of both land currently owned or leased by Lake Charles LNG or Trunkline and other private land. A residence within the liquefaction facility site has been purchased by Lake Charles LNG; no other residential lands would be directly affected during construction or operation of the liquefaction facility. No residential structures or buildings are located within 50 feet of any of the Non-Liquefaction Facilities.

Construction and operation of the liquefaction facility would result in minor, temporary impacts on recreational boating and fishing. Construction-related dust and noise could also be a nuisance to the recreational users of two nearby golf courses, but these impacts would be temporary, and Lake Charles LNG would implement mitigation measures to minimize them. Construction of the Non-Liquefaction Facilities could potentially be noticeable to users of the Lacassine National Wildlife Refuge, which is about 0.4 mile from the Natural Gas Pipeline Company of America–Lakeside Meter Station, or the Kisatchie National Forest, which surround areas near the Pollock Compressor Station. However, construction at these locations would be temporary and would occur within or immediately adjacent to existing industrial facilities. We conclude that visitors to the National Wildlife Refuge or the national forest would not be adversely affected.

Socioeconomics

Construction of the project would not have a significant adverse impact on local populations, employment, provision of community services, or property values. There would not be any disproportionately high or adverse environmental and human health impacts on low-income and minority populations from construction or operation of the project. Construction of the project would result in minor positive impacts due to increases in construction jobs, payroll taxes, purchases made by the workforce, and expenses associated with the acquisition of material goods and equipment. Operation of the project would have a positive effect on the local governments' tax revenues due to the increase in property taxes that would be collected.

Construction of the liquefaction facility would increase the local population for the 5-year construction period. The currently available transient housing in Calcasieu Parish may not be sufficient to accommodate the maximum peak non-resident workforce, which would result in a temporary impact on housing availability in the project area during peak construction. Outside of the time when the workforce peaks, the impact on transient housing would be minor. Lake Charles LNG would require its contractor to develop a plan for addressing worker housing and monitoring availability of housing from the start of construction through the workforce peak. During operation of the liquefaction facility, an additional 176 permanent staff would be required, which would have a minor permanent impact on the local housing market. Nearly all of the workers required to construct the Non-Liquefaction Facilities are anticipated to be local hires. Adequate housing exists to accommodate non-resident workers and their families. Overall, construction of the proposed Non-Liquefaction Facilities would not result in significant impacts on transient housing in the area. Operation of the Non-Liquefaction Facilities would require eight new permanent employees, which would have a negligible impact on the local housing market.

Traffic is anticipated to increase substantially during construction of the liquefaction facility due to worker vehicles, construction vehicles, and trucks taking materials and equipment to and from the site. Lake Charles LNG would consider bussing construction workers to and from the site and expects truck deliveries to occur during off-peak traffic period. A majority of the large deliveries are anticipated to be via barge, reducing the number of truck trips. To reduce potential cumulative impacts of the proposed project and other developments in the project area, we are recommending that Lake Charles LNG file a traffic management plan detailing specific measures that would be implemented to minimize impacts on traffic. Construction of the Non-Liquefaction Facilities would result in only minor, temporary impacts on traffic in the project area. Operation of the Non-Liquefaction Facilities would not result in any significant impacts on traffic or roadways.

Air Quality and Noise

Air quality impacts due to construction would generally be temporary and localized, and are not expected to cause or contribute to a violation of applicable air quality standards. Estimated emissions from the barges and bulk carriers that would deliver materials to the liquefaction facility site during construction were not yet available during preparation of the draft EIS. Therefore, we are recommending that Lake Charles LNG file the estimated emissions from these sources prior to the end of the draft EIS comment period. Subject to analysis of the additional information requested for marine traffic emissions, we find that construction-related impacts on local air quality would not be significant.

Lake Charles LNG would minimize operational impacts on air quality by adhering to applicable federal and state regulations and installing Best Available Control Technology as described in their air permit application to the Louisiana Department of Environmental Quality. Trunkline's AERSCREEN model results demonstrate that the emissions from Compressor Station 203-A and from the modifications at the Longville Compressor Station would not significantly impact the air quality in the surrounding area. However, Trunkline's AERSCREEN analysis only included the proposed modifications, and not the existing facilities. Therefore, we are recommending that Trunkline provide an AERSCREEN modeling analysis for both the existing and proposed units at the station prior to construction.

The increases in noise levels during construction of the liquefaction facility and LNG terminal modifications would be intermittent, would generally occur during daylight hours, and would vary over the course of the 5-year construction period. The noise modeling conducted by Lake Charles LNG found that the estimated noise impact at the nearest noise-sensitive areas (NSA) would have a day-night sound level less than the FERC's guideline of 55 decibels on the A-weighted scale (dBA).

The acoustical analyses Trunkline conducted for construction of Compressor Station 203-A and the Longville Compressor Station modifications indicate that the noise levels at the NSAs nearest to these compressor stations could exceed the 55-dBA threshold when equipment is operating simultaneously. However, construction would occur during daytime hours, would be temporary and localized, and would not cause a significant long-term impact on ambient noise levels at any of the identified NSAs. Trunkline also conducted an acoustical assessment to estimate the sound contribution of the HDDs for NSAs within 0.5 mile of each HDD entry or exit point. The results of this assessment demonstrate that HDD noise at the Indian Bayou Canal is estimated to exceed the FERC guidelines at eight NSAs. Trunkline would implement noise mitigation measures to bring HDD noise levels into compliance with the FERC guidelines, and we are recommending that Trunkline file in its weekly construction status reports information for the Indian Bayou Canal HDD entry and exit points, including noise measurements from the nearest NSA, the noise mitigation that Trunkline implemented, and any additional mitigation measures Trunkline would implement if the initial noise measurements exceed the FERC guidelines. Noise associated with construction of the other pipeline facilities would be short-term and temporary at any one location because of the assembly-line method of pipeline construction. Because Trunkline would primarily limit construction to daytime hours and implement noise mitigation measures at HDD sites, we conclude that construction noise would not have a significant impact on landowners and residents.

Modeling results indicate that, with the incorporation of proposed noise mitigation measures, the noise from operation of the liquefaction facility would not exceed the 55-dBA threshold at any of the NSAs. Although not part of day-to-day operations, Lake Charles LNG would use flares during startup procedures and, if necessary, during emergency situations. Therefore, we are recommending that Lake Charles LNG provide noise estimates for flaring activities prior to the end of the draft EIS comment period.

The modeling analysis for operation of Compressor Station 203-A indicates that with the incorporation of the proposed mitigation measures, operational noise at Compressor Station 203-A would not exceed the 55-dBA noise threshold at any of the NSAs. The noise levels from the existing equipment at the Longville Compressor Station, which were placed in service before the Commission adopted the current noise standards, are currently above an L_{dn} of 55 dBA at three of the four nearby NSAs. However, the noise contribution from the proposed compressor unit replacement at the Longville

Compressor Station would not exceed the 55-dBA L_{dn} noise threshold at any of the nearby NSAs. We are recommending that Lake Charles LNG and Trunkline conduct post-construction noise surveys for the liquefaction facilities and compressor stations to ensure noise impacts resulting from the project would not be significant.

Based on the analyses conducted, mitigation measures proposed, and with our additional recommendations, we believe that the project would not result in significant air or noise impacts on residents and the surrounding communities during construction and operation of the project.

Safety and Reliability

The proposed project facilities would be designed, constructed, operated, and maintained to meet or exceed the U.S. Coast Guard Safety Standards in 33 Code of Federal Regulations (CFR) Parts 105 and 127, the DOT Minimum Federal Safety Standards in 49 CFR 192 and 193, and other applicable federal and state regulations. Based on our technical review of the preliminary engineering design, we conclude that, with the incorporation of our recommendations, the Front End Engineering Design presented by Lake Charles LNG would include acceptable layers of protection or safeguards to reduce the risk of a potentially hazardous scenario from developing into an event that could impact the off-site public.

In a September 19, 2014 letter to FERC staff, the DOT stated that it had no objection to Lake Charles LNG's methodology for determining the single accidental leakage sources for candidate design spills to be used in establishing the Part 193 siting requirements for the proposed liquefaction facilities. Additionally, on January 30, 2015, the DOT indicated that it has no objection to the use of the proposed vacuum insulated piping in the methodology for determining single accidental leakage sources. We conclude that the siting of the proposed project would not have a significant impact on public safety. In a March 5, 2012 letter, the U.S. Coast Guard stated that the existing Waterway Suitability Assessment and Letter of Recommendation are adequate because the proposed modifications for the liquefaction facilities would lie outside of the Marine Transfer Area and because Lake Charles LNG is not proposing to increase the size or frequency of LNG carrier traffic at the Trunkline LNG Terminal. Lake Charles LNG would amend the Operations Manual, Emergency Manual, and Facility Security Plan to capture changes associated with the project.

Cumulative Impacts

Our analysis of cumulative impacts includes other projects in the vicinity of the proposed Lake Charles Liquefaction Project that could affect the same resources as the proposed project in the same approximate time frame. We conclude that, for most resources, the project's contribution to cumulative impacts on resources affected by the project would not be significant, or that the potential cumulative impacts of the Lake Charles Liquefaction Project and the other projects considered would be minor or insignificant. However, concurrent construction of the proposed projects and other projects in the area would result in increased workers in the area, which could exceed available housing and result in impacts on public services. Concurrent construction and operation of the project would also increase traffic, which could result in deficiencies in area roadway capacities. We conclude that the implementation of the proposed mitigation measures and our recommended mitigation measures would adequately reduce these impacts.

Concurrent construction and operation of the Lake Charles Liquefaction Project and the other projects in the area would have a beneficial cumulative effect on revenues for the state and the local parishes due to expenditures for services and materials for the projects, increased expenditures by local workers, and expenditures by the non-local workforce and any family members accompanying the non-local workers. The parishes would also receive a substantial increase in property taxes from the projects.

ALTERNATIVES CONSIDERED

We evaluated the No-Action Alternative, system alternatives for the proposed liquefaction facility and the proposed pipelines, alternatives sites for the liquefaction facility, alternative configurations for the liquefaction facility, alternative pipeline routes, alternative aboveground facility sites for the Non-Liquefaction Facilities, and alternative power sources for the liquefaction facility and Compressor Station 203-A. While the No-Action Alternative would eliminate the short- and long-term environmental impacts identified in the EIS, the stated objectives of the proposed action would not be met.

System alternatives evaluated for the liquefaction facility included 6 operating LNG import terminals with approved, proposed, or planned expansions to provide liquefaction capabilities and 15 approved, proposed, or planned stand-alone liquefaction projects. All of these were eliminated from further consideration as viable alternatives for reasons that include insufficient capacity to meet Lake Charles LNG's customer commitments; incompatible timeframes; and environmental impacts that were considered comparable to or greater than those of the proposed project. We evaluated three system alternatives to the proposed pipelines. All three systems were eliminated from further consideration because they would require construction of additional facilities to provide the 2.6 billion cubic feet per day required by the project and/or would not provide a significant environmental advantage over the proposed project.

We evaluated the proposed site and four alternative sites for the liquefaction facility. We concluded that the currently proposed site represents the preferred site because it is sufficiently sized to allow optimal facility layout design and contiguity with the existing LNG terminal, avoids the need for off-site LNG piping, and is geographically well separated from area residences. We did not identify any alternative configurations for the liquefaction facility that would meet the design and configuration requirements of 49 CFR 193 and other industry or engineering standards while avoiding or reducing the impacts associated with the proposed terminal configuration.

We did not identify any environmental concerns that indicate a need to identify and evaluate alternative routes for the Mainline Connector. The Mainline 200-3 Loop would be collocated with and overlap an existing pipeline, precluding the need for an alternatives analysis. We evaluated one alternative to the proposed Compressor Station 203-A site. In addition to offering no environmental advantage, the alternative site is also in a more densely populated area. Therefore, we conclude that the alternative site would not be environmentally preferable to the proposed location.

Lake Charles LNG evaluated and ruled out the use of electrically driven motors as an alternative to gas-fired turbines at the proposed liquefaction facility due to the excessive amount of electrical power required. Trunkline reviewed the potential use of electric motor-driven compressors at Compressor Station 203-A and concluded that the electric load for this design would require a high-voltage transmission system for which the nearest potential interconnect is more than 2 miles away. Trunkline eliminated this option from initial consideration, but requested that Entergy Gulf States Louisiana, LLC (service provider) provide a high-level feasibility of service analysis. We have recommended that Trunkline file the feasibility analysis of electric motor-driven compressors at Compressor Station 203-A prior to the end of the draft EIS comment period.

CONCLUSIONS

We determined that construction and operation of the project would result in adverse environmental impacts but most impacts would be reduced to less-than-significant levels. This determination is based on a review of the information provided by Lake Charles LNG and Trunkline and further developed from data requests; field investigations; scoping; literature research; alternatives analysis; and contacts with federal, state, and local agencies as well as Indian tribes and individual members of the public.

Although many factors were considered in this determination, the principal reasons are:

- Construction and operation of the proposed liquefaction facility would not result in increased LNG vessel traffic (i.e., LNG vessel traffic would not exceed 225 vessels per year considered by the U.S. Coast Guard in its waterway suitability reviews).
- About 6.5 miles (36 percent) of the proposed new pipelines would be looped and would overlap with the adjacent existing pipeline right-of-way, which would minimize new disturbance.
- Much of the work at aboveground facilities would be located at existing facilities (four existing compressor stations and five existing metering and regulating stations), which would minimize new disturbance.
- The HDD method would be used to cross 22 waterbodies, including the Calcasieu River, which would avoid direct impacts on these resources.
- Lake Charles LNG would mitigate wetland impacts associated with the construction and operation of the proposed liquefaction facility in accordance with the project-specific Compensatory Mitigation Plan.
- The FERC would complete the process of complying with section 7 of the Endangered Species Act prior to construction.
- The FERC staff has completed consultation under section 106 of the National Historic Preservation Act and implementing regulations at 36 CFR 800 and determined that no historic properties would be affected by the project.
- Lake Charles LNG and Trunkline would comply with all applicable air and noise regulatory requirements during construction and operation of the project.
- Lake Charles LNG and Trunkline would minimize impacts on environmental resources during construction and operation of the project by implementing, as applicable, their *Spill Prevention and Response Plan*; *Spill Prevention, Control, and Countermeasure Plans; Plan for Unanticipated Discovery of Contaminated Soils or Groundwater; Horizontal Directional Drill Contingency Plan*; Compensatory Mitigation Plan; Unanticipated Discovery Plans (for cultural resources); traffic management plan; and by implementing the FERC's Plan and Procedures.
- An environmental inspection program would be implemented to ensure compliance with the mitigation measures that become conditions of the FERC authorization.

In addition, we developed 100 mitigation measures that Lake Charles LNG and Trunkline should implement to further reduce the environmental impacts that would otherwise result from construction and operation of the project. We determined that these measures are necessary to reduce adverse impacts associated with the project and, in part, are basing our conclusions on implementation of these measures. Therefore, we are recommending that these mitigation measures be attached as conditions to any authorization issued by the Commission. These recommended mitigation measures are presented in section 5.2 of the draft EIS.

1.0 INTRODUCTION

On March 25, 2014, the companies then known as Trunkline LNG Export, LLC and Trunkline LNG Company, LLC jointly filed an application with the Federal Energy Regulatory Commission (Commission or FERC) pursuant to section 3(a) of the Natural Gas Act (NGA) and part 153 of the Commission's regulations. On September 19, 2014, both companies amended their Certificates of Formation with the state of Delaware, amending their names to Lake Charles LNG Export Company, LLC and Lake Charles LNG Company, LLC, respectively. The amended names are used in this draft environmental impact statement (EIS), and the two entities are often referred to collectively as "Lake Charles LNG."

In Docket No. CP14-120-000, Lake Charles LNG requests authorization to site, construct, and operate new liquefaction facilities adjacent to Lake Charles LNG Company, LLC's existing liquefied natural gas (LNG) terminal (Trunkline LNG Terminal) located in Calcasieu Parish, Louisiana, and to construct and operate certain facility modifications at the existing LNG terminal to facilitate the storage and subsequent export of LNG. Additionally, Lake Charles LNG Company, LLC filed in Docket No. CP14-122-000 an application pursuant to sections 3 and 7(b) of the NGA for authorization to abandon certain facilities at the existing LNG terminal; abandon services provided under its FERC Gas Tariff and its previous certificates of public convenience and necessity; cancel its FERC Gas Tariff; and convert the previously certificated facilities and operation under NGA section 3 so that the entirety of the company's facilities and operations are authorized solely under NGA section 3.

Also on March 25, 2014, Trunkline Gas Company, LLC (Trunkline), filed an application with the FERC for a Certificate of Public Convenience and Necessity (Certificate) pursuant to sections 7(b) and 7(c) of the NGA and Part 157 of the Commission's regulations. In Docket No. CP14-119-000, Trunkline requests authorization to construct, install, and operate new natural gas pipeline, compression, meter station, and appurtenant facilities; modify certain existing pipeline facilities; modify station piping at four existing compressor stations; modify various meter stations; and abandon one existing compressor unit, all within the states of Louisiana, Arkansas, and Mississippi. These facilities are collectively referred to as the Non-Liquefaction Facilities.

The actions and facilities proposed by Lake Charles LNG and Trunkline are referred to collectively in this draft EIS as the Lake Charles Liquefaction Project. As part of the Commission's consideration of these applications, we[1] prepared this draft EIS to assess the potential environmental impacts resulting from construction and operation of the proposed project in accordance with the requirements of the National Environmental Policy Act of 1969 (NEPA).

The existing Trunkline LNG Terminal is located in Calcasieu Parish, Louisiana about 9 miles southwest of the city of Lake Charles, Louisiana on the east side of the Calcasieu Ship Channel. The new liquefaction facility, which would include three liquefaction trains with a design production capacity of 16.45 million metric tons per annum (MTPA) of LNG, would be located on an approximately 286-acre site immediately north of and directly adjacent to the existing Trunkline LNG Terminal. Natural gas would be delivered to the Trunkline LNG Terminal via the existing Trunkline pipeline facilities that connect the terminal with various existing interstate pipeline systems, and/or by the proposed Trunkline Non-Liquefaction Facilities that would interconnect with the new liquefaction facilities. More detailed information regarding the proposed facility components is provided in section 2.2.

Subject to the receipt of FERC authorization and all other applicable permits, authorizations, and approvals, Lake Charles LNG anticipates they would commence construction of the proposed liquefaction

1 "We," "us," and "our" refer to the environmental staff of the FERC's Office of Energy Projects.

facility and associated modifications at the Trunkline LNG Terminal in 2015 and initiate service of the first liquefaction train in 2019. The three liquefaction trains would be placed into service 6 months apart.

The existing regasification facilities at the LNG terminal would remain in place. Lake Charles LNG would isolate the existing revaporization equipment while constructing the liquefaction facilities and exporting LNG. Lake Charles LNG does not anticipate resuming operation of the revaporization equipment until BG LNG Services LLC (BG LNG), their sole regasification service customer, requests resumption of regasification services. With some adjustments, the LNG facilities would be able to import or export gas in accordance with customer contracts and economic demand.

The proposed Non-Liquefaction Facilities would be developed to provide increased capacity on the Trunkline pipeline system to meet the demand for additional transportation capacity to deliver natural gas to certain liquefaction facilities, including the liquefaction facility proposed by Lake Charles LNG. The proposed Non-Liquefaction Facilities would provide for 3,100,000 dekatherms per day of firm transportation service.

Subject to the receipt of a FERC Certificate and all other applicable permits, authorizations, and approvals, Trunkline anticipates it would begin construction of the proposed Non-Liquefaction Facilities in 2017 and initiate service in late 2018. The Non-Liquefaction Facilities would consist of the following key facilities as described in more detail in section 2.0:

- construction, installation, and operation of an approximately 11.4-mile-long, 42-inch-diameter pipeline and an approximately 6.5-mile-long, 24-inch-diameter pipeline loop;
- construction and operation of a new compressor station with a total plate rating of 98,685 horsepower (hp);
- abandonment of a 3,000-hp compressor unit, installation of a 15,002-hp unit, and piping modifications at one existing compressor station;
- modification of station piping at three other existing compressor stations;
- construction and operation of five new meter stations and modifications and upgrades of five existing meter stations;
- modification of certain existing pipeline facilities; and
- construction of miscellaneous auxiliary and appurtenant facilities.

1.1 PROJECT PURPOSE AND NEED

The project purpose as stated by Lake Charles LNG and Trunkline is to transport and liquefy domestic natural gas into LNG for export to foreign markets. Lake Charles LNG and Trunkline identify the following project benefits:

- help stimulate the local, regional, and national economies by allowing for the liquefaction of domestically produced natural gas for export to foreign countries;
- enable producers of domestic natural gas to access world markets for LNG and, thus, encourage further domestic natural gas production;
- help to provide a market solution to producers of LNG and further allow for development of domestic natural gas resources;

- stimulate the local, state, regional, and national economies through the numerous construction jobs required for the project, as well as a number of permanent jobs required to operate the facility;
- create an increase in economic activity and tax revenues;
- contribute to a rising job market as a direct result of continued domestic natural gas development and production;
- provide environmental benefits resulting from the use of natural gas by displacing less desirable fuels abroad, such as fuel oil and coal; and
- increase economic trade with foreign nations receiving LNG from the Trunkline LNG Terminal.

Lake Charles LNG and Trunkline state that the project is consistent with President Obama's National Export Initiative signed in 2010. BG LNG is the sole holder of capacity at the Trunkline LNG Terminal.

Under section 3 of the NGA, the FERC considers as part of its decision to authorize natural gas facilities all factors bearing on the public interest. Specifically, regarding whether to authorize natural gas facilities used for importation or exportation, the FERC shall authorize the proposal unless it finds that the proposed facilities would not be consistent with the public interest.

Section 7(b) of the NGA specifies that no natural gas company shall abandon any portion of its facilities subject to the Commission's jurisdiction without the Commission first finding that the abandonment will not negatively affect the present or future public convenience and necessity. Under section 7(c) of the NGA, the Commission determines whether interstate natural gas transportation facilities are in the public convenience and necessity and, if so, grants a Certificate to construct and operate them. The Commission bases its decisions on technical competence, financing, rates, market demand, gas supply, environmental impact, long-term feasibility, and other issues concerning a proposed project.

1.2 PURPOSE AND SCOPE OF THIS STATEMENT

The principal purposes in preparing an EIS are to:

- identify and assess potential impacts on the human environment that would result from implementation of the proposed action;
- identify and assess reasonable alternatives to the proposed action that would avoid or minimize adverse effects on the human environment;
- facilitate public involvement in identifying significant environmental impacts; and
- identify and recommend specific mitigation measures to avoid or minimize environmental impacts.

This EIS focuses on the facilities that are under the FERC's jurisdiction (that is, the new proposed liquefaction facility and modifications to the existing LNG terminal, and the Non-Liquefaction Facilities). The topics addressed in this EIS include geology; soils; water use and quality; wetlands; vegetation; wildlife; fisheries and essential fish habitat (EFH); threatened, endangered, and special status species; land use, recreation, and visual resources; socioeconomics; cultural resources; air quality; noise;

reliability and safety; cumulative impacts; and alternatives. This EIS describes the affected environment as it currently exists, discusses the potential environmental consequences of the proposed project, and compares the project's potential impact to that of alternatives. This EIS also presents our conclusions and recommended mitigation measures.

The Energy Policy Act of 2005 (EPAct 2005) provides that the FERC shall act as the lead agency for coordinating all applicable authorizations related to jurisdictional natural gas facilities and for purposes of complying with NEPA. The FERC, as the "lead federal agency," is responsible for preparation of this EIS. This effort was undertaken with the participation and assistance of the U.S. Army Corps of Engineers (COE), U.S. Coast Guard (Coast Guard), U.S. Department of Energy (DOE), U.S. Fish and Wildlife Service (FWS), and U.S. Department of Transportation (DOT) as "cooperating agencies" under NEPA. Cooperating agencies have jurisdiction by law or special expertise with respect to environmental impacts involved with a proposal. The roles of the FERC, COE, Coast Guard, DOE, FWS, and DOT in the project review process are described below. The EIS provides a basis for coordinated federal decision making in a single document, avoiding duplication among federal agencies in the NEPA environmental review processes. In addition to the lead and cooperating agencies, other federal, state, and local agencies may use this EIS in approving or issuing permits for all or part of the proposed project. Federal, state, and local permits, approvals, and consultations for the proposed project are discussed in section 1.5.

1.2.1 Federal Energy Regulatory Commission

Based on its authority under the NGA, the FERC is the lead agency for preparation of this EIS in compliance with the requirements of NEPA, the Council on Environmental Quality's (CEQ) regulations for implementing NEPA (Title 40 of the Code of Federal Regulations [CFR], Parts 1500–1508 [40 CFR 1500-1508]), and FERC regulations implementing NEPA (18 CFR 380).

As the lead federal agency for the Lake Charles Liquefaction Project, the FERC is required to comply with section 7 of the Endangered Species Act of 1973 (ESA), as amended; the Magnuson-Stevens Fishery Conservation and Management Act (MSA); section 106 of the National Historic Preservation Act (NHPA); and section 307 of the Coastal Zone Management Act (CZMA). Each of these statutes has been taken into account in the preparation of this EIS. The FERC will use this document to consider the environmental impacts that could result if it issues an authorization to Lake Charles LNG under section 3(a) of the NGA and a Certificate to Trunkline under section 7(c) of the NGA.

1.2.2 U.S. Army Corps of Engineers

The COE has jurisdictional authority pursuant to section 404 of the Clean Water Act (CWA) (Title 33 of the United States Code [USC], section 1344 [33 USC 1344]), which governs the discharge of dredged or fill material into waters of the United States, and section 10 of the Rivers and Harbors Act (33 USC 403), which regulates any work or structures that potentially affect the navigable capacity of a waterbody. Because the COE would need to evaluate and approve several aspects of the project and must comply with the requirements of NEPA before issuing permits under the above statutes, it has elected to participate as a cooperating agency in the preparation of this EIS. The COE could adopt the EIS in compliance with 40 CFR 1506.3 if, after an independent review of the document, it concludes that the EIS satisfies the COE's comments and suggestions. The project occurs within the New Orleans and Vicksburg Districts of the COE Mississippi Valley Division. Staff from the New Orleans District participated in the NEPA review and will evaluate COE authorizations, as applicable.

The primary decisions to be addressed by the COE include:

- issuance of section 404 permits for wetland impacts associated with construction of the proposed liquefaction facility and Non-Liquefaction Facilities; and
- issuance of a section 10 permit for construction activities within navigable waters of the United States.

The COE will consider information contained in this EIS to help reach decisions on these issues. Through the coordination of this document and its own permitting process, the COE will obtain the views of the public and natural resource agencies prior to reaching its decisions on the project.

As an element of its review, the COE must consider whether a proposed project avoids, minimizes, and compensates for impacts on existing aquatic resources, including wetlands, to strive to achieve a goal of no overall net loss of values and functions. The COE would issue a Record of Decision to formally document its decisions on the proposed action, including section 404(b)(1) analyses and required environmental mitigation commitments.

1.2.3 U.S. Coast Guard

The Coast Guard is the federal agency responsible for determining the suitability of waterways for LNG marine traffic. The Coast Guard exercises regulatory authority over LNG Executive Order 10173; the Magnuson Act (50 USC 191); the Ports and Waterways Safety Act of 1972, as amended (33 USC 1221, et seq.), and the Maritime Transportation Security Act of 2002 (46 USC 701). The Coast Guard is responsible for matters related to navigation safety, vessel engineering and safety standards, and all matters pertaining to the safety of facilities or equipment in or adjacent to navigable waters up to the last valve immediately before the receiving tanks. The Coast Guard also has authority for LNG facility security plan reviews, approval and compliance verification as provided in 33 CFR 105, and siting as it pertains to the management of vessel traffic in and around LNG facilities to a point 12 nautical miles seaward from the coastline (to the territorial seas).

As required by its regulations, the Coast Guard is responsible for issuing a Letter of Recommendation (LOR) as to the suitability of the waterway for LNG marine traffic following a Waterway Suitability Assessment (WSA). The process of preparing the LOR begins when an applicant submits a Letter of Intent (LOI) to the local Captain of the Port. In a letter dated March 5, 2012, the Coast Guard stated that the LOI requirements apply only to “new construction” that impacts the Marine Transfer Area, and that a new LOI would not be required for the Lake Charles Liquefaction Project because the proposed modifications for the liquefaction facilities would lie outside of the Marine Transfer Area. Additionally, because Lake Charles LNG is not proposing to increase the size or frequency of LNG carrier traffic at the Trunkline LNG Terminal, the most recent existing WSA remains valid and no further modifications would be required. However, the Coast Guard would require Lake Charles LNG to make applicable amendments to the existing Operations Manual, Emergency Manual, and Facility Security Plan to capture changes to the operations and increased facility footprint associated with the project.

1.2.4 U.S. Department of Energy

The DOE must meet its obligation under section 3 of the NGA to authorize the import and export of natural gas, including LNG, unless it finds that the proposed import or export will not be consistent with the public interest. On May 6, 2011, Lake Charles Exports, LLC (LCE, an affiliate of Lake Charles LNG) filed an application with the DOE (FE Docket No. 11-59-LNG), as subsequently amended. The application sought authorization for LCE to export up to 15 million metric tons per year of domestic natural gas as LNG, the equivalent of about 2 billion cubic feet per day (Bcf/d) of natural gas, for a

25-year period, commencing on the earlier of the date of first export or 10 years from the date of issuance of the requested authorization.

On January 10, 2013, Lake Charles LNG Export Company, LLC (then Trunkline LNG Export, LLC) filed a similar application with the DOE (FE Docket No. 13-04-LNG) seeking authorization to export up to 15 million metric tons per year[2] of domestic natural gas as LNG, the equivalent of about 2 Bcf/d of natural gas, for a 25-year period, commencing the earlier of either the date of first export or 10 years from the date of issuance of the requested authorization. The application indicated that it was non-additive with respect to the May 2011 LCE application, and that the applicant was not seeking to export additional volumes of LNG, but was seeking broader authority than that sought by LCE in order to expand the potential customer base. On October 10, 2014, the DOE was notified that Trunkline LNG Export, LLC's name had been amended as described in section 1.0 above.

As set forth in their applications, LCE and Lake Charles LNG Export Company, LLC each seek to export LNG by vessel from the Trunkline LNG Terminal (referred to as the Lake Charles LNG Terminal in the DOE applications) to any country with which the United States:

1. has, or in the future may have, a Free Trade Agreement (FTA) requiring national treatment for trade in natural gas (FTA countries); and

2. does not have a free trade agreement requiring national treatment for trade in natural gas and with which trade is not prohibited by U.S. law or policy (non-FTA countries).

Section 3(c) of the NGA, as amended by section 201 of the Energy Policy Act of 1992 (Public Law 102–486), requires that applications to the DOE requesting authorization of the import and export of natural gas, including LNG, from and to a nation with which there is in effect a free trade agreement requiring national treatment for trade in natural gas, be deemed consistent with the public interest and granted without modification or delay. Accordingly, on July 22, 2011 and March 7, 2013, the DOE issued orders granting authorization to LCE and Lake Charles LNG Export Company, LLC, respectively, to export LNG by vessel from the Trunkline LNG Terminal to FTA countries.

In the case of LNG export applications to non-FTA countries, section 3(a) of the NGA requires DOE to conduct a public interest review and to grant the applications unless DOE finds that the proposed exports will not be consistent with the public interest. Additionally, NEPA requires DOE to consider the environmental impacts of its decisions on non-FTA export applications. On August 7, 2013, the DOE issued an order conditionally authorizing LCE (in DOE Docket No. 11-59-LNG) to export LNG by vessel to non-FTA countries for a term of 20 years to commence on the date of first export.[3] This authorization is conditioned on the satisfactory completion of this environmental review of the proposed modifications to the Trunkline LNG Terminal under NEPA and on issuance by DOE of a finding of no significant impact or a Record of Decision pursuant to NEPA. In accordance with 40 CFR 1506.3, after an independent review of the EIS, the DOE may adopt the EIS prior to issuing a Record of Decision on LCE's application for authority to export LNG. DOE will not issue a final order granting LCE's application until these environmental conditions have been met.

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2 Although the design production capacity of Lake Charles LNG's proposed liquefaction facility is 16.45 MTPA of LNG, authorization has been secured from the DOE's Office of Fuel Energy to export 15 MTPA, reflecting allowances for design margins, maintenance, and outages.

3 *See Lake Charles Exports, LLC*, DOE/FE Order No. 3324, FE Docket No. 11-59-LNG, Order Conditionally Granting Long-Term Multi-Contract Authorization to Export Liquefied Natural Gas by Vessel from the Lake Charles Terminal to Non-Free Trade Agreement Nations (Aug. 7, 2013).

The separate application of Lake Charles LNG Export Company, LLC to export LNG by vessel to non-FTA countries is currently pending before DOE in DOE Docket No. 13-04-LNG. No conditional or final non-FTA authorization has been issued in that proceeding.

1.2.5 U.S. Fish and Wildlife Service

The FWS is responsible for ensuring compliance with the ESA. Section 7 of the ESA, as amended, states that any project authorized, funded, or conducted by any federal agencies should not "…jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat of such species which is determined…to be critical…" (16 USC 1536(a)(2)). The FWS also reviews project plans and provides comments regarding protection of fish and wildlife resources under the provisions of the Fish and Wildlife Coordination Act (16 USC 661 et seq.). The FWS is responsible for the implementation of the provisions of the Migratory Bird Treaty Act (MBTA) (16 USC 703) and the Bald and Golden Eagle Protection Act (BGEPA) (16 USC 688).

Section 7 of the ESA requires identification of and consultation on aspects of any federal action that may have effects on federally listed species, species proposed for federal listing, and their habitat. The ultimate responsibility for compliance with section 7 remains with the lead federal agency (i.e., the FERC for this project).

As the lead federal agency for the project, the FERC will consult with the FWS pursuant to section 7 of the ESA to determine whether federally listed endangered or threatened species or designated critical habitat are found in the vicinity of the project, and to evaluate the proposed action's potential effects on those species or critical habitats. The FERC will also coordinate with the FWS regarding other federal trust wildlife resources, such as migratory birds. The FWS elected to cooperate in preparing this EIS because it has special expertise with respect to environmental impacts associated with the project. We consulted with the FWS regarding the MBTA, the BGEPA, the Fish and Wildlife Coordination Act, the CWA, and NEPA.

1.2.6 U.S. Department of Transportation

The DOT is a cooperating agency in the development of this EIS. The DOT has authority to enforce safety regulations and design standards for the LNG terminal (see section 4.13.10 of this EIS), as well as safety regulations and standards related to the design, construction, and operation of natural gas pipelines, under the Natural Gas Pipeline Safety Act (49 U.S.C. 1671 et seq.). In a September 19, 2014, letter to the FERC, the DOT Pipeline and Hazardous Materials Safety Administration stated that it had reviewed the criteria used by Lake Charles LNG in identifying credible leakage scenarios and establishing the siting for the LNG terminal to confirm compliance with 49 CFR 193, and had no objections to Lake Charles LNG's methodologies.[4] The DOT would also monitor the construction and operation of the natural gas facilities to determine compliance with its design and safety standards.

1.3 PUBLIC REVIEW AND COMMENT

On March 30, 2012, Lake Charles LNG and Trunkline filed a request with the FERC to use our pre-filing review process. At that time, the companies were in the preliminary design stage of the project and no formal applications had been filed with the FERC. The request to use our pre-filing review process was approved on April 6, 2012. Pre-filing Docket No. PF12-8-000 was established for the project to place information filed by Lake Charles LNG and Trunkline, and related documents issued by the FERC, into the public record. The pre-filing review process provides opportunities for interested

[4] This letter was filed in the FERC public record under Docket Number CP14-120-000 on September 19, 2014. Accession Number 20140919-4005.

stakeholders to become involved early in project planning, facilitates interagency cooperation, and assists in the identification and resolution of issues prior to a formal application being filed with the FERC.

Lake Charles LNG held a public open house for the liquefaction facility and LNG terminal modifications in Lake Charles, Louisiana on July 19, 2012. The FERC staff participated in the meeting to describe the FERC process and provide those attending with information on how to file comments with the FERC.

On September 14, 2012, the FERC issued a *Notice of Intent to Prepare an Environmental Impact Statement for the Planned Lake Charles Liquefaction Project, Request for Comments on Environmental Issues, and Notice of Public Scoping Meeting* (NOI). This notice was sent to about 315 interested parties including federal, state, and local officials; agency representatives; conservation organizations; Native American tribes; local libraries and newspapers in the project area; and property owners in the vicinity of planned project facilities. Publication of the NOI established a 30-day public comment period for the submission of comments, concerns, and issues related to the environmental aspects of the proposed project.

On October 3, 2012, the FERC conducted a public scoping meeting in Sulphur, Louisiana, to provide an opportunity for the public to learn more about the project and provide oral comments on environmental issues to be addressed in the EIS. No individuals elected to present oral comments at the scoping meeting.

We received comments from two federal agencies, the FWS and the U.S. Environmental Protection Agency (EPA), in response to the NOI; a statement of no comment from the U.S. National Park Service; and a letter from the Southwest Louisiana Economic Development Alliance in support of the project. Following the scoping period, letters were received from the Choctaw Nation of Oklahoma requesting copies of correspondence from the Mississippi State Historic Preservation Office (SHPO), and from the Jena Band of Choctaw Indians referring the Commission to the Coushatta Tribe of Louisiana.

Also on October 3, 2012, we held a joint interagency meeting for the project and Cameron LNG, LLC's Cameron LNG Liquefaction Project and met with representatives of the COE, Coast Guard, Louisiana Department of Environmental Quality (LDEQ), Louisiana Department of Natural Resources (LDNR), Louisiana Department of Wildlife and Fisheries (LDWF), National Oceanic and Atmospheric Administration's (NOAA) National Marine Fisheries Service (NOAA Fisheries), FWS, and Cameron LNG, LLC and Lake Charles LNG's representatives to discuss the planned projects, coordination of agency review, permit requirements and status, and each agency's interest in participating in our environmental review as a cooperating agency.

On February 4 and 5, 2013, Trunkline held two additional open houses for the Non-Liquefaction Facilities in Iowa and Jennings, Louisiana, respectively. The FERC staff again participated in those meetings to describe the FERC process and provide those attending with information on how to file comments with the FERC.

On March 21, 2013, the FERC issued a supplemental NOI for the project to describe additional Non-Liquefaction Facilities that were added after the initial NOI was issued. This notice was sent to about 340 interested parties including federal, state, and local officials; agency representatives; conservation organizations; Native American tribes; local libraries and newspapers in the project area; and property owners in the vicinity of planned project facilities. Publication of the supplemental NOI established an additional 30-day public comment period for the submission of comments, concerns, and issues related to these newly proposed facilities.

In total, three letters from federal agencies (FWS, EPA, and NOAA Fisheries) and one letter from a state agency (LDWF) were received in response to the supplemental NOI. In addition, the U.S. Department of Defense (DOD) Siting Clearinghouse provided a letter after the scoping period stating no opposition to the project; the U.S. National Park Service provided a statement of no comment; and the Choctaw Nation of Oklahoma acknowledged receipt and requested copies of SHPO correspondence and survey reports. The Commission also received a letter from the Sierra Club, which included comments on air quality, water impacts, wildlife impacts, traffic and safety, and impacts on local communities.

In June 2013, we mailed a project update newsletter to interested parties, including federal, state, and local officials; agency representatives; conservation organizations; Native American tribes; local libraries and newspapers in the project area; and property owners in the vicinity of planned project facilities. This update provided information on the proposed project, a list of the primary concerns that were raised during scoping, information on the status of the environmental review process and the next steps in the process, and information on how to stay informed about the progress of the review process. In October 2013, we mailed a project post card, which provided updated information on the status of the project.

Issues identified after the initial open houses and during and after the public comment process are summarized in table 1.3-1 along with a listing of the EIS sections that address the comments. Appendix A provides the distribution list for the draft EIS. Issues identified that are not considered environmental considerations or are outside the scope of the EIS process are summarized in table 1.3-2, and are not addressed further in this EIS.

1.4 NON-JURISDICTIONAL FACILITIES

Under section 7 of the NGA, the FERC is required to consider, as part of a decision to authorize jurisdictional facilities, all facilities that are directly related to a proposed project where there is sufficient federal control and responsibility to warrant environmental analysis as part of the NEPA environmental review for the proposed project. Some proposed projects have associated facilities that do not come under the jurisdiction of the Commission. These "non-jurisdictional" facilities may be integral to the need for the proposed facilities, or they may be merely associated as minor components of the jurisdictional facilities that would be constructed and operated as a result of authorization of the proposed facilities. The non-jurisdictional facilities associated with the project are shown on the figures in appendix B.

The following non-jurisdictional actions were identified in association with the proposed project:

- removal of two existing 8- and 12-inch-diameter third-party liquid pipelines that cross the western third of the proposed liquefaction facility site;
- relocation of the Alcoa administration building on existing Alcoa property;
- abandonment of an active oil well currently located on the liquefaction facility site;
- construction of an approximately 19-mile-long, 230 kilovolt (kV) electric transmission line and a new substation by Entergy Gulf States Louisiana, LLC (Entergy) to provide power to the liquefaction facilities; and
- electrical power supply connections to Compressor Station 203-A, the new meter stations, and the Texas Eastern Gas Transmission (TETCO)–Allen Meter Station.

These facilities are described in more detail below and are also addressed in our cumulative impacts analysis in section 4.13 of this EIS.

TABLE 1.3-1	
Key Environmental Concerns Identified During the Scoping Process for the Lake Charles Liquefaction Project	
Issue/Specific Comment	EIS Section Addressing Comment
General	
Project purpose and need	1.1
Project design	2.0
Construction methods	2.6
Coordination of NEPA reviews with cooperating agencies	1.2
Compliance with environmental permits	1.5
Right-of-way requirements and configurations	2.3
Measures to avoid, minimize, and mitigate adverse impacts on the environment	4.0, 5.0
Alternatives	
Evaluation of alternatives	3.0
Geology	
Disposition of active oil/gas well at liquefaction facility site	4.1.2
Soils	
Erosion and sediment control	4.2.5
Water Quality and Aquatic Resources	
Storage of hazardous materials and reporting requirements/procedures	2.7.1, 4.3.2
Floodplain identification	4.3.1
Impacts on groundwater, existing hydrology and drainage patterns, and drinking water supply and mitigation measures	4.3
Water emission impacts on public health, wildlife, threatened and endangered species, and ecosystems	4.3
Tanker traffic impacts on water quality, especially in the Lake Charles area	4.3.2.2
Beneficial uses of affected water	4.3
Impacts on impaired waters, existing restoration and enhancement efforts, and mitigation measures to avoid further degradation	4.3.2.2
Wetlands	
Impacts on wetlands and waters of the United States	4.3.2.2
Wetland crossing methods	2.6.3.2
Implementation of Stormwater and Pollution Prevention Plan to protect adjacent wetlands	4.3.2.2
Vegetation	
Compliance with Executive Order 13112, Invasive Species	4.5.3
Plans for invasive species control	4.5.3
Fish and Wildlife Resources	
Compliance with the MBTA and BGEPA	4.6.1.3
Impacts on aquatic and terrestrial wildlife and habitat	4.6
Impacts on fishery resources	4.6.2, 4.6.3
Special Status Species	
Agency coordination and requirements	4.7
Potential impacts on threatened or endangered species and suitable habitat	4.7
Land Use	
Construction impacts on existing land uses	4.8.1.3
Agricultural operations	4.8.1
Impacts on aesthetics and recreational opportunities	4.8.4, 4.8.6

TABLE 1.3-1 (cont'd)

Key Environmental Concerns Identified During the Scoping Process for the Lake Charles Liquefaction Project

Issue/Specific Comment	EIS Section Addressing Comment
Socioeconomics	
Employment opportunities for local contractors and laborers	4.9.2
Traffic impacts associated with the project, including off-site staging areas	4.9.6
Impacts on Environmental Justice communities	4.9.8
Impacts on homes, businesses, and local communities	4.9
Cultural Resources	
Tribal consultation and impacts on tribal lands and areas of cultural importance to Native American tribes	4.10.4
Impacts on culturally and historically significant properties	4.10
NHPA section 106 consultation and analysis, including correspondence/consultation with State and Tribal Historic Preservation Offices	4.10
Air Quality	
Consistency with the emissions limits and standards	4.11.1
Impacts on air quality resulting from construction and maintenance activities	4.11.1
Air emission impacts on public health, wildlife, threatened and endangered species, and ecosystems	4.11.1
Effects of and impacts on climate change	4.11.1
Reliability and Safety	
Safety during construction and operation of the project	4.12
Safety impacts of off-site staging areas	4.12
Cumulative Impacts	
Analysis of cumulative impacts associated with aquatic and biological resources, including threatened and endangered species, and their habitat	4.13.2
Cumulative and indirect impacts resulting from operation of the project, with a focus on natural gas production in the United States	4.13

Removal/Relocation/Abandonment of Non-jurisdictional Facilities

Two existing 8- and 12-inch-diameter liquid pipelines owned by Boardwalk Pipeline Partners, L.P. (Boardwalk), which currently cross the western third of the liquefaction facility site in one corridor at a slight pitch from northwest to southeast, would be removed after the pipelines are decommissioned and isolated by Boardwalk. Boardwalk would be responsible for obtaining all required permits for the removal of the pipelines. The Alcoa administration building would be relocated on the existing Alcoa property. Lake Charles LNG is also coordinating with Jordan Oil for the plugging and abandonment of an active oil well currently on the liquefaction facility site. Jordan Oil would be responsible for obtaining all required permits for the abandonment of the oil well.

Power Supply Connections

Entergy would construct a new approximately 19-mile-long, 230 kV electric transmission line to provide power to the liquefaction facilities. This transmission line would originate at Entergy's existing Nelson substation, travel generally south parallel to an existing Entergy line, and connect to a new Entergy substation to be constructed adjacent to and north of the Graywood substation (the existing substation for the LNG terminal). Entergy would conduct the necessary consultations and obtain applicable permits and approvals for the electric transmission line, including threatened and endangered species consultations, cultural resources consultation, submittal of a stormwater pollution prevention plan and Notice of Intent to the LDEQ, and COE authorization under section 404 (CWA) and section 10 of the Rivers and Harbors Act, if necessary.

TABLE 1.3-2 **Issues Identified and Comments Received That Are Outside the Scope of the EIS Process**	
Issue/Specific Comment	Explanation
Environmental and economic consequences of any expansion or change in natural gas production, especially in shale gas plays, as a result of increased gas exports	Production and gathering activities, and the pipelines and facilities used for these activities, are not regulated by the FERC, but are overseen by the affected region's state and local agencies with jurisdiction over the management and extraction of the shale gas resource. Determining the well and gathering line locations and their environmental impact is not feasible because the market and gas availability at any given time would determine the source of the natural gas. Therefore, it is outside of the scope of this EIS.
Effects on threatened and endangered species throughout the Gulf region	Effects on threatened and endangered species in the vicinity of the project area are discussed in section 4.7. Impacts beyond the general project area are not anticipated and are outside the scope of this EIS.
Effects of hydraulically fractured shale gas production	The development of natural gas in shale plays by hydraulic fracturing is not the subject of this EIS nor is the issue directly related to the proposed project.
Effects of LNG combustion in end-use/importing markets	Review of the project is limited to the economic and environmental impacts of the proposal before the Commission; therefore, the effects of LNG combustion in end-use/importing markets is outside of the scope of this EIS.
Consideration of other pending LNG export proposals before the DOE and FERC, beyond the alternatives analysis	Cumulative impacts from all proposed export terminals, including those pending or approved by the DOE, would necessitate a programmatic EIS. The Lake Charles Liquefaction Project does not meet the requirements of federal regulations requiring programmatic EISs and so the question is not properly before the Commission.
Delay a decision on the application until comments are received on the DOE Office of Fossil Energy's economic study on impacts of LNG exports.	The comment and reply comment periods closed in January and February 2013 for the DOE-commissioned study into the potential U.S. economic impacts of natural gas exports in the form of LNG. The 2012 study, which was completed by NERA Economic Consulting, largely found that "LNG exports would be beneficial to the U.S. economy under the scenarios modeled." The DOE elected to prepare two additional reports of the environmental impacts of increased LNG exports. However, the reports are beyond the requirements of NEPA and, therefore, are outside of the scope of this EIS.
Impose monitoring conditions for economic disruptions caused by natural gas extraction and domestic increases in gas and electricity prices and resulting shifts to more polluting fuels.	Review of the project is limited to the economic and environmental impacts of the proposal before the Commission; therefore, economic impacts caused by natural gas extraction and domestic increases in gas and electricity prices and resulting shifts to more polluting fuels is outside of the scope of this EIS.

Power would also need to be supplied to Compressor Station 203-A, the new meter stations, and the TETCO–Allen Meter Station. Electric poles would be installed inside the proposed Compressor Station 203-A footprint, along the proposed access road, and would tie-in to existing lines along Dennison Road. Power poles would also be required for the new meter stations and TETCO–Allen Meter Station.

1.5 PERMITS, APPROVALS, AND REGULATORY REVIEWS

As federal agencies, the FERC and COE are required to comply with a number of regulatory statutes including, but not limited to NEPA, section 7 of the ESA, the MSA, the Clean Air Act (CAA), the CWA, the Rivers and Harbors Act, section 106 of the NHPA, and section 307 of the CZMA. Each of these statutes has been taken into account in the preparation of this EIS. The major permits, approvals, and consultations for the Lake Charles Liquefaction Project are identified in table 1.5-1.

To comply with section 7 of the ESA, the FERC is required to determine whether any federally listed or proposed endangered or threatened species or their designated critical habitat occur in the vicinity of the proposed project and conduct consultations with the FWS and/or NOAA Fisheries, if necessary. If, upon review of existing data or data provided by Lake Charles LNG and Trunkline, the FERC determines that these species or habitats may be affected by the project, the FERC is required to prepare a Biological Assessment (BA) to identify the nature and extent of adverse impact, and to recommend measures that would avoid the habitat and/or species, or would reduce potential impact to acceptable levels. Section 4.7 provides information on the status of this review.

TABLE 1.5-1

Major Permits, Approvals, and Consultations Required for the Lake Charles Liquefaction Project

Agency	Permit/Approval/ Consultation	Status: Liquefaction Facility and Modifications to Existing LNG Terminal[a]	Status: Non-Liquefaction Facilities
FEDERAL			
FERC	Certification under section 7(c) of the NGA	Not applicable	Application filed March 25, 2014
	Authorization under section 3(a) of the NGA	Application filed March 25, 2014	Not Applicable
Federal Aviation Administration	Notification of Proposed Construction Possibly Affecting Navigable Air Space	• Application for marine flare, start-up flare, and emergency flare submitted April 1, 2014 • Determination of No Hazard to Air Navigation for marine and start-up flare received May 6, 2014 • Class 2C Survey for the emergency flare submitted for review July 2014 • Determination of No Hazard to Air Navigation for emergency flare received August 11, 2014	Not applicable
DOE[b]	Application for Long Term, Multi-Contract Authorization to Export Natural Gas to Free Trade Agreement Countries	• Authorization received July 22, 2011 for LCE • Authorization received March 7, 2013 for Lake Charles LNG Export Company, LLC	Not applicable
	Application for Long-Term, Multi-Contract Authorization to Export Natural Gas to Non-Free Trade Agreement Countries	• Conditional authorization received August 7, 2013 for LCE • Lake Charles LNG Export Company, LLC application pending	Not applicable
COE	Section 404, CWA Permit	Application submitted August 6, 2014	Application submitted August 6, 2014
	Section 10, Rivers and Harbors Act Permit	Application submitted August 6, 2014	Application submitted August 6, 2014
Coast Guard	Amended Letter of Intent	Consultation completed March 2012	Not applicable
NOAA Fisheries	Section 7 ESA Consultation	• Initial consultation completed for threatened and endangered species in March 2014 • Informal consultation reinitiated for additional construction workspaces (ACW) and revised waterward work plan on March 7, 2014	Not applicable
	MSA Essential Fish Habitat Consultation	• Minimal impact on EFH concurrence received for liquefaction facility on February 7, 2013 • Informal consultation reinitiated for ACWs on March 7, 2014 and no significant adverse impact on EFH concurrence received March 13, 2014	Not applicable

TABLE 1.5-1 (cont'd)

Major Permits, Approvals, and Consultations Required for the Lake Charles Liquefaction Project

Agency	Permit/Approval/ Consultation	Status: Liquefaction Facility and Modifications to Existing LNG Terminal [a]	Status: Non-Liquefaction Facilities
FWS	Section 7 ESA Consultation	• No effect concurrence received for liquefaction facility on November 27, 2012 • Informal consultation reinitiated for ACWs on March 7, 2014 and not likely to adversely affect concurrence received March 31, 2014	• Initial clearances received February 12 and March 11, 2013 • Consultation reinitiated for ACWs and revised waterward work plan on March 7, 2014 • Not likely to adversely affect concurrence received March 31, 2014 (Louisiana) • No effect concurrence received March 11, 2014 (Arkansas) • No effect concurrence received March 18, 2014 (Mississippi)
	Migratory Bird Treaty Act	FWS provided comments and recommendations to Lake Charles LNG on November 27, 2012 and March 31, 2014	FWS provided comments and recommendations to Trunkline on March 11, 2013 (Louisiana facilities), March 11, 2014 (Mississippi Barrel West), and March 18, 2014 (Mississippi Barrel East).
STATE – LOUISIANA			
LDEQ – Air Quality Division	Air Permits	Application filed December 2013. Revised application filed July 31, 2014.	• Compressor Station 203-A permit application filed December 2014 • Longville Compressor Station permit application filed December 2014
LDEQ – Water Quality Division	Hydrostatic Test Water Discharge General Permit	Lake Charles LNG to submit Notices of Intent at least 2 days prior to individual discharges	Trunkline to submit Notices of intent at least 2 days prior to individual discharges
	Water Quality Certification	Application submitted August 6, 2014 with COE application.	Application submitted August 6, 2014 with COE application.
LDNR – Office of Coastal Management	Coastal Zone Consistency – Coastal Use Permit (CUP) application	Not applicable	• Initiated consultation for the Natural Gas Pipeline Company of America (NGPL)–Lakeside and Kinder Morgan–Lake Charles Meter Stations on March 7, 2014 • CUP application for NGPL–Lakeside Meter Station submitted April 21, 2014; (Kinder Morgan–Lake Charles Meter Station is exempt from coastal zone jurisdiction) • Letter of No Objection received from Cameron Parish Police Jury on June 13, 2014 • Determination from LDNR stating no CUP required for NGPL-Lakeside Meter Station received August 27, 2014.

TABLE 1.5-1 (cont'd)

Major Permits, Approvals, and Consultations Required for the Lake Charles Liquefaction Project

Agency	Permit/Approval/ Consultation	Status: Liquefaction Facility and Modifications to Existing LNG Terminal [a]	Status: Non-Liquefaction Facilities
LDWF	Threatened and Endangered Species Consultation	• Consultation submitted January 2013 • Reinitiated consultation for ACWs on March 7, 2014; response pending	• Initial response received April 18, 2013 • Reinitiated consultation for additional project facilities on March 7, 2014; response pending
	Louisiana Natural and Scenic Rivers System	Not applicable	• Initiated consultation for Mainline 200-1 modifications on March 7, 2014 and received confirmation of permit required on March 24, 2014 • Anticipate filing application second half of 2016
Louisiana SHPO[c]	Section 106 Consultation, NHPA	• Draft Phase 1 report for liquefaction facilities sent April 2013 and final clearance received August 28, 2013 • Draft Addendum I report for ACWs sent March 3, 2014 and clearance received March 17, 2014	• Initial approvals received September 4, 2013 and final clearances received September 20, 2013 • Reinitiated consultation for additional project facilities on March 3, 2014 and received final clearances on March 17, 2014 • Request for Categorical Clearance renewal submitted April 29, 2014; renewal signed by Louisiana SHPO on May 13, 2014
STATE – ARKANSAS			
Arkansas Natural Heritage Commission	Threatened and Endangered Species Consultation	Not applicable	Consultation completed for the Mainline 100-3 modifications March 24, 2014
Arkansas SHPO[c]	Section 106 Consultation	Not applicable	Final clearance for the Mainline 100-3 modifications received on March 31, 2014
STATE – MISSISSIPPI			
Mississippi Department of Environmental Quality	Notification of proposed change to Shaw Compressor Station	Not applicable	To be submitted at least 7 days prior to commencing modifications
Mississippi Department of Wildlife, Fisheries, and Parks	Threatened and Endangered Species Consultation	Not applicable	Clearance for Shaw Compressor Station received on February 19, 2013 and clearance for Mainline 100-3 modifications received March 29, 2014
Mississippi SHPO[c]	Section 106 Consultation, NHPA	Not applicable	Clearance for Shaw Compressor Station received on May 16, 2013 and final clearance for Mainline 100-3 modifications received April 14, 2014

[a] Includes the ACWs.

[b] Authorization granted by the DOE is conditioned on the satisfactory completion of the environmental review of the proposed modifications to the Trunkline LNG Terminal under NEPA and on issuance by the DOE of a finding of no significant impact or a Record of Decision pursuant to NEPA.

[c] Consultations with Native American tribes are discussed in section 4.10.3.

The MSA, as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), established procedures designed to identify, conserve, and enhance EFH for those species regulated under a federal fisheries management plan. The MSA requires federal agencies to consult with NOAA Fisheries on all actions or proposed actions authorized, funded, or undertaken by the agency that may adversely affect EFH (MSA §305(b)(2)). Although absolute criteria have not been established for conducting EFH consultations, NOAA Fisheries recommends consolidating EFH consultations with interagency coordination procedures required by other statutes, such as NEPA, the Fish and Wildlife Coordination Act, or the ESA (50 CFR 600.920(e)), to reduce duplication and improve efficiency.

Section 106 of the NHPA requires that the FERC take into account the effects of its undertakings on properties listed, or eligible for listing, in the National Register of Historic Places (NRHP), including prehistoric or historic sites, districts, buildings, structures, objects, or properties of traditional religious or cultural importance, and to afford the Advisory Council on Historic Preservation (ACHP) an opportunity to comment on the undertaking. Lake Charles LNG and Trunkline, as non-federal parties, are assisting the FERC in meeting its obligations under section 106 by preparing the necessary information, analyses, and recommendations under ACHP regulations in 36 CFR 800. Section 4.10 of this EIS provides information on the status of this review.

Lake Charles LNG and Trunkline must comply with sections 401 and 404 of the CWA. Water quality certification (section 401) has been delegated to the state agencies, with review by the EPA. Water used for hydrostatic testing that is point-source discharged into waterbodies would require a National Pollutant Discharge Elimination System (NPDES) permit (section 402) issued by the LDEQ. The COE has responsibility for determining compliance with all regulatory requirements associated with section 404 of the CWA. The EPA also independently reviews section 404 applications for wetland dredge-and-fill applications for the COE and has section 404(c) veto power for wetland permits issued by the COE. The section 404 permitting process regulates the discharge of dredged and fill material associated with the construction of pipelines across streams and in wetlands. Before an individual section 404 permit can be issued, the CWA requires completion of a section 404(b)(1) guideline analysis. The FERC, in the NEPA review represented by this EIS, has analyzed technical issues required for the section 404(b)(1) guideline analyses, including analysis of natural resources and cultural resources that would be affected by the project, as well as analyses of alternatives. The results of our analysis of alternatives are provided in section 3.0, and a summary of wetland impacts are provided in section 4.4 of this EIS. In addition to CWA responsibilities, the COE has jurisdiction over section 10 permits, which would be required for all construction activities in navigable waterways under the Rivers and Harbors Act of 1899. Waterbody crossing methods and impacts are summarized in section 4.3 of this EIS. Section 404 and section 10 permits are required for both the proposed liquefaction facility and the Non-Liquefaction Facilities. Lake Charles LNG and Trunkline submitted an application to the COE on August 6, 2014.

EPAct 2005 and section 3 of the NGA require us to consult with the DOD to determine if there would be any impacts associated with the project on military training or activities on any military installations. The FERC initiated consultation with a letter to the DOD on September 27, 2012. The DOD responded on December 6, 2012, concluding the project would have minimal impact on the military operations conducted in this area and would not oppose construction of the project.

The CZMA calls for the "effective management, beneficial use, protection, and development" of the nation's coastal zone and promotes active state involvement in achieving those goals. As a means to reach those goals, the CZMA requires participating states to develop management programs that demonstrate how those states will meet their obligations and responsibilities in managing their coastal areas. In Louisiana, the LDNR administers the Coastal Zone Management Program (CZMP). Trunkline initiated consultation with the LDNR on March 7, 2014 for the Natural Gas Pipeline Company of

America (NGPL)–Lakeside and Kinder Morgan–Lake Charles Meter Stations, and submitted an application for a Coastal Use Permit (CUP) for the NGPL–Lakeside Meter Station on April 21, 2014. In an August 27, 2014 letter, the LDNR stated that the proposed work at the NGPL–Lakeside Meter Station would have no direct and significant impact on coastal waters and that the Kinder Morgan–Lake Charles Meter Station is exempt; therefore, neither facility would require a CUP. The liquefaction facility is not within the CZMP. The CZMP is discussed further in section 4.8.6.

The CAA was enacted by the U.S. Congress to protect the health and welfare of the public from the adverse effects of air pollution. The CAA is the basic federal statute governing air pollution. Federal and state air quality regulations established as a result of the CAA include, but are not limited to, Title V operating permit requirements and Prevention of Significant Deterioration (PSD) Review. The EPA is the federal agency responsible for regulating stationary sources of air pollutant emissions; however, the federal permitting process has been delegated to the LDEQ in Louisiana. The initial air permit application for the liquefaction facility was filed in December 2013; a revised application was filed on July 31, 2014 incorporating updated project information and LDEQ comments. The air permit applications for Compressor Station 203-A and the Longville Compressor Station were filed in December 2014. No amendment to the existing air permit for the Shaw Compressor Station would be required; a notification letter would be submitted at least 7 days prior to modifying the facility. Air quality impacts that could occur as a result of construction and operation of the project are evaluated in section 4.11.1 of this EIS.

Lake Charles LNG and Trunkline are responsible for all permits and approvals required to implement the Lake Charles Liquefaction Project, regardless of whether they appear in table 1.5-1. However, any state or local permits issued with respect to jurisdictional facilities must be consistent with the conditions of any authorization the Commission may issue. Although the FERC encourages cooperation between applicants and state and local authorities, this does not mean that state and local agencies, through application of state and local laws, may prohibit or unreasonably delay the construction or operation of facilities approved by the FERC.[5]

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[5] See, e.g., Schneidewind v. ANR Pipeline Co., 485 U.S. 293 (1988); National Fuel Gas Supply v. Public Service Commission, 894 F.2d 571 (2d Cir. 1990); and Iroquois Gas Transmission System, L.P., et al., 52 FERC ¶ 61,091 (1990) and 59 FERC ¶ 61,094 (1992).

2.0 PROPOSED ACTION

The Lake Charles Liquefaction Project consists of two main components:

1. development of natural gas liquefaction and LNG export capabilities through construction of a new liquefaction facility and modifications to the existing Trunkline LNG Terminal in Calcasieu Parish, Louisiana; and

2. the construction of facilities necessary to provide natural gas supplies to the proposed liquefaction facility, including two new pipelines, a new compressor station, five new meter stations, and modifications to existing pipeline facilities, compressor stations, and meter stations (collectively, Non-Liquefaction Facilities).

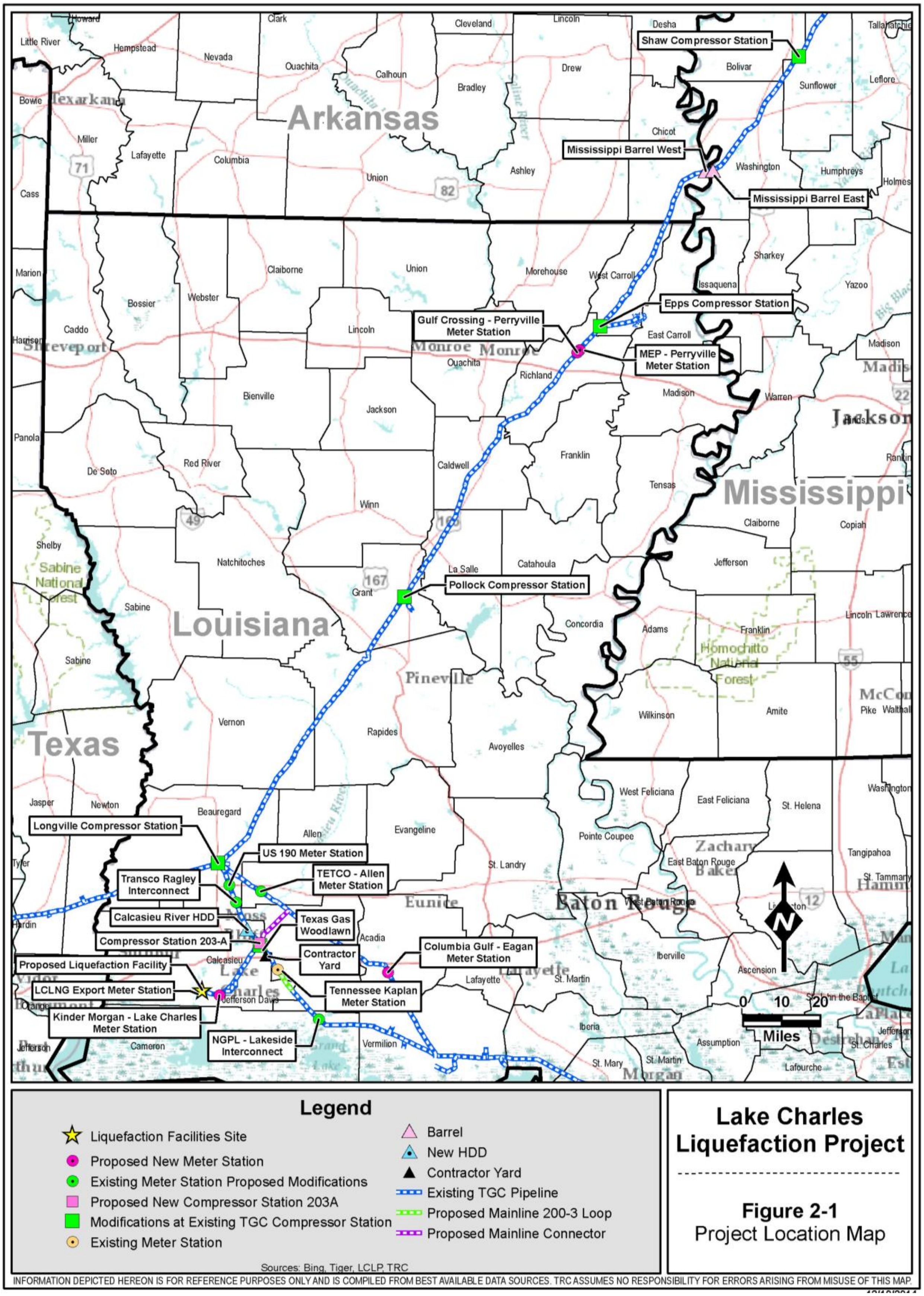
Figure 2-1 depicts the general location of the Lake Charles Liquefaction Project. Figure 2-2 depicts the locations of the proposed liquefaction facility and existing LNG terminal. Figure 2-3 shows the locations of the Mainline Connector and Mainline 200-3 Loop Pipelines. Larger-scale route maps of the pipelines and maps of the other Non-Liquefaction Facilities are provided in appendix C.

2.1 EXISTING FACILITIES

2.1.1 Trunkline LNG Terminal

The existing Trunkline LNG Terminal is located about 9 miles southwest of Lake Charles, Louisiana on the north side of the Industrial Canal, which is accessed via the Calcasieu Ship Channel. The terminal was authorized on April 29, 1977 to regasify and transport natural gas imported to the United States from foreign markets (Trunkline LNG Company, LLC, 2014). The terminal received the first LNG deliveries in 1982; however, deliveries were suspended in 1983 due to market conditions. LNG deliveries resumed in 1989. On December 18, 2002, the Commission authorized expansions of the Trunkline LNG Terminal to include a fourth storage tank, a second unloading dock, appurtenances, and support facilities to increase vaporization services and a peak sendout capacity of 2.1 Bcf/d. On April 5 and July 8, 2006, these additional facilities were placed into service to bring the peak sendout capacity to 2.1 Bcf/d as authorized. On December 26, 2006, the Commission authorized ambient air vaporization and natural gas liquids processing facilities (IEP Project), which were placed into service on March 11, 2010, having no effect on the sendout capacity authorized for the terminal.

A maximum of 225 LNG carriers per year are currently authorized to import or export LNG at the terminal's two existing marine berths at a rate of up to 12,000 cubic meters (m^3) per hour per carrier over an approximate 24-hour period. LNG carriers destined for the terminal are escorted from the pilot boarding area, about 30 miles offshore of Louisiana (CC Buoy), across the gulf to the terminal via the Calcasieu Ship Channel and Industrial Canal, and into the Turning Basin to complete berthing of the vessel. The average frequency of LNG carriers that could call on the terminal is about one carrier every 1.5 days.



Lake Charles Liquefaction Project

Figure 2-1
Project Location Map

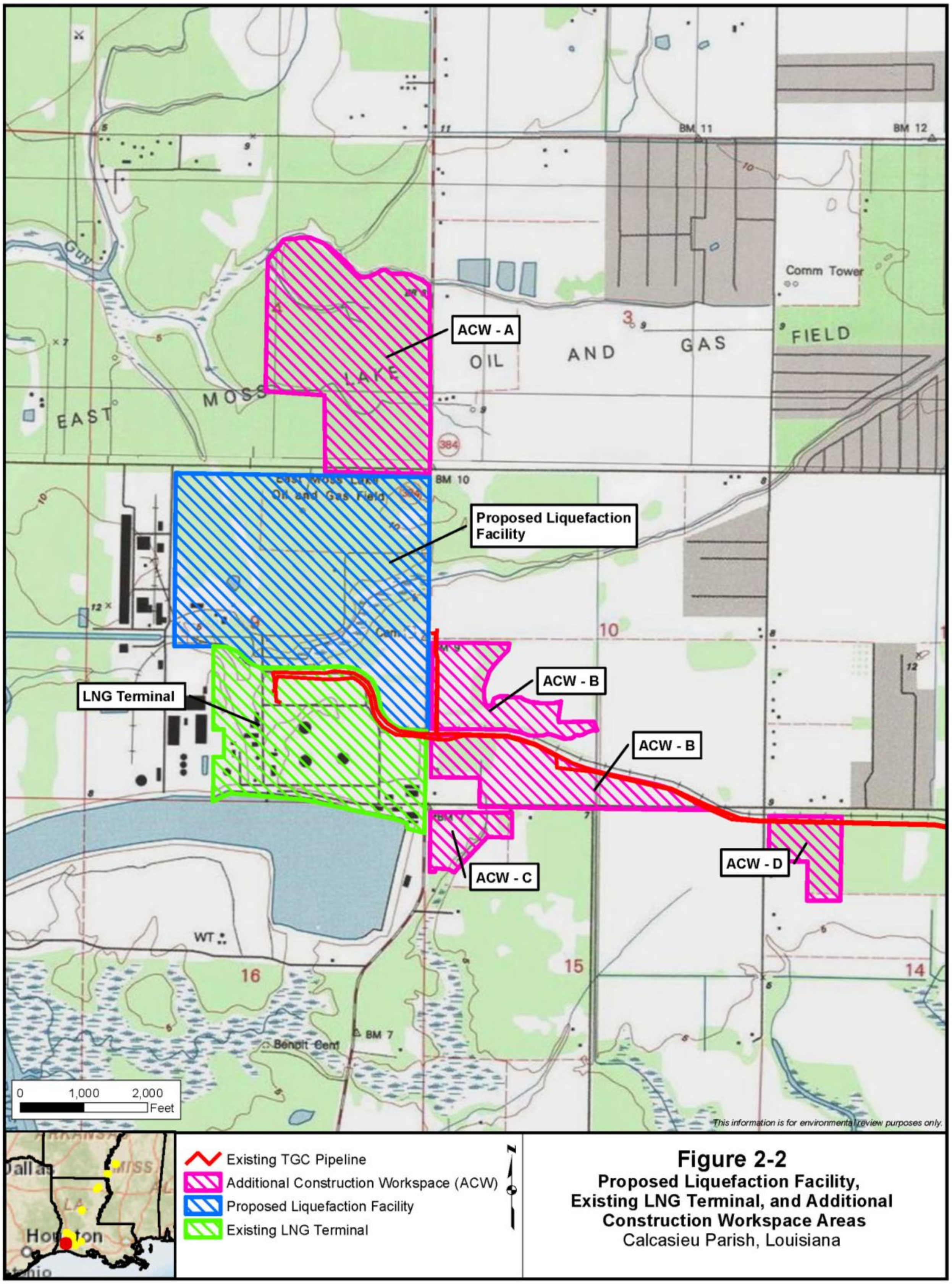


Figure 2-2
Proposed Liquefaction Facility, Existing LNG Terminal, and Additional Construction Workspace Areas
Calcasieu Parish, Louisiana

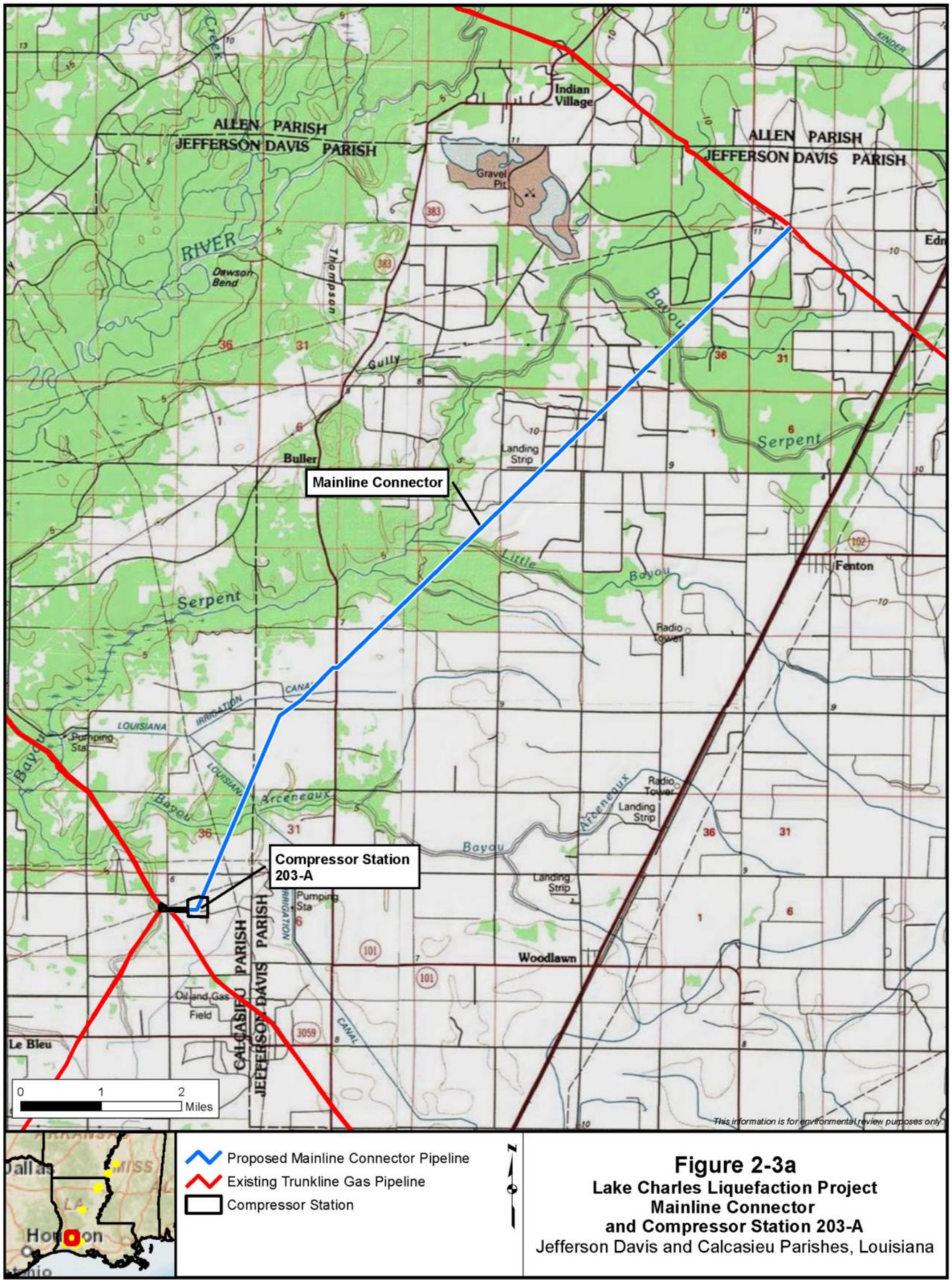


Figure 2-3a
Lake Charles Liquefaction Project
Mainline Connector
and Compressor Station 203-A
Jefferson Davis and Calcasieu Parishes, Louisiana

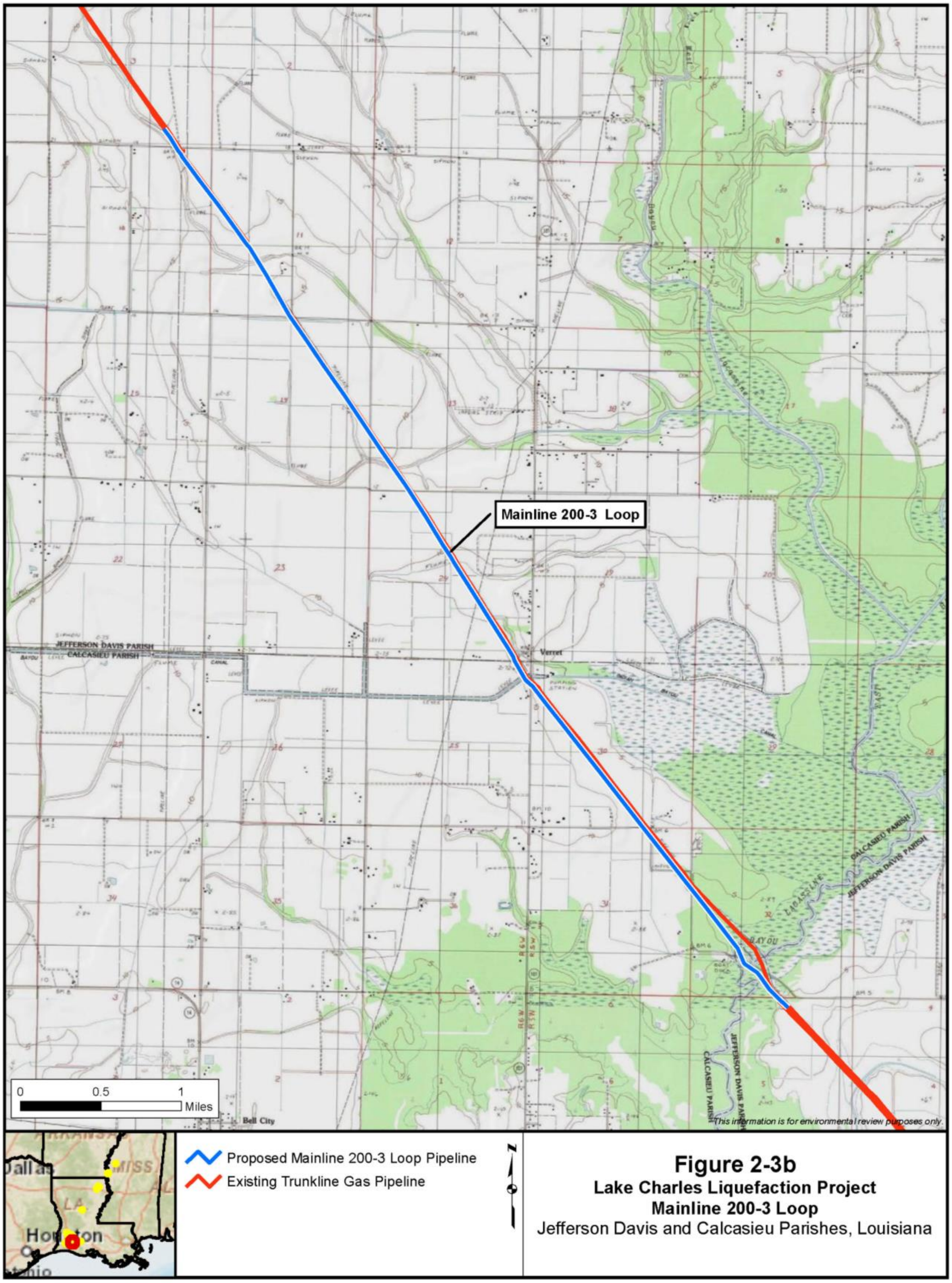


Figure 2-3b
Lake Charles Liquefaction Project
Mainline 200-3 Loop
Jefferson Davis and Calcasieu Parishes, Louisiana

The existing Trunkline LNG Terminal includes the following major facilities:

- two shipping berths (east dock and west dock), each equipped with mooring and breasting dolphins. Each dock contains four liquid loading arms and one vapor return arm; one arm on each dock serves as a hybrid arm that can be used for liquid loading or vapor return;
- four LNG storage tanks: three with a capacity of 95,000 m^3 and one with a capacity of 140,000 m^3, for a total combined capacity of 425,000 m^3;
- LNG sendout facilities, including 12 pumps, 14 vaporizers, and 2 boil-off gas compressors;
- hazard detection, control, and prevention systems, cryogenic piping and insulation, and electrical and instrumentation systems;
- a firewater system;
- a natural gas liquids recovery system; and
- ancillary utilities, buildings, and service facilities.

2.1.2 Non-Liquefaction Facilities

Trunkline owns and operates a natural gas interstate transmission system that extends from its historical supply sources in Texas and Louisiana through Arkansas, Mississippi, Tennessee, Kentucky, and Illinois to a terminus at the Indiana–Michigan state line near Elkhart, Indiana. Trunkline's pipeline system includes a 30-inch-diameter pipeline and an adjacent 36-inch-diameter looping pipeline that connect the existing LNG terminal to the mainline transmission system used for sendout capacity from the terminal (FERC, 2005). Trunkline's pipeline system includes several appurtenant facilities including compressor stations, meter stations, and interconnections with several other natural gas transmission pipelines.

2.2 PROPOSED FACILITIES

2.2.1 Liquefaction Facility, LNG Terminal Modifications, and Additional Construction Workspaces

2.2.1.1 Liquefaction Facility

The new liquefaction facility would be constructed immediately south of W. Tank Farm Road, west of Big Lake Road, and north of the existing LNG terminal in Calcasieu Parish, Louisiana. The new facility would include the following key components:

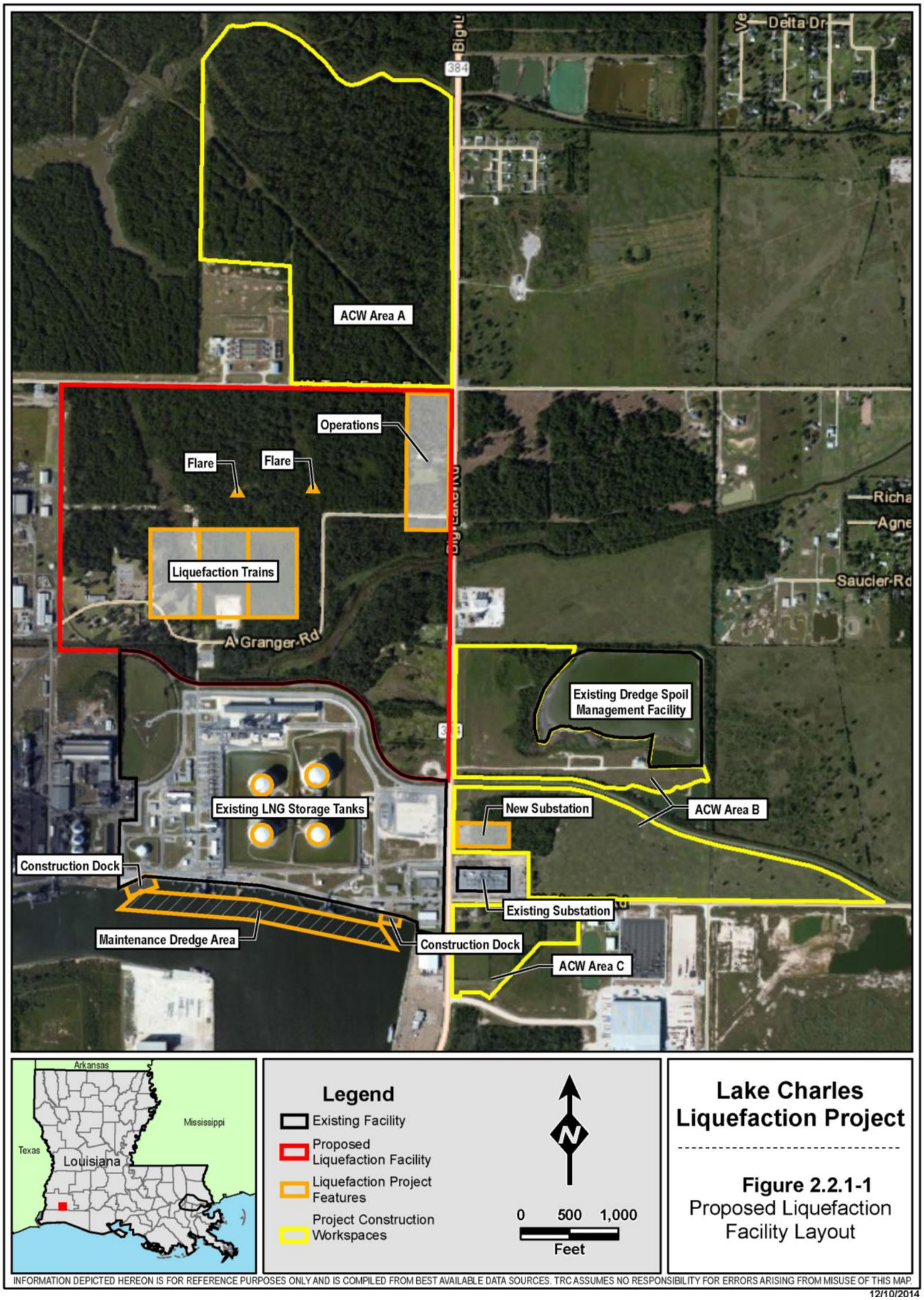
- gas treatment units and heavy hydrocarbon removal units, one for each liquefaction train, each consisting of a fractionation unit, acid gas removal unit, gas dehydration unit, and a mercury removal unit;
- three liquefaction trains, each with a production capacity sufficient to produce 5.48 MTPA of LNG for export;

- refrigerant storage and makeup system for all three liquefaction trains consisting of horizontal storage bullets holding refrigerants (ethane and propane);
- nitrogen generation and distribution system;
- boil-off gas system consisting of compressors to handle boil-off gas in the facility;
- fuel gas system to provide high-pressure gas to the refrigerant gas turbine drivers and low-pressure gas to the flare systems, heaters, and thermal oxidizers;
- hot oil system providing high-temperature oil for the regeneration gas heater and low-temperature oil for all other services;
- flare system, including include seven flares on three derrick structures;
- hazard detection system;
- firewater and fire protection system;
- instrument and utility air system for supplying instrumentation and control systems and for powering tools and equipment used in the operation and maintenance of the liquefaction facilities;
- service water supply system providing service water to the utility station, demineralized water treatment package, glycol water system, chilled glycol water system, and firewater system;
- demineralized water supply system providing demineralized water for the operation of the amine unit;
- potable water service and supply system; and
- emergency power systems consisting of diesel-fueled standby generators.

Figure 2.2.1-1 shows the layout of the proposed liquefaction facility. Additional information about some of the key facilities and processes is provided below.

Trains, Utilities, and Systems

Trunkline's existing pipelines, proposed new pipelines and facilities, and proposed modifications to the existing pipelines and facilities (see section 2.2.2) would transport natural gas (feed gas) to the liquefaction facility. Feed gas would be supplied to the liquefaction trains via a 48-inch-diameter feed gas pipeline from the Lake Charles LNG Export Meter Station (LCLNG Export Meter Station). The gas would be cooled into a liquid at the liquefaction facility, then conveyed to the existing storage tanks at the LNG terminal via an LNG rundown line and loaded onto LNG carriers at the existing terminal docks.



Delta Dr
384
ACW Area A
Operations
Flare
Flare
Richa
Agne
Saucier Rd
Liquefaction Trains
A Granger Rd
Big Lake Rd
Existing Dredge Spoil Management Facility
Existing LNG Storage Tanks
New Substation
ACW Area B
Construction Dock
Existing Substation
Maintenance Dredge Area
Construction Dock
ACW Area C
Arkansas
Mississippi
Texas
Louisiana
Legend
Existing Facility
Proposed Liquefaction Facility
Liquefaction Project Features
Project Construction Workspaces
N
0 500 1,000
Feet
Lake Charles Liquefaction Project
Figure 2.2.1-1
Proposed Liquefaction Facility Layout
INFORMATION DEPICTED HEREON IS FOR REFERENCE PURPOSES ONLY AND IS COMPILED FROM BEST AVAILABLE DATA SOURCES. TRC ASSUMES NO RESPONSIBILITY FOR ERRORS ARISING FROM MISUSE OF THIS MAP.
12/10/2014

The proposed liquefaction facility would consist of three liquefaction trains, with each train containing a natural gas pre-treatment system, including a heavy hydrocarbon removal unit, a fractionation unit, an acid gas removal unit, a gas dehydration unit, and a mercury removal unit. Before liquefaction, the feed gas would be pre-treated for removal of mercury to prevent corrosion of aluminum equipment, removal of carbon dioxide and sulfur compounds, and reduction of water to allow operation of the cryogenic heat exchanger. The fractionation unit would remove benzene and aromatics with heavy components from the feed gas to prevent freezing during the cryogenic processes. Ethane would be recovered for use as mixed refrigerant in the refrigerant storage and makeup systems. The stabilized condensate product, including extracted pentane and heavier hydrocarbons, would be air cooled and routed to the stabilized condensate storage tanks.

After the pre-treatment process, the liquefaction process would cool and condense the natural gas into a liquid at –260 degrees Fahrenheit. The primary components involved in the liquefaction process include the main cryogenic heat exchanger, refrigerant systems, and the end flash gas system. Liquefaction utility components would include a boil-off gas system, fuel gas system, hot oil system, flares, instrument and utility air systems, service water supply systems, a demineralization water supply system, hazard detection, and firewater protection systems, and emergency (backup) power systems. The liquefaction process would generate boil-off gas from the transfer of heat in system components that would be diverted to boil-off gas compressors. The fuel gas system would receive compressed boil-off gas, and excess boil-off gas would be recycled back through the liquefaction process.

Power Generation

To provide electrical power to the liquefaction facility, Entergy would build an approximately 19-mile-long, 230-kV electric transmission line in Calcasieu Parish, Louisiana. The line would originate at Entergy's existing Nelson Substation and would connect to a new Entergy substation to be constructed adjacent to and north of the existing Graywood Substation at the LNG terminal (see figure 2.2.1-1 and appendix B). The electric transmission line would be a non-jurisdictional facility, as discussed in sections 1.4 and 4.13 (cumulative impacts). Four 4,000-kilowatt (kW), stand-by diesel generators would provide emergency backup power to all systems.

LCLNG Export Meter Station

The proposed LCLNG Export Meter Station would be constructed in the southeast portion of the proposed liquefaction facility. The existing meter station at the LNG terminal, located in the northwest portion of the facility where the existing natural gas pipelines enter the terminal, would remain.

Associated Infrastructure

Existing roads would be used to access the proposed liquefaction facility site during construction; no new access roads would be required. Two roads within the existing LNG terminal would be installed/upgraded, including a heavy haul road leading from the west construction dock to the liquefaction facility and a medium haul road for transporting materials and equipment from the east construction dock to the liquefaction facility. Roads would be developed within the construction site during site preparation/construction, which would later comprise the operational road network for the site.

2.2.1.2 Modifications to the Existing Trunkline LNG Terminal

The proposed modifications to facilities at the existing Trunkline LNG Terminal include:

- installation of larger in-tank LNG pumps;
- replacement of LNG loading arms at the west dock;
- modifications to boil-off compression and handling systems;
- expansion and integration of electrical systems;
- installation of LNG rundown lines from the liquefaction area to the LNG storage tanks;
- expansion and integration of security system;
- integration of control and emergency showdown systems;
- expansion and integration of telecommunication system;
- installation of larger vapor return pipeline from each dock to the LNG tanks;
- installation of a marine flare;
- addition of mooring dolphins and breasting dolphins at west dock and breasting dolphins at east dock; and
- construction of temporary construction docks (TCD), including dredging with disposal onshore.

Lake Charles LNG indicates that these modifications are required to facilitate the storage and subsequent export of LNG using the existing storage, piping, and docking facilities at the LNG terminal. The proposed modifications would also expand and integrate existing electrical, security, telecommunications, and emergency shutdown systems to accommodate the new and modified facilities. The modifications to the existing LNG terminal would occur within the existing fenced facility (see figure 2.2.1-1).

2.2.1.3 Additional Construction Workspaces

Construction of the liquefaction facility and LNG terminal modifications would require the use of four temporary additional construction workspaces (ACW) located north and east of the liquefaction facility and LNG terminal. The ACWs would be used for a variety of purposes such as material and equipment storage, temporary field offices, parking, and fabrication and staging activities.

2.2.2 Non-Liquefaction Facilities

Trunkline proposes to construct and operate the Non-Liquefaction Facilities described below to increase the volume of natural gas able to be delivered to the liquefaction facility from 1.2 Bcf/d to the required 2.6 Bcf/d, enable bi-directional (north–south) flow capability in the pipeline system, and increase access to new natural gas supplies.

2.2.2.1 Proposed New Pipelines

Mainline Connector

Trunkline proposes to construct and operate a new 11.4-mile-long, 42-inch-diameter natural gas greenfield pipeline from mainline valve (MLV) 303-A in Jefferson Davis Parish, Louisiana on the Kaplan 300 pipeline to MLV 203-A and proposed Compressor Station 203-A in Calcasieu Parish, Louisiana on the Kaplan 200 pipeline (see figure 2-3.a and appendix C). Bi-directional pigging facilities (launchers/receivers)[1] would be installed at the origin and terminus of the proposed Mainline Connector.

Mainline 200-3 Loop

Trunkline proposes to construct and operate a new 6.5-mile-long, 24-inch-diameter natural gas looping pipeline from MLV 205 to MLV 204A on the Kaplan 200 pipeline (see figure 2-3.b and appendix C). The pipeline loop would start and end in Jefferson Parish, Louisiana, and cross a portion of Calcasieu Parish, Louisiana. The new loop line would be offset 25 feet from the adjacent existing pipeline. Bi-directional pigging facilities would be installed at the north end of the loop at MP 182.5 and at the NGPL–Lakeside Meter Station at MP 165.6.

2.2.2.2 Proposed Pipeline Modifications

Mainline 100-3 Modifications

Trunkline proposes to construct and modify launcher/receiver barrels at existing facilities on Trunkline's 100 pipeline system in Washington County, Mississippi and Chicot County, Arkansas. These modifications would enable bi-directional flow on the pipeline system.

Mainline 200-1 Modifications

The proposed Mainline 200-1 modifications include the removal of a check meter at the existing U.S. 190 Meter Station and replacement of MLV 202 at the Transco Ragley Meter Station, both in Beauregard Parish, Louisiana, as well as replacement of a 100-foot section of overhead pipeline with a same-length section of underground pipeline installed via conventional methods at the Texas Gas–Woodlawn Meter Station in Calcasieu Parish, Louisiana. These modifications would facilitate flow on the system and help meet the required throughput and demand for the project.

In addition, the Mainline 200-1 modifications would include the replacement of an approximately 2,867-foot-long segment of the existing 200-1 pipeline at the Calcasieu River crossing in Calcasieu Parish. The replacement segment would be constructed beneath the river using the horizontal directional drill (HDD) crossing method. The original river crossing segment would be abandoned in place and taken out of service.

2.2.2.3 Aboveground Facilities

Compressor Station 203-A

Trunkline proposes to construct and operate a new compressor station near MLV 203-A on Trunkline's Mainline 200 system in Calcasieu Parish, Louisiana (see figure 2-3.b and appendix C). Compressor Station 203-A would include 10 natural gas-driven compressor units, including

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[1] A pipeline "pig" is a device used to clean or inspect the pipeline. A pig launcher/receiver is an aboveground facility where pigs are inserted or retrieved from the pipeline.

5 Mars 100 units, and 5 Caterpillar G3616 units, for a total of 98,685 hp. The compressor station facility would include two compressor buildings, gas coolers, above- and belowground piping, auxiliary and control buildings, a backup power system (generator), and an office building and utilities.

Longville Compressor Station

Trunkline proposes to replace one Allison 500 Unit 4521 (3,000 hp) with a new Mars 100 natural gas-driven compressor unit (15,002 hp) at the existing Longville Compressor Station in Beauregard Parish, Louisiana (see figure 2-1 and appendix C). This would result in a station total of 48,752 hp. Modifications of piping and appurtenances at the facility would also be required to increase the flow capacity and enable bi-directional flow on the pipeline system. Trunkline would also install a 4,200-gallon lube oil storage tank.

Pollock, Epps, and Shaw Compressor Stations

Trunkline proposes to install and modify piping and appurtenant facilities at the existing Pollock (Grant Parish, Louisiana), Epps (West Carroll Parish, Louisiana), and Shaw (Bolivar County, Mississippi) Compressor Stations (see figure 2-1 and appendix C). Modifications at these facilities would allow bi-directional flow on the pipeline system. Modifications at the Shaw Compressor Station would also include installation of a scrubber/separator with a 10,000-gallon storage tank.

Meter Stations

Trunkline proposes to construct the following five new meter stations in Louisiana:

- the LCLNG Export Meter Station in the southeast corner of the liquefaction facility in Calcasieu Parish;
- the Kinder Morgan–Lake Charles Meter Station at the intersection of the Trunkline laterals and the Kinder Morgan pipeline in Calcasieu Parish;
- the Gulf Crossing–Perryville Meter Station at the intersection of Mainline 100-3 and the Gulf Crossing Pipeline in Richland Parish;
- the Midcontinent Express Pipeline (MEP)–Perryville Meter Station at the intersection of Mainline 100-3 and the MEP pipeline in Richland Parish; and
- the Columbia Gulf–Egan Meter Station near the intersection of the Kaplan 300 Line and the Columbia Gulf Transmission Pipelines in Acadia Parish.

In addition to metering equipment, each meter station would include a remote terminal unit building and an emergency generator typically sized at about 25 kW.

Additionally, Trunkline proposes to modify the NGPL–Lakeside, TETCO–Allen, Texas Gas–Woodlawn, Tennessee Kaplan, and Transco Ragley Meter Stations. The proposed modifications include installing upgraded equipment, increasing receipt/delivery points, and enabling bidirectional flow.

The new and modified meter stations would increase Lake Charles LNG's and Trunkline's access to natural gas supply by interconnecting with new supplies and increasing throughput capacity at existing interconnects.

2.3 LAND REQUIREMENTS

Lake Charles LNG and Trunkline would require about 1,522.2 acres of land and open water for construction of the project (see table 2.3-1). Operation of the project, including the modified existing facilities and the proposed new facilities, would require a total of about 838.6 acres, of which 436.0 acres would be maintained as new permanent right-of-way or new aboveground facility area, and 402.6 acres would consist of existing facilities and right-of-way. About 358.4 acres of temporary workspace would revert to preconstruction use and condition, while the 325.2 acres of temporary ACW to be used during construction of the liquefaction facility would be permanently affected as discussed in section 2.6.1.5. See section 4.8 for more detailed information regarding land uses affected by the project.

2.3.1 Liquefaction Facility, LNG Terminal, and Additional Construction Workspaces

Construction of the new liquefaction facility and modifications to the existing LNG terminal would require about 762.9 acres of land, including 285.9 acres for the new liquefaction facility; the existing 151.8-acre LNG terminal; and 325.2 acres of ACWs. Additionally, construction of the TCDs and berth modifications would require dredging of 22.1 acres within the Industrial Canal. During operation, the new liquefaction facility would permanently occupy the entire 285.9-acre site. Operations at the existing LNG terminal would continue to occur within the current facility boundaries (i.e., the project would not result in an increase in the existing terminal area).

Lake Charles LNG indicated that the ACW property owners do not want the land returned to present conditions because the fact that these sites would be cleared and slightly elevated makes them more suitable for future use and development. Additionally, since compacted fill material would be distributed across the whole of each ACW and construction would continue for about 5 years, successful broad-scale restoration to previous conditions would be difficult, time consuming, and costly. Therefore, although Lake Charles LNG would not retain the ACWs for operation of the project facilities in accordance with landowner agreements, these areas would not be restored to preconstruction conditions (see section 2.6.1.5). Due to the type and duration of disturbance required for project construction, impacts on the ACWs would likely be permanent.

2.3.2 Non-Liquefaction Facilities

Construction of the Non-Liquefaction Facilities would require a total of about 737.1 acres of land and open water. In addition to the 250.8 acres of land that are already within the operational boundaries of existing Trunkline facilities to be modified or used temporarily for construction, operation of the new and modified Non-Liquefaction Facilities would require 150.1 acres of newly affected land.

2.3.2.1 New and Modified Pipeline Facilities

Construction and Permanent Right-of-Way

Trunkline generally proposes to construct the 42-inch-diameter Mainline Connector within a 125-foot-wide construction right-of-way, which would affect about 150.9 acres (the construction right-of-way width would be reduced within wetlands as discussed in section 2.6.3.2). Following construction of the Mainline Connector, a 50-foot-wide permanent easement would be retained during operation of the pipeline, encompassing 67.8 acres.

TABLE 2.3-1

Land and Open Water Requirements for the Proposed Lake Charles Liquefaction Project (in acres)[a]

Facility	Total Construction Land Requirements[b]	Operational Land Requirements: Existing Facility Footprint/ Right-of-Way	Operational Land Requirements: New Facility Footprint/ Right-of-Way[c]
LIQUEFACTION FACILITY, LNG TERMINAL, AND ACWs			
LNG terminal	151.8	151.8	0
Dredge area	22.1	0.0	0.0
Liquefaction facility	285.9	0.0	285.9
ACWs	325.2	0.0	0.0
Liquefaction Facility, LNG Terminal, and ACWs Total	**785.0**	**151.8**	**285.9**
NON-LIQUEFACTION FACILITIES			
New Pipelines			
Mainline Connector			
Right-of-way	150.9	0.0	67.8
Additional temporary workspace (ATWS)	43.3	0.0	0.0
Access Roads	49.9	0.0	0.0
Subtotal	**244.1**	**0.0**	**67.8**
200-3 Loop			
Right-of-way	54.4	16.6	22.7
ATWS	36.5	0.0	0.0
Access Roads	10.4	0.0	0.0
Subtotal	**101.3**	**16.6**	**22.7**
Pipeline Modifications			
Mainline 100-3 Modifications			
Mississippi Barrel East	2.0	2.0	0.0
Mississippi Barrel West	1.6	1.6	0.0
Subtotal	**3.6**	**3.6**	**0.0**
Mainline 200-1 Modifications			
Calcasieu River HDD			
Right-of-way and ATWS	36.1	0.1	2.4
Access Roads	27.6	0.0	0.0
U.S. 190 Meter Station			
Existing facility	0.3	0.3	0.0
ATWS	0.9	0.0	0.0
Access Roads	<0.1	0.0	<0.1
100-foot overhead crossing replacement[d]	0.0	0.0	0.0
MLV 202[e]	0.0	0.0	0.0
Subtotal	**64.9**	**0.4**	**2.4**
Contractor Yard	**20.8**	**0.0**	**0.0**
Compressor Stations			
203-A[f] (new)	46.6	1.0	45.6
Longville (existing)	44.5	44.5	0.0
Pollock (existing)	78.4	78.4	0.0
Epps (existing)	41.9	41.9	0.0
Shaw (existing)	62.9	62.9	0.0
Subtotal	**274.3**	**228.7**	**45.6**

TABLE 2.3-1 (cont'd) **Land and Open Water Requirements for the Proposed Lake Charles Liquefaction Project (in acres)** [a]			
		Operational Land Requirements	
Facility	Total Construction Land Requirements [b]	Existing Facility Footprint/ Right-of-Way	New Facility Footprint/ Right-of-Way [c]
Meter Stations			
LCLNG Export[g] (new)	0.0	0.0	0.0
Kinder Morgan–Lake Charles (new)	2.4	0.0	1.5
Columbia Gulf–Egan[f] (new)	4.6	0.0	2.7
NGPL–Lakeside[f] (existing)	3.2	0.3	0.3
TETCO–Allen[f] (existing)	4.8	0.3	2.4
Gulf Crossing–Perryville[f] (new)	3.2	0.0	1.4
MEP–Perryville[f] (new)	5.5	0.0	3.2
Texas Gas–Woodlawn[f] (existing)	2.3	0.2	0.0
Tennessee–Kaplan[h] (existing)	0.0	0.0	0.0
Transco Ragley[f] (existing)	2.1	0.7	0.1
Subtotal	**28.1**	**1.5**	**11.6**
Non-Liquefaction Facilities Total	**737.1**	**250.8**	**150.1**
PROJECT TOTAL	**1,522.2**	**402.6**	**436.0**

[a] The totals shown in this table may not equal the sum of addends due to rounding.
[b] Total construction land requirements include both temporary and permanent work areas.
[c] New operational land requirements include only new or additional facility areas or pipeline right-of-way resulting from the project.
[d] Land required for the 100-foot overhead crossing replacement is accounted for in the requirements for the Texas Gas–Woodlawn Meter Station.
[e] Land required for the MLV 202 replacement is accounted for in the requirements for the Transco Ragley Meter Station.
[f] Includes temporary and permanent access road impacts.
[g] Land required for the LCLNG Export Meter Station, which would be located within the liquefaction facility site, is accounted for in the liquefaction facility requirements.
[h] Land required for the Tennessee–Kaplan Meter Station modifications, which would be located at the origin of the Mainline 200-3 Loop, is accounted for with the Mainline 200-3 Loop requirements.

Construction of the 24-inch-diameter Mainline 200-3 Loop would require a 75-foot-wide construction right-of-way that would overlap the existing right-of-way by 25 feet and affect a total of 54.4 acres. A 50-foot-wide permanent easement would be retained during operation of the Mainline 200-3 Loop; however, 25 feet of the easement would overlap the adjacent pipeline's existing permanent easement. In total, 39.3 acres would be required for operation of the Mainline 200-3 Loop, of which 22.7 acres would be new permanent right-of-way and 16.6 acres would be existing right-of-way.

Construction and operation of the Mainline 100-3 modifications at the Mississippi River barrel sites would be conducted entirely within the existing facility footprints, consisting of a total of 3.6 acres.

Construction of the Mainline 200-1 modifications would require a total of 64.9 acres. Construction of the U.S. 190 Meter Station modifications would require 1.2 acres of land, including the 0.3-acre existing facility site and about 0.9 acre of temporary workspace, as well as a less than 0.1-acre new, permanent access road. Following construction, the temporary workspace would revert to preconstruction condition and operation of the modified facility would occur within the existing 0.3-acre site. The 100-foot overhead crossing replacement and MLV 202 replacement would take place within the Texas Woodlawn and Transco Ragley Meter Station sites, respectively, and would not require additional temporary or permanent workspace.

Additional Temporary Workspace

Trunkline proposes to use 79.8 acres of additional temporary workspace (ATWS) at road, wetland, and waterbody crossings to provide extra space for construction activities and storage of excavated materials during construction of the Mainline Connector and Mainline 200-3 Loop.

Although Trunkline has identified areas where ATWS would be required, additional or alternative ATWS could be identified in the future due to site-specific construction requirements. Examples of locations where other ATWS could potentially be requested include:

- pipe stringing truck and other equipment turnaround areas;
- existing pipeline, utility line, drain tile, and irrigation system crossings;
- steep side slopes to create level working areas; and
- full right-of-way topsoil segregation areas.

Trunkline would be required to file information on each of these areas for our review and approval prior to use.

Access Roads

Trunkline would use 37 temporary access roads during construction of the new and modified pipeline facilities, including 17 for the Mainline Connector, 12 for the Mainline 200-3 Loop, and 8 for the Calcasieu River HDD, which together would total about 87.9 acres. Access roads would typically be no more than 30 feet wide. Three of the access roads would be new roads constructed in open or agricultural land; the remainder are existing dirt paths or roads. Grading, graveling, side vegetation trimming, and/or deployment of construction mats would possibly be required to improve the roads for project use based on site-specific conditions at the time of construction. Access roads are discussed in more detail in section 4.8.1.2.

Contractor Yard

Trunkline would use one 20.8-acre site as a contractor yard during construction (see appendix C). This site was previously used for industrial/commercial purposes. Contractor yards are typically used during construction for storage of pipe, equipment, and other materials, as well as staging and other contractor activities. Following construction of the project, the contractor yard would be allowed to revert to preconstruction condition and use.

2.3.2.2 Aboveground Facilities

Construction of the proposed aboveground facilities and facility modifications (compressor and meter stations) would affect a total of 302.4 acres of land and open water. About 57.2 acres of new land would be required for operation of the new and expanded facilities. The remaining land includes about 230.2 acres of existing facility sites and about 15.0 acres of temporary workspace and temporary access roads. The temporary construction areas would be restored and allowed to revert to preconstruction condition and use.

Construction of new permanent access roads would be required for Compressor Station 203-A and the TETCO–Allen, Columbia Gulf–Egan, Gulf Crossing–Perryville, MEP–Perryville, and Transco Ragley Meter Stations. Acreage for the permanent access roads is included in the construction and operation land requirements shown for the respective facilities in table 2.3-1. The existing road leading to the NGPL–Lakeside Meter Station would also be used during construction; however, no improvements to the road would be required.

Operation of Compressor Station 203-A would require all of the 46.6 acres used during construction. No additional land would be required for operation of the modified facilities at the Longville, Pollock, Epps, and Shaw Compressor Stations. The LCLNG Export Meter Station would be constructed and operated within the liquefaction facility site and would not require additional land. The combined new land requirements associated with operation of the Kinder Morgan–Lake Charles, Columbia Gulf–Egan, NGPL–Lakeside, TETCO–Allen, Gulf Crossing–Perryville, and MEP–Perryville Meter Stations would be 11.6 acres. No additional land would be required for operation of the modified facilities within the Texas Gas–Woodlawn and Transco Ragley Meter Stations except for a 0.1-acre new permanent access road at the latter. Land requirements for the Tennessee-Kaplan Meter Station are included in the Mainline 200-3 Loop.

2.4 CONSTRUCTION SCHEDULE

Assuming receipt of all certifications, authorizations, and necessary permits, Lake Charles LNG anticipates starting construction of the liquefaction facility and modifications to the existing LNG terminal in 2015, and placing the first new liquefaction train into service in 2019. The three liquefaction trains would be placed into service 6 months apart.

Assuming receipt of all certifications, authorizations, and necessary permits, Trunkline would begin construction of the Non-Liquefaction Facilities in 2017 and initiate service in late 2018.

2.5 ENVIRONMENTAL COMPLIANCE

2.5.1 Compliance Monitoring

The FERC may impose conditions on any Certificate or authorization it grants for the project. These conditions include additional requirements and mitigation measures recommended in this EIS to minimize the environmental impact that would result from construction and operation of the Lake Charles Liquefaction Project (see sections 4 and 5). We will recommend that these additional requirements and mitigation measures (bold type in the text of the EIS) be included as specific conditions to any approving Certificate or authorization issued for the project. We will also recommend to the Commission that Lake Charles LNG and Trunkline be required to implement the mitigation measures proposed as part of the project unless specifically modified by other Certificate or authorization conditions. Lake Charles LNG and Trunkline would be required to incorporate all environmental conditions and requirements of the FERC Certificate, authorization, and associated construction permits into the construction documents for the project.

Lake Charles LNG and Trunkline would employ environmental inspectors (EI) for the project, including one EI for the liquefaction facility and one EI for each of the pipeline spreads, one of which would also be responsible for Compressor Station 203-A. Additional EIs may be assigned as needed. At existing facilities, a qualified inspector may be assigned EI responsibilities and operational environmental personnel would likely assist in environmental compliance and inspection for the bi-directional modifications. For all other facilities (meter stations and mainline modifications) and depending on the final construction schedule, a dedicated EI may be assigned to roam between various project sites, the pipeline EIs may participate in inspection and oversight, and/or another qualified inspector may be assigned EI responsibilities with assistance from Trunkline operational staff. The responsibilities of the EIs are described in the 2013 FERC *Upland Erosion Control, Revegetation, and Maintenance Plan* (Plan) and *Wetland and Waterbody Construction and Mitigation Procedures* (Procedures).[2] The FERC Plan and Procedures are a set of construction and mitigation measures developed by FERC staff with input from

[2] The FERC Plan and Procedures can be viewed on the FERC website at http://www.ferc.gov/industries/gas/enviro/plan.pdf and http://www.ferc.gov/industries/gas/enviro/procedures.pdf, respectively.

other federal and state agencies, environmental consultants, inspectors, construction contractors, non-governmental organizations, and the natural gas pipeline industry to minimize the potential environmental impacts of the construction of pipeline projects in general.

The EIs' responsibilities would include verifying that environmental obligations, conditions, and other requirements of permits and authorizations for the project are met. The EIs would inspect construction and mitigation activities to verify environmental compliance and, if applicable, may also oversee cultural resource and/or biological monitors that monitor and evaluate construction impacts on resources as specified in this EIS.

Lake Charles LNG and Trunkline would conduct environmental training for the EIs to familiarize them with project-specific issues and requirements, and would provide separate training for contractor personnel to make them aware of the environmental requirements of the project. Additionally, Lake Charles LNG and Trunkline would incorporate environmental requirements and specifications in contractor bid documents, and would provide the contractors with copies of environmental permits, certificates, and clearances.

In addition to Lake Charles LNG's and Trunkline's environmental compliance activities, the FERC staff would conduct field inspections during construction. Other federal and state agencies may also conduct oversight or inspections to the extent determined necessary by the individual agency. After construction is completed, the FERC staff would continue to monitor the project area during operation of the project to verify successful restoration. Additionally, the FERC staff would conduct bi-annual engineering safety inspections of the liquefaction facility operations.

2.6 CONSTRUCTION PROCEDURES

The project would be constructed in accordance with the DOT Federal Safety Standards for Liquefied Natural Gas Facilities, 49 CFR 193, and the National Fire Protection Association (NFPA) 59A LNG Standards. All pipeline facilities would be designed, constructed, tested, operated, and maintained in accordance with the DOT regulations in 49 CFR 192. Lake Charles LNG and Trunkline would implement the FERC Plan and Procedures (with the exception of alternative measures where sufficiently justified), as well as all conditions resulting from the Certificate and other project permits. Lake Charles LNG and Trunkline would also implement their proposed project-specific plans and measures developed to avoid or minimize environmental impacts during construction, which are discussed throughout this EIS.

Lake Charles LNG and Trunkline requested several alternative measures to those specified in the FERC Procedures. The requested alternative measures and our evaluation and conclusions regarding these requests are provided in sections 4.3.2.2 and 4.4.3.

2.6.1 Liquefaction Facility and LNG Terminal Modifications

2.6.1.1 Site Preparation

The proposed liquefaction facility site and any staging, laydown, and storage areas that are currently undeveloped would be cleared, grubbed, filled, and graded to accommodate construction of the new liquefaction facility. In accordance with the FERC Plan, Lake Charles LNG would install temporary erosion controls immediately after initial soil disturbance to minimize erosion; these erosion controls would be maintained throughout construction. Materials removed from developed areas would be salvaged and/or disposed of in accordance with applicable laws and regulations.

The existing grade at the liquefaction facility site varies between 6.4 and 7.6 feet above mean sea level (AMSL). The liquefaction facility site would be built up to an elevation of 11 feet AMSL in areas with buildings or critical equipment (e.g., transformers, substations, switchgears, propane, or boil-off gas compressors, cryogenic heat exchangers). This 11-foot grade elevation is based on the 100-year flood plain elevation of 9 feet AMSL as recommended by the Federal Emergency Management Agency (FEMA), plus an additional 2 feet to compensate for sea level rise and area subsidence for a 25-year lifespan. Other areas would be elevated to 8 feet AMSL.

Lake Charles LNG would import local fill material from commercial operators in the vicinity of the project area.

2.6.1.2 Marine Construction – Temporary Construction Docks

Prior to installation of major facilities, Lake Charles LNG would construct two TCDs to facilitate delivery via barge of major equipment, plant pre-fabricated packages, main part of the bulks, commodities, and other materials necessary for the construction and commissioning of the liquefaction facility (see figure 2.2.1-1). The TCDs would consist of anchored steel sheetpile bulkheads that are backfilled to create a working platform for offloading materials and equipment. TCD 1, which would be located at the western limit of the facilities, would be a mixed-use dock with a quay width of 475 feet and a 250-foot clear linear distance behind the berth for package unloading. TCD 2, which would be located east of the last mooring dolphin at the existing east berth, would have a quay width of 200 feet and a 165-foot clear linear distance behind the berth for shipment unloading. Mooring dolphins and breasting dolphins would be modified at the existing west dock, and breasting dolphins would be added to the existing east dock.

The TCDs would be constructed using conventional waterborne marine construction equipment (e.g., barges, cranes, pile driving equipment) and shore-based construction equipment (e.g., backhoes, bulldozers). It is anticipated that steel sheet piles would first be installed waterward of the bank to allow the inner space to be backfilled with select structural fill. The anchorage system would be installed to provide restraining force from the active earth pressures. The surface features of the TCDs would be installed with the conventional shore-based equipment and would include a gravel working surface, curbing, etc. The dredging of the TCD areas would most likely involve the use of a cutter suction hydraulic dredge that would hydraulically pump the material to the existing dredged material disposal site northeast of the waterfront. Modification of the current banks of the Turning Basin would be disturbed by excavation and fill activities to assist with suitable anchoring and structural integrity of the TCDs.

Dredging volumes are estimated at 20,000 and 6,000 cubic yards for TCDs 1 and 2, respectively. The dredged material would be pumped through the dredge pipeline from the waterfront to the disposal area where it would be allowed to dewater through a conventional weir system that would then return the decanted water back to the Industrial Canal, meeting all water quality requirements. The dredged material would be tested prior to disposal. Best management practices would be employed during dredging and disposal activities.

The TCDs would have a design life of about 6 years. The procedures for demolition and removal of the TCDs would include removal of all surface features (curbing, gravel, etc.) and excavation of any backfill material to allow the anchor system to be removed prior to extraction of the steel sheetpiles. The shoreline would be restored by grading the slope to approximately the existing in-situ conditions. Shoreline protection would be reinstalled if needed. Impacts for removal would likely be minimal because most work would be completed from shore-based equipment.

2.6.1.3 Facility Foundations

For lightly loaded structures, Lake Charles LNG would use conventional spread footings/concrete slab and/or grade beam foundations bearing on properly compacted structural fill soils, which it would install at an elevation of 8 to 11 feet AMSL, matching the design of the existing LNG terminal. For flood risk purposes, the liquefaction facility site would be built up to an elevation of 11 feet AMSL in areas with buildings or critical equipment (e.g., transformers, substations, switchgears, propane or boil-off gas compressors, cryogenic heat exchangers). Some buildings and critical equipment may be placed on higher foundations to accommodate specific design requirements such as piping and utility connections. For example, top of concrete (operating level) of the control building would be at an elevation of 12 feet 6 inches AMSL, which puts the 18-inch recessed areas of the building at the same 11-foot AMSL elevation as the surrounding grade elevation for flood risk purposes.

Lake Charles LNG would drive piles to a depth not expected to exceed about 70 feet below the ground surface.

2.6.1.4 Piping and Equipment Installation and Testing

All pipe would be fabricated according to American Society of Mechanical Engineers (ASME) standards by ASME Section IX qualified welders. Once process equipment is set in place on the foundations, roughly aligned, and secured to the foundations, pipe installation would begin. Lake Charles LNG would coat all piping and equipment with a material that resists corrosion.

When all process equipment is installed and electrical, mechanical, and other instrumentation work completed, the key pre-commissioning activities would commence, which typically include the following:

- conformity checks on each part or piece of equipment to ensure proper installation;
- flushing and cleaning of equipment; and
- nitrogen leak testing of all hydrocarbon piping and associated equipment.

After all pre-commissioning activities are complete, Lake Charles LNG would clean and hydrostatically or pneumatically test piping in compliance with the applicable codes that govern pipe design, and purge the piping. In general, Lake Charles LNG would pneumatically test cryogenic piping using dry air or nitrogen and hydrostatically test non-cryogenic piping using clean water (see section 4.3.2.2 for further information on hydrostatic test water). All testing would be performed in accordance with ASME B31.3.

2.6.1.5 Restoration

Following construction, the liquefaction facility site would be graded and surfaces would be finished as gravel- or asphalt-covered, concrete-paved, and grassy areas. Site restoration would be conducted in accordance with the FERC Plan and Procedures. In addition, a Stormwater Pollution Prevention Plan (SWPPP) would be implemented for facility operation. As noted previously, the ACWs would not be restored to preconstruction condition. Lake Charles LNG anticipates that these areas would be graveled or converted to vegetated surfaces based on landowner agreements; temporary and/or permanent erosion control devices would be installed as needed to prevent off-site erosion and sedimentation.

2.6.2 Non-Liquefaction Facilities

Trunkline would construct the pipelines and associated facilities as described in this section and in accordance with 49 CFR 192. Figure 2.6.2-1 shows a depiction of the typical pipeline construction sequence. Figures 2.6.2-2 and 2.6.2-3 illustrate the typical right-of-way configurations Trunkline proposes for the Mainline Connector and Mainline 200-3 Loop Pipelines, respectively. As indicated in figure 2.6.2-2, Trunkline proposes a 125-foot-wide construction right-of-way for the Mainline Connector, which is wider than the typical right-of-way identified in the FERC Plan (75 feet, with an additional 25 feet allowed in specific circumstances). The wider construction right-of-way is necessary to accommodate the trench required for the 42-inch-diameter Mainline Connector pipeline and to allow for containment of spoil material within the approved right-of-way. The proposed construction right-of-way for the Mainline Loop is 75 feet wide, including a 25-foot overlap with an existing pipeline easement as shown in figure 2.62-3.

2.6.2.1 Surveying and Easement Clearance

Prior to initiating construction-related activities, Trunkline would survey the route and secure right-of-way easements from the appropriate landowners. The limits of construction would be clearly marked in the field with various color-coded flagging to represent temporary easement, centerlines, workspaces, etc. Trunkline would notify landowners in advance of construction activities that could affect their property or business.

2.6.2.2 Clearing and Grading

Trunkline would clear and grade the construction right-of-way and extra workspaces (including brush, trees, and roots), where necessary, to provide a relatively level surface for trench excavating equipment, sufficient space to accommodate safe working and passage of heavy construction equipment, and to provide for the safety of the pipeline workers. In grassy areas where grading is not required, vegetation would be mowed to avoid damage to root systems and cleared to the edge of the work area. Temporary erosion controls would be installed after initial soil disturbance, where necessary, to minimize erosion and would be maintained throughout construction as needed.

2.6.2.3 Pipe Stringing, Bending, and Welding

Trunkline would string the pipe segments along the construction right-of-way on temporary supports, which involves positioning pipe sections parallel to the centerline of the trench so they are easily accessible to construction personnel. Field bends of the pipe would follow the natural grade and direction changes of the right-of-way. Following stringing and bending, the ends of the pipe sections would be aligned and welded together. Trunkline would x-ray welds to ensure structural integrity and compliance with applicable DOT regulations at 49 CFR 192. Trunkline would repair or replace any welds that do not meet the DOT’s safety standards. The welded joints would be externally coated and the assembled pipeline would be visually and electronically inspected for faults, scratches, or other damage, including coating defects. Any damage would be repaired prior to lowering the pipe into the trench.

2.6.2.4 Trenching

Trunkline would install the majority of the pipeline in uplands using conventional open-cut methods, which typically include the steps described below. Trunkline’s proposed pipeline installation across waterbodies and wetlands, as well as other specialized construction procedures, are described in section 2.6.3.

Wheel ditching machines and/or backhoes would be used to excavate a trench to a depth sufficient to allow coverage of the pipeline to meet the DOT standards at 49 CFR 192.327. The typical depth of cover would be 36 inches.

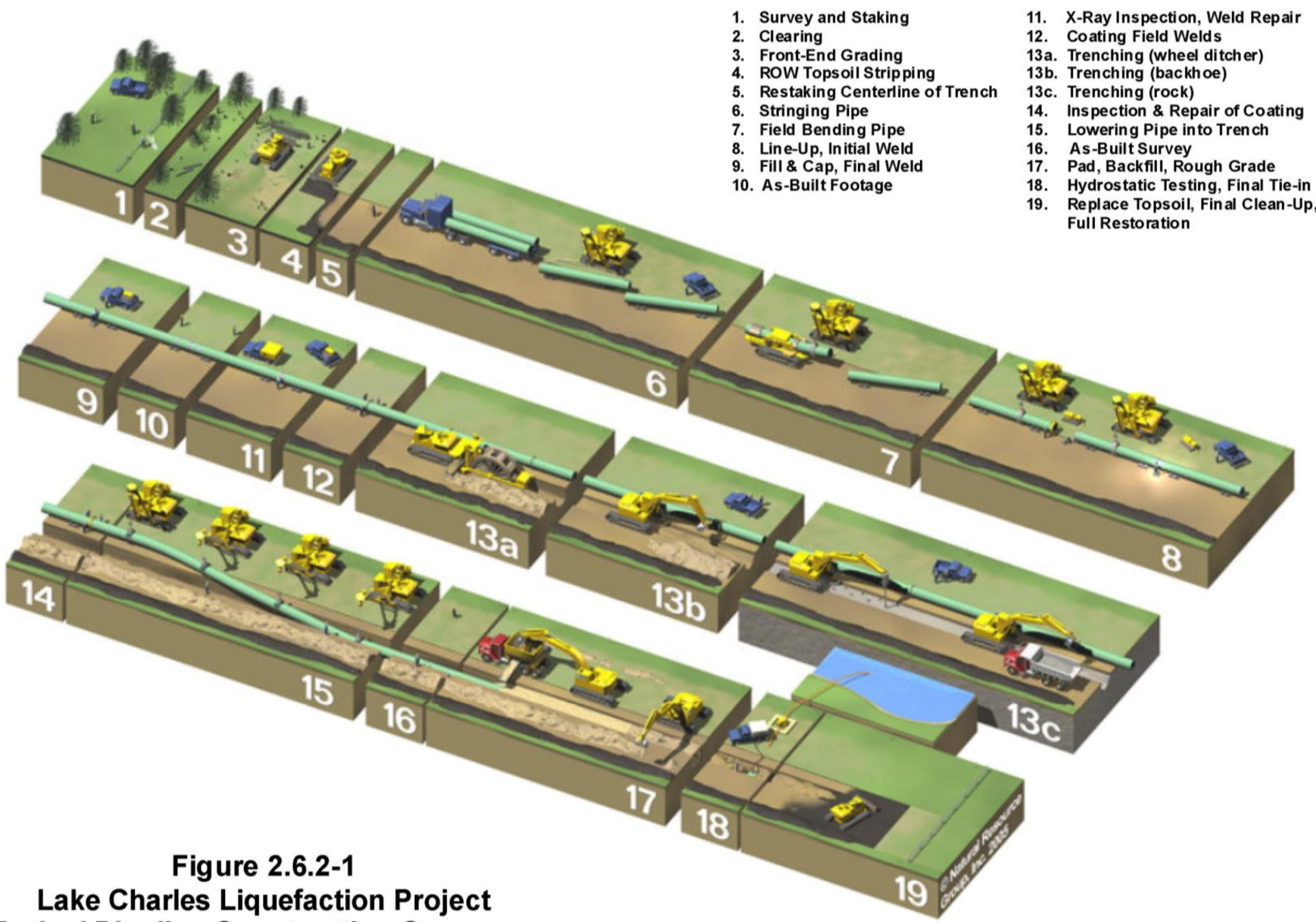
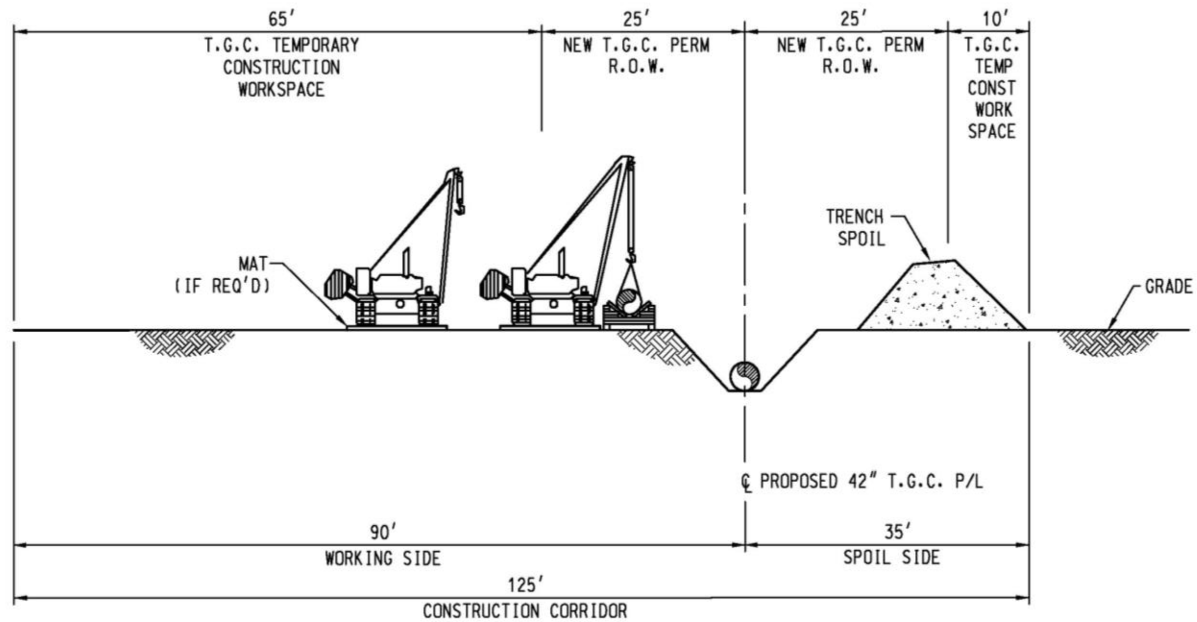


Figure 2.6.2-1
Lake Charles Liquefaction Project
Typical Pipeline Construction Sequence



TYPICAL ROW CONFIGURATION

LOOKING SOUTH WEST

ISSUED FOR PRELIMINARY REVIEW
05/22/2013

NOTES:

- EROSION CONTROLS WILL BE INSTALLED AS WARRANTED BY SITE CONDITIONS IN ACCORDANCE WITH PERMITS AND AUTHORIZATION
- DRAWING FOR ENVIRONMENTAL PERMITTING PURPOSES ONLY
- ALL AREAS WILL BE RESTORED TO ORIGINAL GRADE AND CONTOURS

PIPELINE, STATION, OR ACCOUNT NUMBER	SCALE N.T.S.	CONST. YR. 2017
FILENUMBER / CADD FILENAME	DRAWN PLH	DATE 05/22/13

REV. NO.	DESCRIPTION	BY	DATE	APP.
A	ISSUED PRELIMINARY	JM	05/22/13	JWV

TRUNKLINE GAS
An ENERGY TRANSFER Company

Wood Group Mustang, Inc.

Figure 2.6.2-2

42" MAIN LINE CONNECTOR
LIQUIFACTION PROJECT
TYPICAL ROW CONFIGURATION
FROM M.P. 0.00 TO M.P. 11.44
CALCASIEU AND JEFFERSON DAVIS PARISHES, LOUISIANA

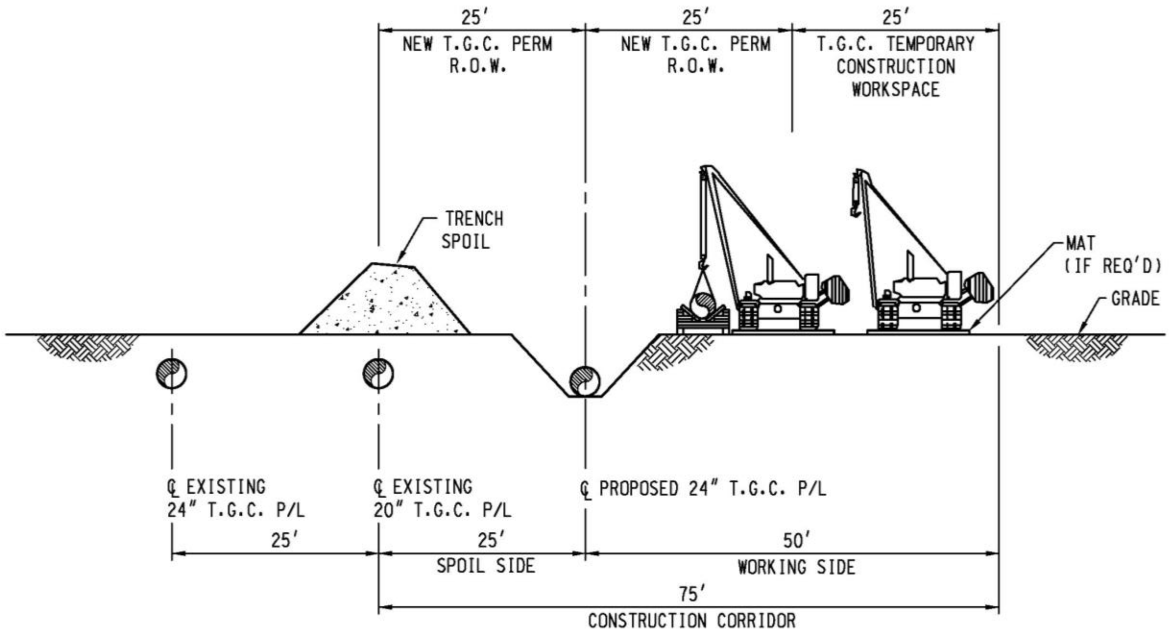
PROJECT NO.
W.O. 569000919621

PREVIOUS DWG. NO.

SHT. 1 OF 1

DWG. NO.
ROW TYPICAL 2

A



TYPICAL ROW CONFIGURATION

LOOKING SOUTH EAST

ISSUED FOR PRELIMINARY REVIEW
05/22/2013

NOTES:

- EROSION CONTROLS WILL BE INSTALLED AS WARRANTED BY SITE CONDITIONS IN ACCORDANCE WITH PERMITS AND AUTHORIZATION
- DRAWING FOR ENVIRONMENTAL PERMITTING PURPOSES ONLY
- ALL AREAS WILL BE RESTORED TO ORIGINAL GRADE AND CONTOURS

PIPELINE, STATION, OR ACCOUNT NUMBER	SCALE N.T.S.		CONST. YR. 2017
FILENUMBER	CADD FILENAME	DRAWN PLH	DATE 05/22/13

REV. NO.	DESCRIPTION	BY	DATE	APP.
A	ISSUED PRELIMINARY	JM	05/22/13	JWV

TRUNKLINE GAS
An ENERGY TRANSFER Company

Figure 2.6.2-3

24" MAIN LINE LOOP LINE – 200-3 LINE
LIQUIFACTION PROJECT
TYPICAL ROW CONFIGURATION
FROM M.P. 176.05 TO M.P. 182.51
CALCASIEU AND JEFFERSON DAVIS PARISHES, LOUISIANA

Wood Group Mustang, Inc.

PROJECT NO.
W.O. 569000919621

PREVIOUS DWG. NO.

SHT. 1 OF 1

DWG. NO.
ROW TYPICAL 1

A

For the 42-inch-diameter Mainline Connector, the trench depth would typically be about 8 feet to allow for 3 to 4 feet of cover over the pipe. The trench width would be about 15 feet in stable soils and even wider in saturated or otherwise unstable soils. Additional trench width could be required to maintain stability of the trench walls for the safety of pipeline workers and equipment. For the 24-inch-diameter Mainline 200-3 Loop, the nominal trench depth would be 6 feet to allow for 3 to 4 feet of cover; the trench width would typically be about 12 feet.

Trunkline would install the pipeline at least 36 inches below ground surface to the top of the pipe at drainage ditches and public roads, and 48 inches below ground surface in agricultural areas. In cultivated agricultural areas, Trunkline would strip and segregate up to 12 inches of topsoil. Topsoil segregation would also be conducted on residential land unless topsoil replacement is deemed more efficient. Trunkline would typically store excavated materials (including subsoil and segregated topsoil) on the non-working side of the trench, away from construction traffic and pipe assembly areas.

Trunkline would be required to employ the measures described in the FERC Plan and Procedures to minimize erosion during trenching operations and construction activities. To contain disturbed soils in upland areas and minimize the potential for sediment loss to wetlands and waterbodies, Trunkline would install temporary erosion controls immediately after initial soil disturbance and maintain them throughout construction.

2.6.2.5 Lowering-In and Backfilling

Prior to lowering the pipeline, Trunkline would dewater the trench as necessary. Trunkline would pump accumulated groundwater or rainwater from the trench to stable upland areas in accordance with applicable federal, state, and local permitting requirements, as well as the FERC Procedures. If necessary, dewatering effluent would be passed through sediment filters (e.g., hay bale structures, filter bags) to ensure compliance with water quality requirements. Trench breakers would be installed at regular intervals, where appropriate, to prevent subsurface erosion and flow of water between the trench and crossed waterbodies, wetlands, or near-surface groundwater.

After the pipeline is lowered into the trench and adequately protected, Trunkline would place previously excavated materials into the trench. If the excavated material has significant amounts of rock that could damage the pipe coating, Trunkline would install a rock shield, obtain commercial fill for padding, or separate rocks from suitable material from the excavated trench spoil. Trunkline would be required to dispose of excess rock deemed unsuitable for backfill in accordance with applicable regulations and landowner requests. In areas where topsoil has been segregated, Trunkline would place the excavated subsoil into the trench first and top it with the topsoil. No topsoil would be used for pipeline padding.

2.6.2.6 Hydrostatic Testing

Once installation and backfilling are completed, Trunkline would hydrostatically test the pipeline in accordance with DOT safety standards (49 CFR 192) and applicable permit conditions to verify its integrity and ensure its ability to withstand the maximum allowable operating pressure (MAOP). Hydrostatic testing consists of installing a hydrostatic test cap and manifold, filling the pipeline with water, pressurizing the pipeline to 125 percent of its MAOP, and maintaining that test pressure for a minimum of 8 hours. Section 4.3.2.2 provides additional information on hydrostatic testing and test water discharge.

2.6.2.7 Cleanup and Restoration

After the trench is backfilled, Trunkline would remove all remaining debris, surplus materials, and temporary structures and dispose of them in accordance with applicable federal, state, and local regulations. In accordance with the FERC Plan, Trunkline would finish grade and restore all disturbed areas as closely as practicable to preconstruction contours. The soil over the trench may be compacted or mounded as needed to minimize future settling. During this phase, Trunkline would also install permanent erosion control measures in accordance with the FERC Plan and Procedures.

Trunkline would be required to seed the right-of-way after pipeline installation and re-contouring in accordance with the FERC Plan and Procedures. Trunkline would inspect the right-of-way after the first and second growing seasons, at a minimum, to determine the success of revegetation. FERC staff would also continue inspections throughout revegetation, until such time as restoration is deemed successful. Trunkline would be required to implement additional restoration measures if deemed necessary by the FERC and/or other federal, state, or local agencies.

After completion of construction and hydrostatic testing, the new pipeline would be cleaned and dried, using pipeline pigs propelled through the pipeline with compressed air, and then packed with natural gas. Trunkline would install pipeline markers and/or warning signs along the pipeline centerline at line-of-sight intervals to identify the pipeline location, identify Trunkline as the pipeline operator, and provide telephone numbers for emergencies and inquiries. Trunkline would install a pipeline cathodic protection system in accordance with 49 CFR 192 (also see section 2.7.2.1).

2.6.3 Special Construction Procedures

2.6.3.1 Road, Railroad, and Existing Pipeline Crossings

The proposed pipeline routes would cross paved and unpaved roads, highways, railroads, and existing pipelines. Trunkline would construct across these features in accordance with the requirements of all applicable crossing permits and approvals. Trunkline would be required to use traffic warning signs, detour signs, and other traffic control devices as required by federal, state, and local departments of transportation.

Trunkline would cross most major roads and railroads via the conventional bore method, which would result in minimal or no disruption to traffic at road or railroad crossings. The conventional bore method involves excavating a pit on each side of the feature, boring a hole under the road or railroad at least equal to the diameter of the pipe, and pulling a prefabricated pipe section through the borehole. The bore pipe may or may not be cased depending on applicable permit conditions. Some highways and railroads may be crossed using the HDD method (see section 2.6.3.3 for more information regarding the HDD crossing method).

Trunkline would cross unpaved and smaller roads by traditional open-cut methods as allowed by respective landowners. Trunkline would schedule construction activities at road crossings to avoid or minimize interruptions in the flow of traffic. Detours may not be necessary, except for during brief periods, if one lane of traffic can be kept open during the crossing.

Trunkline would be required to maintain a minimum clearance of 12 inches between the proposed pipeline and the crossing of existing pipelines in accordance with 49 CFR 192 and in compliance with pipeline crossing agreements negotiated with the existing pipeline operators.

2.6.3.2 Wetland Crossings

Trunkline would construct the proposed facilities across wetlands (see section 4.4.2 for specific facilities located within wetlands) in accordance with applicable federal and state permits and the FERC Procedures, except where alternatives to the standard FERC Procedures are warranted (see table 4.4.3-1). The wetland crossing methods and mitigation measures identified in the FERC Procedures are designed to minimize the extent and duration of construction-related disturbance within wetlands. The FERC Procedures require a 75-foot-wide construction right-of-way through wetlands. Trunkline would comply with this requirement except in areas along the Mainline Connector where Trunkline has determined a wider right-of-way would be necessary to accommodate installation of the 42-inch-diameter pipeline in saturated wetland soil conditions. Trunkline has requested a 100-foot-wide construction right-of-way in these areas to allow for sufficient trench slopes and enough space to contain excavated material within the approved construction area. Section 4.4.3 provides information on Trunkline's requested deviations from the FERC Procedures.

In wetlands, trees and brush would be removed from the construction workspace and vegetation would be cut just above ground level, leaving existing root systems intact. Stumps would be removed only directly over the trench line (minimum 10 feet), except in areas that would be permanently converted to upland or where it is determined that the stumps present a safety hazard for construction. Retaining the stumps and root systems where practicable helps to stabilize the soil and promote re-sprouting by some species. Debris would be removed from the wetland and stockpiled within an upland area of the right-of-way for proper disposal.

Immediately after initial ground disturbance, erosion control devices would be installed across the right-of-way at all wetlands and along the limits of the right-of-way directly upslope of the wetlands as needed. All sediment barriers would be maintained during construction and repaired/replaced as necessary until permanent erosion controls are installed or restoration of adjacent upland areas is complete.

A backhoe would be used to excavate a trench to the proper depth to allow for the burial of the pipe with a minimum of 3 feet of cover as required by the DOT regulations at 49 CFR 192. The top 12 inches of topsoil over the trenchline would be segregated in unsaturated wetlands with firm substrates. Trench spoil would be temporarily stored in a ridge along the pipeline trench and segregated as required. Gaps in the spoil pile would be left at appropriate intervals to provide for natural drainage of water.

Where practicable, the pipeline would be assembled in an upland staging area during trench excavation. Pipe assembly would occur in the wetland only if site conditions are dry enough to support the skids and pipe. Either low ground weight bearing equipment would be used, or standard equipment would be operated from travel mats to minimize rutting and inadvertent mixing of topsoil with subsoil. Trunkline may use the push/pull method to install the pipeline in inundated or excessively wet areas that cannot support the standard installation methods.

After the pipeline is lowered into the trench and backfilled, the disturbed areas would be graded to preconstruction contours, restored in accordance with the FERC Procedures, and monitored until revegetation is successful.

2.6.3.3 Waterbody Crossings

The FERC defines a waterbody as any natural or artificial stream, river, or drainage with perceptible flow at the time of crossing, and other permanent waterbodies such as ponds and lakes. Trunkline would implement the measures in the FERC Procedures to minimize the extent and duration of construction disturbance on waterbodies. With the exception of the initial clearing equipment, only the equipment necessary for in-stream excavation and backfilling would be allowed in the stream channel. All other construction equipment would cross the waterbody on temporary equipment bridges, which would be constructed in accordance with the FERC Procedures. Trunkline would maintain water flow at waterbody crossings.

Trunkline proposes to use the open-cut or HDD methods to cross the waterbodies along the pipeline route. Dry crossing methods (flume or dam-and-pump) are sometimes used to cross waterbodies up to 30 feet wide (at the water's edge at the time of construction) that are state-designated as either coldwater or significant coolwater or warmwater fisheries, or federally designated as critical habitat. Trunkline is not proposing to cross any waterbodies using the dry crossing method; therefore, this method will not be further discussed in this EIS. Any modifications during construction to the methods described in this EIS and Trunkline's filings would require review and approval by the FERC and other applicable agencies prior to their implementation.

Open-cut Crossing Method

The open-cut crossing technique is a "wet" crossing method that is completed while the waterbody continues to flow across the work area. The open-cut crossing method is typically used to cross non-sensitive minor and intermediate waterbodies (width greater than 10 feet but less than or equal to 100 feet between the water's edges). In general, an open-cut crossing is accomplished using methods similar to conventional upland open-cut trenching. The open-cut construction method involves excavation of the pipeline trench across the waterbody, installation of a pre-fabricated segment of pipeline, and backfilling of the trench with native material without affecting or diverting flow at the time of crossing. Trunkline would use a backhoe or other similar equipment operating from one or both waterbody banks to excavate the trench within the water. Material excavated from the trench would be stored at least 10 feet from the water's edge in accordance with the FERC Procedures. Trunkline would minimize the introduction of sediment into waterbodies from disturbed upland areas by installing and maintaining sediment barriers (silt fences and/or straw bales) at stream crossings. Trunkline would complete construction activities at these stream crossings within the timeframes indicated in the FERC Procedures, typically within 24 hours of initiation of the crossing for minor waterbodies and within 48 hours for intermediate waterbodies, unless bedrock is encountered.

Horizontal Directional Drill

The HDD method is a trenchless crossing method used to avoid direct impacts on sensitive resources (such as waterbodies and wetlands) or infrastructure (major roads and railroads) by conducting a deep bore beneath them. This method requires specialized equipment and personnel and has four general steps:

1. placement of guide wires over the anticipated path of the drill;

2. drilling a pilot hole on an arc-shaped path that typically extends between 30 and 50 feet beneath the waterbody or other sensitive feature;

3. enlarging the pilot hole with a series of reamers to accommodate the pipeline; and

4. pulling a pre-fabricated section of pipe through the hole.

The HDD method involves an entry and exit pad on each side of the crossing. The initial step of placing HDD guide wires over the path of the drill may require minor hand clearing of woody vegetation and/or branches. A pilot hole is drilled under the waterbody and banks. The head of the pilot drill string contains a pivoting head that can be controlled by an operator as the drill progresses. Typically, the pilot hole would be directed downward at an angle until the proper depth is achieved, then turned and directed horizontally for the required distance, and finally angled upward back to the surface. Throughout the process of drilling and enlarging the hole, mud slurry, consisting of bentonite and water, would be pressurized and pumped through the drill stem to lubricate the drill bit, maintain the hole, and remove drill cuttings. Bentonite is the commercial name for a nontoxic mixture of nontoxic clays and rock particles consisting of about 85 percent montmorillonite clay, 10 percent quartz and feldspars, and 5 percent accessory materials, such as calcite and gypsum. This slurry, referred to as drilling mud or drilling fluid, has the potential to be inadvertently released to the surface if fractures or fissures are encountered in the substrate during drilling.

The potential for an inadvertent release is generally greatest during drilling of the pilot hole when the pressurized drilling mud is seeking the path of least resistance and near the drill entry or exit pits where the drills are at their shallowest depths. The path of least resistance is typically back along the path of the drilled pilot hole. However, if the drill path becomes temporarily blocked or encounters areas such as large fractures or fissures that lead to the ground, then an inadvertent release could occur. Trunkline developed a site-specific HDD plan for each drill site and a *Horizontal Directional Drill Contingency Plan* (HDD Contingency Plan) to monitor for, contain, and clean up any inadvertent releases of drilling fluid during HDD operations. The HDD Contingency Plan is included in appendix D. Additional information on waterbody crossings, including the use of the HDD method, is presented in section 4.3.2.2.

2.6.3.4 Residential Areas

Lake Charles LNG identified one residence within the proposed liquefaction facility site on the west side of Big Lake Road; however, the tract has since been purchased for the liquefaction facility. No residential structures or buildings are located within 50 feet of any of the proposed project facilities. Access to all rural residences in the project area would remain open throughout construction and operation of the project.

2.6.3.5 Agricultural Areas

The project crosses several agricultural areas, including:

- pasture lands (liquefaction facility, Non-Liquefaction Facilities);
- land used for row and field crops, including soybean and rice, or alternately crayfish farming (Non-Liquefaction Facilities); and
- pine plantations (Mainline Connector and Mainline 200-3 Loop).

Trunkline would implement the FERC Plan in these areas to minimize impacts on current agricultural uses. Prior to starting construction in agricultural areas, Trunkline would coordinate with landowners to determine the location of existing drainage structures and irrigation facilities. Irrigation system water flow would be maintained throughout construction if possible. Any required irrigation system shut off would be coordinated with the affected parties.

In accordance with the FERC Plan and in coordination with the landowner(s), topsoil would be removed to its actual depth, up to a maximum of 12 inches, and stockpiled separately from the subsoil excavated from the pipeline trench. During construction, Trunkline would maintain the natural flow patterns of all fields by providing breaks in the stockpiles of topsoil and subsoil. In addition, flow would be maintained in drainage systems during construction to prevent ponding in adjacent non-disturbed areas.

After pipeline installation, Trunkline would follow the restoration and revegetation practices outlined in the FERC Plan. Any soil rutting or compaction would be repaired prior to revegetation of the disturbed areas. All stones at the surface larger and/or in higher densities than those in adjacent undisturbed areas would be collected and properly disposed of per the requirements described in the FERC Plan.

Impacts on agricultural lands would be limited to the construction periods except where conversion to an industrial/commercial land use is proposed. Following construction, the agricultural lands affected by the project would be restored to their previous use, except for limited clearing of the pipeline rights-of-way for maintenance. In addition, any drain tiles or systems damaged during construction would be returned to original or better condition.

No special construction techniques would be used within pine plantations unless requested by the landowners; the landowner would be allowed to replant the temporary construction right-of-way. For the areas alternately used for growing rice and raising crayfish, the landowner(s) would be compensated for crop loss due to construction activities.

2.6.4 Aboveground Facilities Construction Procedures

Site preparation, including clearing, grading, and compacting, would be conducted where necessary. Excavations would be performed as necessary to accommodate the new reinforced concrete foundations for the new compressors, pigging facilities, metering equipment, and buildings. Subsurface piles could be required to support the foundations, depending upon the bearing capacity of the existing soils and the equipment loads. Forms would be set, rebar installed, and the concrete poured and cured in accordance with applicable industry standards. Concrete pours would be randomly sampled to verify compliance with minimum strength requirements. Backfill would be compacted in place, and excess soil would be used elsewhere or distributed around the site to improve grade.

Materials and equipment would be shipped to the site by truck and offloaded using cranes, front-end loaders, or both. The equipment would be positioned on the foundations, leveled, grouted where necessary, and secured with anchor bolts. All non-threaded piping associated with the aboveground facilities would be welded, except where connected to flanged components. All welders and welding procedures would be qualified in accordance with American Petroleum Institute standards. Welds in gas piping systems would be examined using non-destructive testing in accordance with applicable codes.

All components in high-pressure natural gas service would be pressure tested prior to arrival or on site, and all controls and safety equipment and systems, emergency shutdown, relief valves, and gas measurement and control equipment would be commissioned prior to being placed in service.

Disturbed surface areas would be restored, and stabilization measures installed in a timely manner in accordance with the FERC Plan and Procedures.

2.7 OPERATION, MAINTENANCE, AND SAFETY PROCEDURES

2.7.1 Liquefaction Facility and LNG Terminal

Lake Charles LNG would operate its liquefaction facility and LNG terminal in compliance with federal requirements for LNG facilities (see table 1.5-1), which include operation, emergency, and security procedures. The liquefaction facility and LNG terminal would meet NFPA 59A LNG Standards. Safety controls would be designed, constructed, operated, and maintained in accordance with DOT federal safety standards for LNG facilities at 49 CFR 193. In addition, Lake Charles LNG would update the existing LNG terminal's operations manual(s) as needed to include the new liquefaction facility and submit amendments to the agencies prior to commissioning the facility. The plans would include written procedures consistent with corporate policy and federal standards, including DOT regulations at 33 CFR 127.401 and 49 CFR 193(G).

The liquefaction facility and LNG terminal would be operated from a central control room. The control room would be fully integrated with all facility hazard detection and control, security, and emergency shutdown systems. LNG storage tank systems and ship loading would also be monitored from the control room.

All facility operations and maintenance personnel would be trained to properly and safely perform their duties. The facility operators would be trained in the potential hazards associated with LNG, cryogenic operations, and the proper operations of all the equipment. The operators would meet all the training requirements of the Coast Guard, DOT, Louisiana State Fire Marshal, and other regulatory entities, as well as the requirements of Lake Charles LNG.

The facility full-time maintenance staff would conduct routine maintenance and minor overhauls. Major overhauls and other major maintenance would be handled by outside maintenance personnel specifically trained to perform the required activities. All scheduled and unscheduled maintenance would be entered into a computerized maintenance management system.

2.7.1.1 Spill Containment System

There would be three liquefaction trains at the liquefaction process area. Each liquefaction train would include two insulated concrete impoundment sumps: 1) the Liquefaction Area Sump would be located south of the liquefaction train and contain LNG or refrigerant liquid spills from liquefaction facilities; and 2) the NGL Impoundment would be located north of the liquefaction train and serve hydrocarbon liquid spills from the NGL extraction facilities. Lake Charles LNG proposes to construct two other insulated concrete impoundment sumps to contain any spills along the rundown lines between the liquefaction area and the LNG storage tank area. Furthermore, any potential spills at the LNG storage tank area from the rundown lines during liquefaction operation or from the in-tank pump withdrawal header during export operation would drain toward the existing Tank Area Impoundment Sump.

Lake Charles LNG also proposes to install a Refrigerant Storage Impoundment at the refrigerant storage area to contain any spills from the refrigerant make-up tanks and the refrigerant trucks. Additional information regarding spill containment system for the stabilized condensate product storage tank, Amine Storage Tank, and Aqueous Ammonia Storage Tank is presented in section 4.12.5.1.

2.7.1.2 Hazard and Fire Detection System

The liquefaction facility would have a variety of strategically located fire and gas monitoring systems that would provide detection of flammable gas releases or fires throughout all potentially affected areas of the facilities. The monitoring system would be hard-wired from the field devices to the new central control room. Any detection would provide an alarm at the control console. The fire and gas monitoring system would include detectors for:

- flammable gas;
- low temperature;
- ultraviolet/infrared fire and flame to indicate ignition of flammable vapors;
- high temperature to detect a fire; and
- smoke.

Additional detail regarding the hazard detection system is provided in section 4.12.2.

2.7.1.3 Firewater and High Expansion Foam System

The existing LNG terminal has a fire protection system that would provide protection for the new equipment added in the LNG storage and loading areas. Lake Charles LNG would install a similar firewater supply and distribution system for the new liquefaction facility, consisting of a looped firewater header, fire monitors, fire headers, hose reels, dry chemical, and high expansion foam systems. Additional detail regarding the fire protection system can be found in section 4.12.3.

2.7.1.4 Emergency Shutdown System

Lake Charles LNG would install an emergency shutdown system for the new liquefaction facility that would be integrated with the existing LNG terminal's system. The emergency shutdown system would consist of separate shutdown sequences that would result in total plant shutdown, shutdown of ship loading/unloading; shutdown of the sendout system; and/or shutdown of individual pieces of equipment, depending on the type of incident. Audible and visual alarms would be throughout the facility to alert personnel in affected locations (inside and outside) and in the control room.

2.7.2 Pipelines

Trunkline would operate and maintain all of its pipeline facilities in accordance with the DOT regulations in 49 CFR 192, other applicable federal and state regulations, and in accordance with industry standard procedures designed to ensure the integrity of the pipeline and minimize the potential for pipe failure. Trunkline would inspect the pipeline for leakage as part of scheduled operations and maintenance in accordance with 49 CFR 192.

Pipeline operational activity would be limited primarily to maintenance of the right-of-way and inspection, repair, and cleaning of the pipelines. Trunkline would maintain vegetation on the permanent right-of-way in upland areas by mowing, cutting, and trimming, except in areas of actively cultivated cropland and in accordance with the FERC Plan and Procedures. The entire construction right-of-way would be allowed to revegetate; however, large brush and trees would be periodically removed near the pipeline. In accordance with the FERC Procedures, Trunkline would not conduct vegetation maintenance over the full width of the permanent right-of-way in forested wetland areas. However, a corridor up to 10 feet wide centered on the pipeline would be maintained in an herbaceous state to facilitate periodic pipeline corrosion/leak surveys. In addition, trees within 15 feet of the pipeline with roots that could compromise the integrity of the pipeline coating would be selectively cut and removed from the permanent right-of-way. No routine vegetation mowing or clearing would occur in wetlands over HDD easements where the pipeline is greater than 10 feet deep. Pipeline inspection would be accomplished by means identified in the pipeline integrity management program in accordance with applicable laws and regulations.

Trunkline would install pipeline identification markers at line-of-sight intervals and at crossings of roads, railroads, waterbodies, and other key points in accordance with DOT regulations. The markers would clearly indicate the presence of the pipeline, identify Trunkline as the pipeline operator, and provide telephone numbers where a Trunkline representative could be reached in the event of an emergency or prior to any excavation in the area by a third party. As part of its effort to prevent any third-party damage to the pipeline, Trunkline is also a member of the "One Call" system in all states where it currently has operational facilities.

2.7.2.1 Corrosion Protection and Detection System

During construction of the pipeline facilities, Trunkline would install a cathodic protection system to prevent or minimize corrosion of the buried pipelines and aboveground facilities. A cathodic protection system impresses a low-voltage current on a pipeline to offset natural soil and groundwater corrosion potential. The pipeline would be designed to allow the use of internal inspection technology. The condition of the pipe coating and the effectiveness of the cathodic protection system would be monitored in accordance with federal standards and regulations. If defects are detected during the monitoring, Trunkline would repair the pipe, pipe coating, or the cathodic protection system.

2.7.2.2 Pipeline Emergency Response Procedures

The DOT regulations at 49 CFR 192 (Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards) are intended to ensure adequate protection for the public and prevent natural gas pipeline facility accidents and failures. Part 192 specifies material selection and qualification, minimum design requirements, and protection from internal, external, and atmospheric corrosion. Part 192 also prescribes the minimum standards for operating and maintaining pipeline facilities, including the requirement to establish a written plan governing these activities. Under Section 192.615, each pipeline operator must also establish an emergency plan that includes procedures to minimize the hazards in a natural gas pipeline emergency. Key elements of the plan include the following:

- receiving, identifying, and classifying emergency events, gas leakage, fires, explosions, and natural disasters;
- establishing and maintaining communications with local fire, police, and public officials, and coordinating emergency response;
- making personnel, equipment, tools, and materials available at the scene of an emergency;
- protecting people first and then property, and ensuring safety from actual or potential hazards; and
- emergency shutdown of the system and safe restoration of service.

Part 192 also requires that each operator establish and maintain a liaison with appropriate fire, police, regulatory, and public officials to learn the resources and responsibilities of each organization that may respond to a natural gas pipeline emergency, and to coordinate mutual assistance. Trunkline must also establish a continuing education program to enable customers, the public, government officials, and those engaged in excavation activities to recognize a gas pipeline emergency and report it to appropriate public officials.

3.0 ALTERNATIVES

As required by NEPA and FERC policy, we evaluated alternatives to the Lake Charles Liquefaction Project and its various components to determine whether any such alternatives would be reasonable and have significant environmental advantages compared with the proposed action. The range of alternatives analyzed included the No-Action Alternative, system alternatives for both the proposed liquefaction facility and the Non-Liquefaction Facilities, alternative sites for the liquefaction facility, alternative configurations for the liquefaction facility, alternative pipeline routes, alternative aboveground facility sites for the Non-Liquefaction Facilities, and alternative power sources for the liquefaction facility and Compressor Station 203-A. In some cases, our analysis concluded that consideration of alternatives was not feasible or required and this is indicated where applicable.

As part of the No-Action Alternative, we considered the effects and actions that could conceivably result if the proposed Lake Charles Liquefaction Project were not constructed. Under the analysis of system alternatives, we evaluated the ability of other existing, planned, or proposed (new or expanded) LNG export terminals and pipeline systems to meet Lake Charles LNG's and Trunkline's project objectives. Our evaluation of alternative sites for the liquefaction facility focused on several locations, all close to the existing Trunkline LNG Terminal. For the aboveground facilities associated with the Non-Liquefaction Facilities, we focused on alternative sites for the proposed new compressor station in Calcasieu Parish. Our primary consideration of pipeline route alternatives related to the proposed Mainline Connector pipeline, an 11.4-mile-long greenfield facility.

The principal criteria for considering and weighing the alternatives for the Lake Charles Liquefaction Project were:

- the technical and economic feasibility and practicality of each alternative;
- the significance of each alternative's environmental advantages and disadvantages relative to the proposed undertaking; and
- the ability of each alternative to reasonably meet Lake Charles LNG's and Trunkline's primary objective of liquefying 15 MTPA of domestically produced natural gas for foreign export as competitively priced LNG within a timeframe that would allow contractual obligations to be met.

BG LNG is the sole holder of capacity at the Trunkline LNG Terminal.

Lake Charles LNG and Trunkline participated in our pre-filing process during the preliminary design stage of the Lake Charles Liquefaction Project (see section 1.3). This process emphasized identification of stakeholder issues, as well as identification and evaluation of alternatives that could reduce environmental impacts. We analyzed each alternative based on public comments and guidance received from federal, state, and local regulatory agencies. Additional sources of information included Lake Charles LNG's and Trunkline's field surveys, aerial photography, U.S. Geological Survey (USGS) topographic maps, National Wetlands Inventory (NWI) maps, pipeline system maps, agency consultations, and publicly accessible databases. To ensure equitable results, consistent data sources were used when comparing a feature across alternatives (e.g., NWI data were used for wetlands comparisons, rather than a combination of NWI and field survey data.) The scope, methodology, and results of our alternatives analyses are discussed in the following sections.

3.1 NO-ACTION ALTERNATIVE

Under the No-Action Alternative, the Lake Charles Liquefaction Project would not be developed and Lake Charles LNG's and Trunkline's objective of providing the proposed liquefaction and transportation capacity for LNG export would not be realized. In addition, the potential adverse and beneficial environmental impacts discussed in section 4.0 of this EIS would not occur.

The development and production of gas supplies from conventional and unconventional gas formations has increased in recent years throughout many areas of the United States and is projected to continue for decades. With or without the No-Action Alternative, other LNG export projects could be developed in the Gulf Coast region or elsewhere in the United States, resulting in both adverse and beneficial environmental impacts. Terminal and pipeline system expansions of similar scope and magnitude to the Lake Charles Liquefaction Project would likely result in environmental impacts of comparable significance, especially those projects in a similar regional setting. LNG export terminal developments on greenfield sites, without the attendant marine facilities, LNG storage, and pipeline infrastructure offered by an existing import terminal, would likely result in greater environmental impacts than projects at established sites, such as the Lake Charles Liquefaction Project.

The No-Action Alternative could require that potential end users make different arrangements to obtain natural gas service, use other fossil fuel energy sources (e.g., coal or fuel oil), or possibly use traditional long-term energy sources (e.g., nuclear power) and/or renewable energy sources (e.g., solar power) to compensate for the lack of natural gas that would otherwise be supplied by the Lake Charles Liquefaction Project. Although the No-Action Alternative could also be aligned with a drive to promote international energy conservation, this sphere of discussion lies beyond our analytical scope.

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

The International Energy Agency (IEA, 2013) indicates that the global market for coal remains buoyant and demand will continue to increase in the next two decades in countries outside the Organization for Economic Co-operation and Development, led by China and India. However, coal use in Organization for Economic Co-operation and Development countries will decline by 2035 as it is backed out of electric generation. In the United States, several new coal export projects have been proposed recently, suggesting that coal will remain competitive with natural gas as an international commodity in the foreseeable future, despite coal's greater air emissions. Similarly, fuel oil, which also produces greater emissions, is commonly used for power generation in many countries and will continue to compete with natural gas as a fuel source. The EPA (2013a) states that natural gas-fired electric generation, compared with the average air emissions from coal-fired electric generation, produces half as much carbon dioxide (CO_2), less than a third as much nitrogen oxides (NO_x), and 1 percent as much sulfur oxides (SO_x).

If the No-Action Alternative is selected, it could result in the continued use of less clean-burning fossil fuels at levels that might otherwise have been reduced through replacement with LNG; it could also result in the increased consumption of other fossil fuels to satisfy any future growth in demand that might otherwise be addressed in whole or part by LNG. Consequently, the more severe air emissions and other adverse environmental impacts associated with the use of less clean-burning fossil fuels would not be reduced and may increase if the No-Action Alternative were to be adopted, irrespective of the fact that many countries are cognizant of the environmental impacts of these fuels and prefer to use natural gas as an energy source.

There has been a recent renewed interest in nuclear fuel as a source of electric power generation, although the U.S. Energy Information Administration (2013) estimates the proportion of electricity generated in the United States by nuclear power will decrease from 19 percent to 16 percent by 2040, with actual nuclear generating capacity remaining fairly static over the long term. Whereas global nuclear capacity is still projected to rise, led by China, Korea, India, and Russia (IEA, 2012a, 2013), regulatory hurdles, public concerns over facility safety and nuclear waste disposal, project costs, and plant construction lead times make it unlikely that sufficient nuclear capacity could be available to serve all the markets targeted by the Lake Charles Liquefaction Project on a compatible timeline. Further, plans for nuclear power generation have been scaled back in some countries, reflecting policy reconsideration following the 2011 accident at the Fukushima Daiichi nuclear power plant near Fukushima, Japan (IEA, 2012a).

Renewable sources may become an increasingly significant factor in meeting future energy demands worldwide. Renewable sources for electric power generation include hydropower, which accounted for 78.0 percent of the global electricity production fueled by the renewables sector in 2012 (Observ'ER, 2013). With respect to all fuel sources (renewable and non-renewable), hydropower accounted for 16.2 percent of global electric generation in the same year (Observ'ER, 2013). The IEA expects hydropower to remain as the predominant renewable energy source through 2035 (IEA, 2013). However, as with nuclear power generation, there are high costs associated with developing substantial hydropower projects and a long development time between project conception and operation. Other promising renewable energy resources include solar, ocean energy, biomass, and wind, as discussed in more detail below.

With respect to solar energy, photovoltaic production is increasing as the cost of photovoltaic systems decreases. Photovoltaic cells have the potential to supplement electric power generation resources. In 2012 solar energy accounted for 2.2 percent of global electricity production (Observ'ER, 2013).

Ocean energy is a largely unexplored renewable resource. Technologies to capture ocean energy are in their infancy, and environmental and engineering considerations are being studied to better understand the implications of placing power-generating facilities in the ocean. In 2012, ocean energy accounted for 0.01 percent of global electricity production (Observ'ER, 2013).

Biomass categories for electric power generation include solid biomass, liquid biomass, biogas, and renewable household waste. Like ocean energy, this is an emerging area of study and biomass research covers diverse applications. For example, researchers are working to accelerate the development of applications that use algal biomass as a fuel source. In 2012, biomass sources accounted for 1.4 percent of global electricity production (Observ'ER, 2013). The IEA (2012a) projects a four-fold increase in biomass consumption for electric power generation through 2035.

Further growth of wind-generated electric power requires construction of new wind turbines and transmission lines. Although this is likely to occur in many parts of the world, it is also likely that such development will be slow-paced in most countries due to the high cost of construction. In addition, wind power cannot be used for constant and reliable electricity production because of its inherent variability, and back-up modes of power generation are commonly required. In 2012, wind power accounted for 2.4 percent of global electricity production (Observ'ER, 2013).

In 2012, renewable energy sources (solar, marine, biomass, wind, geothermal, and hydropower) accounted for 20 percent of global electricity production (Observ'ER, 2013). Renewables are projected to become the world's second-largest source of power generation by 2015, and are expected to challenge coal as the primary source by 2035, when they are expected to fuel 31 percent of global electricity production (IEA, 2013). However, compared with natural gas-fired power generation, the cost of renewable energy projects per energy output unit is currently high and any significant increase in their relative contribution to global electric power generation hinges critically on continued subsidies. In 2012, these subsidies amounted to $101 billion, but to reach the projection noted above, the subsidies would need to increase to $220 billion by 2035 (IEA, 2013).

Natural gas is often considered a "bridge fuel," meaning a fuel that bridges the timespan between the dominant use of fossil fuels today and the greater use of renewable energy sources in the future. Natural gas is cleaner burning than other fossil fuels and can also serve as a reliable backup fuel to renewable energy facilities, which characteristically provide power on an intermittent basis.

There is currently considerable momentum behind advancing renewable energy technologies and moving towards more diversified energy sources. These advanced technologies, either individually or in combination, will likely be important in addressing future energy demands. However, whereas renewables are forecast to gain increasing global prominence as energy sources for electric power generation over the next two decades, this trend does not reflect any corresponding decrease in natural gas demand; rather, an increase approaching 50 percent in worldwide gas demand is predicted over the same timespan (IEA, 2013). Based on this forecast, the increased use of renewable energy sources does not constitute a reasonable alternative to the Lake Charles Liquefaction Project.

Although it is speculative and beyond the scope of this analysis to predict what actions might be taken by policymakers or end users in response to the No-Action Alternative, it is possible that the energy needs to be satisfied by the Lake Charles Liquefaction Project would be met largely by other fossil fuel energy sources, such as coal and oil, resulting in more air emissions and greater environmental impacts. Renewable sources are not always reliable or available in sufficient quantities to support most market requirements and would not necessarily be appropriate substitutes for natural gas in all applications. Similarly, the use of nuclear power in lieu of natural gas would depend on geographic availability and could be especially problematic from the perspective of negative public perception.

Based on our consideration of environmental impacts and the evident lack of viable energy source alternatives, we have dismissed the No-Action Alternative as a reasonable alternative to meet the objectives of the Lake Charles Liquefaction Project. Because the purpose of the project is to prepare natural gas for export to foreign markets, the development or use of renewable energy technology would not be a reasonable alternative to the proposed action.

3.2 SYSTEM ALTERNATIVES

We reviewed system alternatives to evaluate the ability of other existing, modified, approved, planned, or proposed facilities to meet the stated objectives of the Lake Charles Liquefaction Project and to determine if a system alternative exists that would have less significant adverse environmental impacts than those associated with the project.[1] The status identified for each system alternative (e.g., planned, proposed, or approved) is current as of the time this EIS is being written, and is subject to change over time. Our analyses of system alternatives for the proposed liquefaction facility and Non-Liquefaction Facilities are presented in sections 3.2.1 and 3.2.2, respectively. By definition, implementation of a system alternative would make construction of all or some of the proposed facilities unnecessary; conversely, infrastructure

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

additions or other modifications to the system alternative may be required to increase capacity or provide receipt and delivery capability consistent with that of the proposed facilities. Such modifications may result in environmental impacts that are less than, comparable to, or greater than those associated with construction and operation of the proposed facilities.

3.2.1 Liquefaction Facility Alternatives

For a system alternative to be viable, it must be technically and economically feasible, as well as offer a significant environmental advantage over the proposed project. In the case of the Lake Charles Liquefaction Project, it must also be compatible with Lake Charles LNG's contractual agreements for LNG export.

Each of the planned, proposed, or authorized projects described in sections 3.2.1.1 and 3.2.1.2 was considered as a potential system alternative (see section 4.13 for additional information on project locations). Our analysis was predicated on the assumption that each project has an equal chance of being constructed and would therefore be available as a potential alternative. However, market forces will ultimately decide which and how many of these facilities are built.

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

In addition to the Trunkline LNG Terminal, there are six operating LNG import terminals along the Gulf Coast in the southern United States, all of which are associated with approved, proposed, and/or planned expansions to provide liquefaction capabilities, as identified below.

Approved

- Cameron LNG, LLC (Cameron LNG) Terminal
- Freeport LNG Development, LP (Freeport LNG) Terminal
- Sabine Pass LNG, LP (Sabine Pass LNG) Terminal

Proposed

- Golden Pass LNG, LLC (Golden Pass LNG) Terminal
- Sabine Pass LNG Terminal – Trains 5 and 6

Planned

- Gulf LNG Liquefaction Company, LLC (Gulf LNG) Terminal
- Main Pass Energy Hub Deepwater Port
- Cameron LNG Terminal – Trains 4 and 5

Liquefaction and export facilities are under construction at the Sabine Pass LNG and Cameron LNG Terminals and may be constructed at each of the other import terminals pending completion of regulatory review and permitting. Each of the six projects was evaluated as a potential system alternative to the Lake Charles Liquefaction Project. Although it might be theoretically possible to move Lake Charles LNG's total liquefaction capacity to any of the six project locations by building additional infrastructure alongside previously announced expansion facilities, the commercial, technical, environmental, and schedule impediments to such an undertaking preclude further analysis. However, where Lake Charles LNG's proposed liquefaction capacity is higher than that of another project, we have evaluated the potential for Lake Charles LNG to use the other project's capacity and for the proponent to install additional infrastructure to address the differential. Although the design production capacity of Lake Charles LNG's proposed liquefaction facility is 16.45 MTPA of LNG, authorization has been secured from the DOE's Office of Fuel Energy to export 15 MTPA, reflecting allowances for design margins, maintenance, and outages. For the purposes of evaluating system alternatives, we have used the LNG volumes requested from or authorized by the DOE for export, including 15 MTPA for the Lake Charles Liquefaction Project.

Table 3.2.1-1 provides a summary of the six liquefaction projects listed above, the criteria used to evaluate their system alternatives status, and the results of the evaluation in each case. Further details for each project are provided in the text that follows the table.

TABLE 3.2.1-1

Existing LNG Import Terminals with Planned, Proposed, or Approved Liquefaction Projects Along the Gulf Coast – Summary Profile as System Alternatives

Project	MTPA	MTPA Differential	FERC Status	In-Service Target Date	Customer Base Compatibility[a]	Compatible Timeline for Additional Expansion	Less Environ-mental Impact	Reasonable Alternative
Approved Projects								
Cameron LNG	14.95	–0.05	Authorized 06-19-14	2017–2018	No	No	Unlikely	No
Freeport LNG	13.2	–1.8	Authorized 7-30-14	2018–2019	No	No	Unlikely	No
Sabine Pass LNG	20	+5	Authorized 04-16-12	2016–2017	No	No	Unlikely	No
Proposed Projects								
Golden Pass LNG	15.6	+0.6	Application filed 7-7-14	2019–2020	Possible	No	Unlikely	No
Sabine Pass LNG (Trains 5 and 6)	9.0	–6.0	Application filed 9-30-13	2019	No	No	Unlikely	No
Planned Projects								
Gulf LNG	10.0	–5.0	Pre-filing initiated 5-21-14	2019–2020	Possible	No	Unlikely	No
Main Pass Energy Hub Deepwater Port	24.0	+9.0	Not applicable[b]	2017	Possible	No	Not comparable	No
Cameron LNG (Trains 4 and 5)	9.97	-5.03	Pre-filing initiated 3-2-15	2019	No	No	Unlikely	No

[a] This reflects the degree to which currently designed export capacity has been subscribed.

[b] The Main Pass Energy Hub Deepwater Port would require authorizing from the U.S. Maritime Administration and the Coast Guard. Applications have not been filed to date.

Cameron LNG Terminal

The Cameron LNG Terminal is located on the Calcasieu Ship Channel, near Hackberry, Louisiana, about 5 miles south-southwest of the Trunkline LNG Terminal. It started operation as an LNG import terminal in 2009 and received authorization in 2010 to re-export foreign-sourced LNG. The existing facilities include vaporization units and three 160,000-m^3 LNG storage tanks with a sustained send-out capacity of 1.8 Bcf/d and maximum send-out capacity of 2.1 Bcf/d. There are two LNG carrier berths, each capable of loading/unloading vessels ranging from 125,000 to 217,000 m^3 in size.

Cameron LNG will construct three liquefaction trains, each capable of producing 4.99 MTPA of LNG, a fourth 160,000-m^3 LNG storage tank, and additional facilities on 502 acres, consisting of 70 acres within the existing terminal fenceline and 432 contiguous acres adjacent to the terminal. Concurrent with the terminal expansion, Cameron Interstate Pipeline, LLC will construct a new 56,820 hp compressor station, 21 miles of 42-inch-diameter natural gas pipeline, and associated facilities, to supply the gas for liquefaction. On January 17, 2012, Cameron LNG was granted DOE authorization to export up to 12.0 MTPA of LNG (equivalent to 1.7 Bcf/d of vaporized natural gas) over 20 years to FTA nations. On September 10, 2014, Cameron LNG received approval from the DOE to export LNG over 20 years to non-Free Trade Agreement (non-FTA) nations. On May 9, 2012, Cameron LNG received approval to enter our pre-filing process [2] for adding liquefaction and export facilities to the existing terminal. The formal application for the LNG facilities was filed with the Commission on December 7, 2012 [3] and the for the pipeline facilities on December 14, 2012.[4] The final EIS was issued on April 30, 2014. The FERC issued an *Order Granting Authorization Under Section 3 of the Natural Gas Act and Issuing Certificates* for the project on June 19, 2014. Cameron LNG's project is currently under construction and has an in-service target date of early 2018 for the first train, mid-2018 for the second train, and end of 2018 for the third train.

On February 23, 2015, Cameron LNG applied for DOE authorization to export an additional 9.97 MTPA of LNG to FTA nations over a 20-year period. Cameron LNG plans to construct two liquefaction trains (Trains 4 and 5) with a capacity of 4.985 MTPA and a fifth 160,000-m^3 LNG storage tank (Tank 5). On March 2, 2015, the FERC initiated its pre-filing process for this expansion.[5]

The customer bases for the two facilities do not overlap. Cameron LNG's capacity is contracted to multiple customers, whereas Lake Charles LNG's capacity is contracted solely to one mutually exclusive customer, BG LNG. Given the different customer bases, Cameron LNG's terminal expansion could not meet Lake Charles LNG's market-based objectives. Also, in both cases, the environmental impacts of the proposed facilities would likely be similar, so Cameron LNG's Project would not provide a significant environmental advantage over the Lake Charles Liquefaction Project. Therefore, this system alternative was not evaluated further.

Freeport LNG Terminal

The Freeport LNG Terminal is located on Quintana Island in Brazoria County, Texas, about 146 miles southwest of the Trunkline LNG Terminal. The import terminal, which started operations in 2008, includes two 160,000-m^3 LNG storage tanks, vaporization units, and a single berth capable of handling LNG carriers in excess of 200,000-m^3. It has a peak natural gas send-out capability of about 1.5 Bcf/d. Authorization to re-export foreign-sourced LNG was received in 2009.

Freeport LNG and FLNG Liquefaction, LLC (collectively, Freeport LNG) propose to add liquefaction facilities to the existing terminal to provide LNG export capacity of about 13.2 MTPA. This project would require about 105 acres for three liquefaction trains and ancillary facilities, each train with a nominal capacity of 4.4 MTPA. An off-site pre-treatment plant and interconnecting pipeline/utility line system is also proposed. In addition, Freeport LNG filed an application on December 9, 2011 to construct

[2] Docket Nos. PF12-12-000 and PF12-13-000

[3] Docket No. CP13-25-000

[4] Docket No. CP13-27-000

[5] Docket No. PF15-13

a marine berthing dock, transfer facility, 160,000-m^3 LNG storage tank, and an access road system to serve the existing import and re-export operations, as well as the liquefaction project described below.[6]

FLNG Expansion and FLNG Liquefaction, LLC (collectively, FLEX) filed two separate applications with the DOE, each to export up to 9.0 MTPA of LNG (equivalent to 1.4 Bcf/d of vaporized natural gas) over 25 years to FTA nations. The DOE approved the applications in February 2011 and February 2012. On December 17, 2010, Freeport LNG submitted an application to the DOE to export 9.0 MTPA of LNG (equivalent to 1.4 Bcf/d of vaporized natural gas) over 25 years to non-FTA nations; on May 17, 2013, authorization was duly granted. On December 19, 2011, Freeport LNG submitted a second application to export an additional 1.4 Bcf/d to non-FTA nations, and received DOE approval for 0.4 Bcf/d on November 15, 2013. On January 5, 2011, Freeport LNG received authorization to use the FERC pre-filing process and filed its formal application with the Commission on August 31, 2012.[7] The FERC issued an *Order Granting Authorization Under Section 3 of the Natural Gas Act* for the project on July 30, 2014.[8]

On July 31, 2012, Freeport LNG Expansion announced a 20-year agreement with Osaka Gas and Chubu Electric for the liquefaction capacity (4.4 MTPA) of the first train. On February 11, 2013, Freeport LNG Expansion announced a 20-year agreement with BP for the liquefaction capacity (4.4 MTPA) of the second train. On September 9, 2013, Freeport LNG Expansion announced separate 20-year agreements with Toshiba and SK E&S for the liquefaction capacity (4.4 MTPA) of the third train, split equally between the two companies. Freeport LNG anticipates that the first liquefaction train will enter service in 2018 and the remaining two trains will enter service in 2019, 48 to 54 months after initiation of construction.

Freeport LNG's proposed liquefaction facilities are projected to enter full service about 1 year ahead of the Lake Charles Liquefaction Project (which is not scheduled to enter full service until 2020). In this respect, Freeport LNG's expansion would be constructed in a timeframe that could meet Lake Charles LNG's delivery schedule requirements. However, in addition to the 1.8 MTPA differential that would need to be made up (theoretically, by adding a fourth train) for Freeport LNG's expansion to supply the delivery output of the Lake Charles Liquefaction Project, the customer bases for the two projects do not overlap: as described previously, Freeport LNG's capacity is fully subscribed to multiple customers (Osaka Gas, Chubu Electric, BP, Toshiba, and SK E&S), whereas Lake Charles LNG's capacity is contracted solely to one different customer, BG LNG. Given the inherent schedule delays associated with the design, permitting, and construction of an additional train, and the different customer bases, Freeport LNG's terminal expansion could not meet Lake Charles LNG's market-based objectives. Therefore, this system alternative was not evaluated further.

Sabine Pass LNG Terminal

The Sabine Pass LNG Terminal is located on the eastern shore of the Sabine Pass Channel in Cameron Parish, Louisiana, about 42 miles west of the Trunkline LNG Terminal. The terminal occupies an approximately 853-acre site and includes five LNG storage tanks with a total storage capacity of 16.9 billion cubic feet and two LNG carrier berths. The facility has a natural gas send-out capacity of 4.0 Bcf/d. The terminal became operational as an LNG import facility in 2008 and received authorization for the re-export of foreign-sourced LNG in 2009.

On September 7, 2010, Sabine Pass LNG received approval from DOE to export 16.0 MTPA of LNG (equivalent to 2.2 Bcf/d of vaporized natural gas) to FTA nations over 30 years; on August 7, 2012, Sabine Pass LNG received approval from the DOE to export the same volume of LNG to non-FTA nations over the same period. On July 11, 2013 and July 12, 2013, Sabine Pass LNG received DOE approval for

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6 Docket No. CP12-29-000

7 Docket Nos. PF11-2 and CP12-509-000

8 Docket Nos. CP12-509-000 and CP12-29-000

LNG exports equating to 0.28 Bcf/d and 0.24 Bcf/d of vaporized natural gas, respectively. On January 22, 2014, Sabine Pass LNG received DOE approval to export surplus LNG equating to an additional 0.86 Bcf/d of vaporized natural gas. DOE approvals for comparable non-FTA applications in 2013/2014 are pending.

On April 16, 2012, the FERC authorized Sabine Pass LNG to receive, process, and export 16.0 MTPA of domestically originated LNG through its liquefaction project,[9] which involves the addition of four 4.0 MTPA liquefaction trains (Trains 1 through 4). On February 20, 2014,[10] the FERC authorized an increase in LNG production for Trains 1 through 4 from 16.0 to 20.0 MTPA to reflect a higher production capability due to certain approved design changes. The authorized project is currently under construction and will involve the permanent use of about 191 acres as well as the temporary disturbance of about 97 acres, all 288 acres being within the existing terminal site. Sabine Pass LNG anticipates that Trains 1 and 2 will be placed in service in 2016 and Trains 3 and 4 will be placed in service in 2017.

Currently, two interstate natural gas pipelines, the Creole Trail Pipeline and the Kinder Morgan Louisiana Pipeline, interconnect with the Sabine Pass LNG terminal. A third pipeline, owned by NGPL, crosses the terminal site but does not directly interconnect. Sabine Pass LNG indicates that the 2.2 Bcf/d of natural gas needed for the liquefaction facilities would be supplied via the Creole Trail Pipeline. Creole Trail Pipeline filed an application and subsequently received FERC authorization on February 21, 2013 to add a 53,125 hp compressor station to provide 1.5 Bcf/d of reverse flow capacity on its system.[11] The compressor station is currently under construction.

On February 27, 2013, Sabine Pass LNG and Creole Trail Pipeline requested use of the FERC pre-filing process for expansions of the liquefaction project and the Creole Trail Pipeline system, which would involve the addition of two more liquefaction trains (Trains 5 and 6) at the Sabine Pass LNG Terminal, about 104 miles of new pipeline, one new compressor station, and four new metering stations. The FERC approved the request on March 8, 2013.[12] Sabine Pass LNG and Creole Trail submitted their respective applications on September 30, 2013.[13] If approved, Trains 5 and 6 would add 9.0 MTPA (equivalent to 1.4 Bcf/d of vaporized natural gas) to the 20.0 MTPA already authorized for Trains 1 through 4. Sabine Pass LNG anticipates that Train 5 would be placed into service in 2019 and Train 6 at a later date when commercially feasible.

All 20.0 MTPA of LNG from Sabine Pass LNG's first four trains is fully committed and the customer base is wholly different from that of Lake Charles LNG. Both projects are fully subscribed to different customer bases and, therefore, further consideration of the four-train expansion as a system alternative is precluded.

With respect to the two additional trains, Sabine Pass LNG announced in March 2013 that Total and UK-based Centrica had collectively committed to 3.75 MTPA of liquefaction capacity for the fifth train. Although some liquefaction capacity (5.25 MTPA) does remain unsubscribed on the two trains, the unsubscribed capacity is insufficient to meet Lake Charles LNG's delivery requirements. Also, in both cases, the environmental impacts of the proposed facilities would likely be similar. As a result, the Sabine Pass Liquefaction Project was not considered to be environmentally advantageous or a reasonable system alternative to the Lake Charles Liquefaction Project and was not evaluated further.

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[9] Docket No. CP11-72-000

[10] Docket No. CP14-12-000

[11] Docket No. CP12-351-000

[12] Docket No. PF13-8-000

[13] Docket Nos. CP13-552-000 and CP13-553-000

Golden Pass LNG Terminal

The Golden Pass LNG Terminal is located near the town of Sabine Pass, Texas, on the western shore of the Sabine Pass Channel, about 44 miles southwest of the Trunkline LNG Terminal. The import terminal occupies an approximately 477-acre site and includes five 155,000-m^3 LNG storage tanks and two LNG carrier berths. It has a maximum send-out capacity of 2.5 Bcf/d and became operational in 2010.

Natural gas is sent out from the LNG terminal via the Golden Pass Pipeline, which connects to five interstate and four intrastate pipelines providing access to major markets on the Gulf Coast and across the mid-western and northeastern United States. The proposed export facility includes three 5.2 MTPA liquefaction trains, providing a total LNG send-out capacity of 15.6 MTPA. It would also require about 2.6 miles of 24-inch-diameter pipeline, compression facilities totaling 121,750 hp at three new compressor stations, and modification of certain existing interconnect facilities to provide for bi-directional transportation to deliver 2.6 Bcf/d of natural gas for liquefaction.

On September 27, 2012, Golden Pass Products, LLC (GPP) received approval from the DOE to export 15.6 MTPA of LNG (equivalent to 2.03 Bcf/d of vaporized natural gas) over 25 years to FTA nations. On October 26, 2012, GPP submitted an application, for which authorization is currently pending, to export LNG over the same period to non-FTA nations. On May 30, 2013, GPP received authorization to use the FERC pre-filing process, and GPP filed its application with the Commission on July 7, 2014.[14] GPP anticipates the first liquefaction train would enter service in 2019, and the remaining two trains would enter service in 2020.

GPP established a commercial framework agreement with Qatar Petroleum International and ExxonMobil to sell up to the full 15.6 MTPA. Based on GPP's and Lake Charles LNG's projects having similar total liquefaction capacities (15.0 and 15.6 MTPA, respectively), and the fact that GPP's capacity may still be available for subscription, it is theoretically possible that the Golden Pass terminal expansion could serve Lake Charles LNG's customer commitments. However, the permitting and review process for the Golden Pass expansion began substantially later than the process for the Lake Charles Liquefaction Project and, therefore, the Golden Pass expansion may not be permitted in time to meet Lake Charles LNG's customer commitments. In addition, the environmental impacts of constructing and operating the proposed facilities would likely be similar in each case, with no evidence of a clear advantage for either project. Therefore, the Golden Pass system alternative was not evaluated further.

Gulf LNG Terminal

The Gulf LNG Terminal is on a 40-acre site in Pascagoula, Mississippi, about 286 miles east of the Trunkline LNG Terminal. The terminal started import operations in October 2011 and has a natural gas send-out capacity of 1.3 Bcf/d. It includes two 160,000-m^3 LNG storage tanks and a single LNG carrier berth designed to receive vessels up to 250,000 m^3 in capacity. The terminal is connected to the Mobile Bay Lateral pipeline through a 15.5-mile-long, 26-inch-diameter pipeline. The Mobile Bay Lateral pipeline provides interconnects with Florida Gas Transmission Company, LLC (FGT) and Transcontinental Gas Pipeline Company, LLC (Transco) pipelines.

Gulf LNG is proposing to construct liquefaction facilities at its existing terminal, with plans to export up to 10.0 MTPA of LNG. The expansion would include two 5.0 MTPA liquefaction trains, providing a total liquefaction capacity of 10.0 MTPA. It would also include a new LNG storage area, a new truck loading/unloading facility, and a new dock designed to receive barges transporting large equipment during construction.

[14] Docket Nos. PF13-14, CP14-517, and CP14-518

On June 15, 2012, Gulf LNG received DOE authorization to export 11.5 MTPA[15] of LNG (equivalent to 1.5 Bcf/d of vaporized natural gas) to FTA nations over 25 years; on August 31, 2012, Gulf LNG filed an application with DOE to export the same volume of LNG to non-FTA nations over the same period. DOE approval of the non-FTA application is pending. On December 5, 2012, Gulf LNG requested use of the FERC pre-filing process.[16] The FERC approved the use of the pre-filing process on May 21, 2014. On July 31, 2014, the FERC issued a *Notice of Intent to Prepare and Environmental Impact Statement for the Planned Gulf LNG Liquefaction Project, Request for Comments on Environmental Issues, and Notice of Public Scoping Meeting*. Irrespective of the 5.0 MTPA differential in total liquefaction capacity between the Gulf LNG expansion and the Lake Charles Liquefaction Project, Gulf LNG is behind the Lake Charles Liquefaction Project in the permitting and review schedule may not be permitted for service in time to meet the customer commitments of the Lake Charles Liquefaction Project. As a result, the planned Gulf LNG Liquefaction Project does not meet the market-based objectives of Lake Charles LNG's and Trunkline's proposed development and was not evaluated further as a system alternative.

Main Pass Energy Hub Deepwater Port

Freeport – McMoRan Energy LLC (FME) plans to export LNG from existing and new facilities at the Main Pass Energy Hub Deepwater Port, located in federal waters in Main Pass Block 299, 16 miles offshore from southeastern Louisiana and about 272 miles east-southeast of the Trunkline LNG Terminal. The existing infrastructure includes 8 platforms. The planned project includes natural gas to be delivered to the port via pipeline, stored in new underground salt dome storage caverns, liquefied on six new floating liquefaction, storage, and offloading (FLSO) units and transferred to LNG carriers for export. Each FLSO unit would have a liquefaction capacity of 4.0 MTPA and an LNG storage capacity of 200,000 m^3, providing a collective liquefaction capacity of 24 MTPA and storage capacity of 1,200,000 m^3.

On May 24, 2013, FME received approval from the DOE to export 24.0 MTPA of LNG (equivalent to 3.22 Bcf/d of vaporized natural gas) to FTA nations over 30 years; a corresponding application for export to non-FTA nations is currently under DOE review. The facility would qualify as a "deepwater port" under the Deepwater Port Act and, as such, would require a license from the U.S. Maritime Administration (MARAD) and the Coast Guard. At the time of writing, FME has not filed an application with the MARAD and Coast Guard.

On April 24, 2013, it was announced that Petronet LNG Limited committed to 4.0 MTPA of the total LNG output of 24 MTPA from the Main Pass Energy Hub Deepwater Port. While the FME project would have sufficient remaining capacity to meet Lake Charles LNG's commitment of 15.0 MTPA and the original in-service target date was 2017, it is unlikely that it could match Lake Charles LNG's required timeline, given that applications have not yet been submitted. As an offshore ocean facility, environmental impacts are not readily comparable with those of the Lake Charles Liquefaction Project but there is no clear evidence that they would necessarily be less significant. Therefore, this system alternative was not considered further.

3.2.1.2 Approved, Proposed, and Planned Stand-Alone Liquefaction Projects

In addition to the liquefaction projects proposed or planned at the six existing LNG import facilities described above, there are several approved, proposed, and planned stand-alone liquefaction projects located along the Gulf Coast in the southern United States, as identified below.

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15 Current project design is based on 10.0 MTPA.

16 Docket No. PF13-4

Approved

- Corpus Christi Liquefaction, LLC (Corpus Christi) – Corpus Christi Liquefaction Project

Proposed

- Excelerate Liquefaction Solutions, LLC (ELS) – Lavaca Bay LNG Project
- Magnolia LNG (Magnolia) – Magnolia LNG Project

Planned

- Louisiana LNG Energy LLC (LLNG) – Louisiana LNG Project
- CE FLNG, LLC (CE FLNG) – CE FLNG LNG Project
- Venture Global Calcasieu Pass, LLC (Venture Global) – Calcasieu Pass Project
- Texas LNG Brownsville LLC (Texas LNG) – Texas LNG Project
- Annova LNG Common Infrastructure, LLC, Annova LNG Brownsville A, LLC, Annova LNG Brownsville B, LLC, and Annova LNG Brownsville C, LLC (collectively, Annova) – Annova LNG Project
- Port Arthur LNG, LLC and Port Arthur Pipeline, LLC (collectively, Port Arthur) – Port Arthur LNG Project
- Rio Grande LNG, LLC and Rio Bravo Pipeline Company, LLC (collectively, Rio Bravo) – Rio Grande Project
- Gasfin Development USA, LLC (Gasfin) – Gasfin LNG Project
- Waller Point LNG (Waller Point) – Waller Point LNG Project
- Delfin LNG LLC (Delfin) – Delfin LNG Project
- Gulf Coast LNG Exports, LLC (Gulf Coast) – Gulf Coast LNG Project
- Eos LNG LLC (Eos) Project/Barca LNG LLC (Barca) Project – Eos LNG Project[17]
- Southern California Telephone and Energy LNG, LLC (SCT&E LNG) – SCT&E LNG Project
- WesPac Midstream LLC (WesPac) – WesPac/Gulfgate Terminal Project

These projects are new or "greenfield" projects that are not associated with existing LNG import terminals, but we considered them as potential system alternatives. Table 3.2.1-2 provides a summary of the 16 liquefaction projects listed above, the criteria used to evaluate their system alternatives status, and the results of the evaluation in each case. Further details for each project are provided in the text that follows the table.

[17] The Eos and Barca Projects constitute the same planned development, for which separate DOE applications were filed. As such, to avoid unnecessary redundancy, only the Eos Project is discussed further in section 3.1.1.2.

TABLE 3.2.1-2

Stand-Alone Approved, Proposed, and Planned Liquefaction Projects Along the Gulf Coast Summary Profile as System Alternatives

Project	MTPA	MTPA Differential	FERC Status	In-Service Target Date	Customer Base Compatibility[a]	Compatible Timeline for Additional Expansion	Less Environmental Impact	Reasonable Alternative
Approved Project								
Corpus Christi LNG	13.5	–1.5	Authorized 12-30-14	2017–2020	Possible	No	No	No
Proposed Projects								
Lavaca Bay	10.0	–5.0	Application Filed 02-06-14 – On Hold	2018	Possible	No	No	No
Magnolia LNG	8.0	–7.0	Application Filed 04-30-14	2018–2019	Possible	No	No	No
Planned Projects								
Louisiana LNG	2.0	–13.0	Pre-filing initiated 7-18-14	2018	No	No	No	No
CE FLNG	8.0	–7.0	Pre-filing initiated 04-16-13	2019	Possible	No	No	No
Calcasieu Pass	10.0	–5.0	Pre-filing initiated 10-10-14	2019	Possible	No	No	No
Texas LNG	2.0	–13.0	Pre-filing requested 3-9-15	2020	No	No	No	No
Annova LNG	7.0	–8.0	Pre-filing requested 3-11-15	2019	No	No	No	No
Port Arthur LNG	10.0[b]	-5.0	Pre-filing requested 3-20-2015	2021	Possible	No	No	No
Rio Grande	27.0[b]	+12.0	Pre-filing requested 3-20-15	2020	Possible	No	No	No
Gasfin	1.5	–13.5	Pre-filing not initiated	Not known	Possible	No	No	No
Waller Point	1.5	–13.5	Pre-filing not initiated	Not known	No	No	No	No
Delfin LNG	13.0	–2.0	N/A[c]	2017–2021	Possible	No	No	No
Gulf Coast LNG	18.0	+3.0	Pre-filing not initiated	2018	Possible	No	No	No
Eos LNG	12.0	–3.0	Pre-filing not initiated	Not known	No	No	No	No
SCT&E LNG	12.0	–1.0	Pre-filing not initiated	Not known	No	No	No	No
WesPac LNG Project	1.5	–13.5	Pre-filing not initiated	Not known	No	No	No	No

Note: N/A = Not Applicable

[a] This reflects the degree to which currently designed export capacity has been subscribed and/or predicted differences in target markets based on project size.

[b] The volumes of LNG listed are based on the information provided in the FERC pre-filing requests because the DOE applications were not available at the time of this writing.

[c] The Delfin LNG Project, a deepwater port project, would require authorizing from the U.S. Maritime Administration and the Coast Guard. Applications have not been filed to date.

Corpus Christi Liquefaction Project

The proposed Corpus Christi Liquefaction Project is located about 285 miles southwest of the Trunkline LNG Terminal, on the northeast side of Corpus Christi Bay in San Patricio County, Texas. The proposed site was originally authorized for the Corpus Christi LNG Import Terminal, which was not constructed due to market changes.[18] The liquefaction and export terminal would include three trains, each with a liquefaction capacity of 4.5 MTPA, for a total send-out capacity of 13.5 MTPA, three 160,000-m^3 LNG storage tanks, and two LNG berthing docks. The proposed project also includes an approximately 23-mile-long, 48-inch-diameter pipeline, which would connect the LNG terminal with five interstate and intrastate natural gas transmission pipelines in south Texas, and two new compressor stations. In total, about 1,000 acres of construction workspace would be required.

On October 16, 2012, Corpus Christi (through Cheniere Marketing, LLC) received DOE authorization to export 13.5 MTPA of LNG (equivalent to 2.1 Bcf/d of vaporized natural gas) to FTA nations over 25 years; on August 31, 2012, Corpus Christi (through Cheniere Marketing, LLC) applied to the DOE to export the same volume of LNG to non-FTA nations over 22 years. Approval of the latter application is pending.

Corpus Christi received authorization to use the FERC pre-filing process on December 22, 2011 [19] and submitted its application on August 31, 2012.[20] In December 2013, Corpus Christi announced a contractual agreement with Pertamina for 0.8 MTPA of liquefaction capacity. In April 2014, two contractual agreements with Endesa S.A. for 2.25 MTPA brought the subscribed capacity of the first train to 3.05 MTPA. Currently, Corpus Christi forecasts construction start-up in 2015 and operational start-up as early as late 2017. On December 30, 2014, the FERC issued an *Order Granting Authorization Under Section 3 of the Natural Gas Act and Issuing Certificates* authorizing the project.

The Corpus Christi project only has 10.45 MTPA of unsubscribed liquefaction capacity. As such, a 4.55 MTPA addition (theoretically, a fourth train) to the currently proposed facilities would be needed to supply the 15.0 MTPA required under Lake Charles LNG's current customer agreements. Therefore, Corpus Christi's terminal expansion could not meet Lake Charles LNG's market-based objectives. In addition, with new berthing facilities and about 1,000 acres of land-based disturbance, this project would not provide a significant environmental advantage over the Lake Charles Liquefaction Project. Therefore, it was not evaluated further as a system alternative.

Lavaca Bay LNG Project

ELS's proposed Lavaca Bay LNG Project is located in Port Lavaca in Calhoun County, Texas, about 222 miles southwest of the Trunkline LNG Terminal. The planned terminal development includes two FLSO units that would manufacture LNG from domestically produced natural gas, two marine berths, and onshore pretreatment facilities and infrastructure associated with the FLSO units, which would be permanently moored. The project would include a total of eight liquefaction trains, four on each of the two FLSO units. It would have an LNG storage capacity of up to 502,000 m^3, and a peak LNG send-out capacity of 10.0 MTPA. LNG would be stored, as needed, prior to transfer to marine carriers for export.

The project would require improvement dredging of the existing Matagorda Ship Channel to accommodate the delivery of the FLSO units, new dredging to create a berth for the FLSOs, and new dredging to create a berth and turning basin for the LNG carriers. The project would also include a 29.5-

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18 Docket No. CP04-37

19 Docket No. PF12-3-000

20 Docket No. CP12-507

mile-long, 42-inch-diameter natural gas delivery pipeline and compression, metering, and appurtenant facilities. The pipeline would connect with nine interstate and intrastate pipelines.

On August 9, 2012, ELS received DOE authorization to export 10.0 MTPA of LNG (equivalent to 1.38 Bcf/d of vaporized natural gas) to FTA nations over 20 years; an application to export 1.38 Bcf/d to non-FTA nations over the same period is pending approval. On November 12, 2012, ELS received authorization to use the FERC pre-filing process[21] and filed its formal application with the Commission on February 6, 2014.[22] In a letter December 23, 2014, ELS requested that the FERC place the project on hold until April 1, 2015 while it reevaluates the economics of the Lavaca Bay LNG Project.

Because the Lavaca Bay LNG Project is on hold, the timelines for permitting, construction, and operational start-up are uncertain. In addition, the Lavaca Bay LNG Project would not have the capacity needed to meet Lake Charles LNG's customer commitments, with a 5.0 MTPA differential. The addition of a third FLSO to address this differential is technically infeasible. Also, we anticipate that the environmental impacts associated with construction and operation of two new berthing areas and turning basins, onshore terminal infrastructure, and an extensive pipeline delivery system would be no less than those of the Lake Charles Liquefaction Project. Therefore, the Lavaca Bay LNG Project would not provide a significant environmental advantage over the Lake Charles Liquefaction Project and this system alternative was not evaluated further.

Magnolia LNG Project

Magnolia's proposed liquefaction project site is located about 250 yards southwest of the existing Trunkline LNG Terminal, on the opposite side of the Port of Lake Charles' Industrial Canal, off the Calcasieu Ship Channel, in Calcasieu Parish, Louisiana. The Magnolia LNG Project would be constructed on a 115-acre site that partially overlaps Liquefaction Facility Site 1, one of the terminal expansion site alternatives considered by Lake Charles LNG (see section 3.3.1). At full capacity, the project would export 8.0 MTPA of LNG through four liquefaction trains, each with a nominal capacity of 2.0 MTPA. The project would also include two vessel loading facilities and two 160,000-m^3 LNG storage tanks. Natural gas would be supplied from an existing transmission pipeline (Kinder Morgan Louisiana Pipeline) that crosses the site.

On February 26, 2013, Magnolia received DOE authorization to export 4.0 MTPA of LNG (equivalent to 0.54 Bcf/d of vaporized natural gas) to FTA nations over 25 years; if and when it pursues a second phase of its project encompassing exports to non-FTA nations, it will apply for the necessary DOE approval. On March 20, 2013, the FERC initiated its pre-filing process for the project and Magnolia filed an application on April 30, 2014.[23] Subject to the receipt of necessary approvals, construction is proposed to begin in 2015, with operational start-up of the first train scheduled for 2018.

With a 7.0 MTPA differential, the Magnolia LNG Project would require the construction of two additional trains to meet Lake Charles LNG's customer commitment of 15.0 MTPA, assuming Magnolia's initial 8.0 MTPA could also be utilized for this purpose. Moreover, the environmental impacts of constructing and operating the proposed facilities for the two projects would likely be similar. Therefore, this system alternative was not evaluated further.

[21] Docket No. PF13-1-000

[22] Docket Nos. CP14-71-000, CP14-72-000, and CP14-73-000

[23] PF13-9-000; CP14-347

Louisiana LNG Project

LLNG plans to construct and operate a liquefaction facility on a 200-acre site on the east bank of the Mississippi River downstream from the Port of New Orleans in Plaquemines Parish, Louisiana, about 216 miles east-southeast of the Trunkline LNG Terminal. The project would include four liquefaction trains, each producing 0.5 MTPA of LNG for a total capacity of 2.0 MTPA.

On February 5, 2014, LLNG applied for DOE authorization to export 2.0 MTPA of LNG (equivalent to 0.27 Bcf/d of vaporized natural gas) to FTA nations over 25 years; a corresponding application for export of 2.0 MTPA of LNG to non-FTA nations over the same period was submitted on February 18, 2014. On August 28, 2014 LLNG received DOE authorization to export 2.0 MTPA of LNG to FTA nations over 25 years; its application to export to non-FTA nations over the same period is pending approval. LLNG received authorization to use the FERC pre-filing process on July 18, 2014.[24]

We do not consider the Louisiana LNG Project to be a reasonable alternative to the Lake Charles Liquefaction Project because it would not have the necessary send-out capacity to meet Lake Charles LNG's customer commitments. Also, based on the small scale of the Louisiana LNG Project, fundamental differences are anticipated in the type of market each project serves. Moreover, the Louisiana LNG Project offers no clear environmental advantage over the Lake Charles Liquefaction Project. Therefore, this system alternative was not considered further.

CE FLNG LNG Project

CE FLNG has announced the planned development of a floating LNG liquefaction and export facility on the east bank of the Mississippi River in Plaquemines Parish, Louisiana, about 250 miles east-southeast of the Trunkline LNG Terminal. Terminal facilities would include two marine berths, a turning basin, and two FLSO units, each capable of producing up to 4.0 MTPA of LNG, for an overall project output of 8.0 MTPA. The FLSO units would each have four liquefaction trains and LNG storage capacity of 250,000 m^3, for an overall project storage capacity of 500,000 m^3. LNG carriers would berth next to the FLSO units to receive LNG. An approximately 125-acre area fronting the Mississippi River would be dredged to install the berths and FLSO units. The project would also include a 37-mile-long pipeline to connect the terminal with two sources of natural gas: (1) the existing Enterprise Products natural gas processing plant in Bernard Parish, and (2) the existing Targa Venice natural gas processing plant in Plaquemines Parish. CE Pipeline, LLC plans to construct and operate the pipeline.

On November 21, 2012, CE LNG received DOE approval to export 8.0 MTPA of LNG (equivalent to 1.07 Bcf/d of vaporized natural gas) to FTA nations over 30 years; a September 21, 2012 application to export 8.0 MTPA of LNG to non-FTA nations over the same period is pending. On April 16, 2013, FERC initiated the pre-filing process;[25] at the time of writing, an application had not been filed. CE FLNG anticipates that the FLSO units would be placed in service during the third quarter of 2019.

To meet Lake Charles LNG's 15.0 MTPA LNG delivery requirement, CE FLNG would need to commit the entire capacity of its project (8.0 MTPA) to Lake Charles LNG's customers and install two additional FLSO units and marine berths, along with attendant on-shore facilities, to address the differential (7.0 MTPA). Irrespective of technical feasibility, the inherent schedule delays associated with the design, permitting, and construction of these additional facilities would preclude attainment of Lake Charles LNG's timeline commitments. Moreover, the environmental impacts of constructing and operating these facilities

[24] Docket No. PF14-17-000.

[25] Docket No. PF13-11-000.

would likely be no less than those associated with the Lake Charles Liquefaction Project. Therefore, the CE LNG Project was not evaluated further as a system alternative.

Calcasieu Pass Project

Venture Global is planning to construct and operate a liquefaction and LNG export facility on a 203-acre site on the east side of the Calcasieu Ship Channel near the Gulf of Mexico, about 23 miles south of the Lake Charles Liquefaction Project, in Cameron Parish, Louisiana. The proposed greenfield development would use single mixed refrigerant technology and would consist of 10 LNG blocks capable of producing a total of 10.0 MTPA of LNG, two 200,000-m^3 LNG storage tanks, two LNG berthing docks that would accommodate vessels up to 185,000 m^3 in size. The project would also include construction of two new natural gas lateral pipelines, one 19 miles long and the other 24 miles long, that would connect to the existing natural gas pipeline grid in southern Louisiana.

On September 27, 2013, Venture Global received approval from the DOE to export up to 5.0 MTPA (equivalent to 0.67 Bcf/d) of LNG to FTA nations over 25 years; an application for DOE approval to export 5.0 MTPA of LNG to non-FTA nations is pending. On May 13, 2014, Venture Global submitted a second application to DOE to export another 5.0 MTPA of LNG to both FTA and non-FTA nations. On October 10, 2014, Venture Global received approval from the DOE to export up to 5.0 MTPA (equivalent to 0.67 Bcf/d) of LNG to FTA nations over 25 years; an application for DOE approval to export 5.0 MTPA of LNG to non-FTA nations is pending. Additionally, on February 9, 2015 Venture Global submitted a third application to DOE to export another 2.0 MTPA of LNG to both FTA and non-FTA nations. The FERC approved Venture Global's request to enter the FERC pre-filing process on October 10, 2014.[26] According to its pre-filing request letter, Venture Global anticipates an in-service date of December 2019.

We do not consider the Calcasieu Pass Project to be a reasonable alternative to the Lake Charles Liquefaction Project because it would not have the necessary send-out capacity to meet Lake Charles LNG's customer commitments. Moreover, the Calcasieu Pass Project offers no clear environmental advantage over the Lake Charles Liquefaction Project. Therefore, this system alternative was not considered further.

Texas LNG Project

Texas LNG is planning a liquefaction and LNG export terminal on a 625-acre site on the Brownsville Ship Channel in Cameron County, Texas. The proposed project would be located about 375 miles southwest of the proposed LNG Terminal and would include up to two liquefaction trains with an overall LNG capacity of approximately 4 MTPA, two 210,000-m^3 LNG storage tanks, and a marine berth for one LNG carrier. The planned terminal would receive domestic feed gas from the Agua Dulce natural gas hub through a new, 150-mile-long intrastate natural gas header pipeline. If approved, Texas LNG anticipates commencing operation in 2020.

On June 11, 2014, Texas LNG received DOE authorization to export 2.0 MTPA of LNG (equivalent to 0.27 Bcf/d of vaporized natural gas) to FTA nations over 25 years; an application to export the same volume to non-FTA nations over the same period is pending approval. Texas LNG indicates that it plans on placing the facilities in service in early 2020. On March 9, 2015, Texas LNG requested that the FERC initiate the pre-filing process.[27]

We do not consider the Texas LNG Project to be a reasonable alternative to the Lake Charles Liquefaction Project because it would not be completed in a compatible timeframe or have the necessary

[26] Docket No. PF15-2

[27] Docket No. PF15-14

send-out capacity to meet Lake Charles LNG's customer commitments. Also, based on the small scale of the Texas LNG Project, fundamental differences are anticipated in the type of market each project serves. Moreover, the Texas LNG Project offers no clear environmental advantage over the Lake Charles Liquefaction Project. Therefore, this system alternative was not considered further.

Annova LNG Project

Annova is planning an LNG liquefaction and export terminal on a 650-acre site on the Brownsville Ship Channel in Cameron County, Texas, about 375 miles southwest of the LNG Terminal. Annova's facility would include six liquefaction trains with an overall LNG capacity of approximately 7.0 MTPA. LNG produced by the trains would be stored in two 160,000-m^3 LNG storage tanks, and a marine berth for one LNG carrier. The planned terminal would receive domestic feed gas from the Isla Grande Pipeline through a new, intrastate natural gas header pipeline.

On February 20, 2014, Annova received DOE authorization[28] to export 7.0 MTPA of LNG (equivalent to 0.94 Bscf/d of vaporized natural gas) to FTA nations over 30 years; a corresponding application for LNG export to non-FTA nations is not anticipated. If approved, Annova anticipates an in-service date of December 2019. On March 11, 2015, Annova LNG requested that the FERC initiate the pre-filing process.[29]

We do not consider the Annova LNG Project to be a reasonable alternative to the Lake Charles Liquefaction Project because it does not have the necessary send-out capacity to meet Lake Charles LNG's customer commitments. Therefore, this system alternative was not considered further.

Port Arthur LNG Project

Port Arthur is planning a liquefaction and LNG export facility on the west side of the Sabine-Neches Waterway near Port Arthur, Texas, about 45 miles southwest of the proposed LNG Terminal. Port Arthur's facility would include two 5.0 MTPA liquefaction trains (providing a total liquefaction capacity of 10.0 MTPA), two 160,000-m^3 capacity LNG storage tanks, a natural gas liquids and refrigerant storage area, a truck loading/unloading facility, two LNG carrier berths. To supply natural gas required for the terminal, construction of two 42-inch-diameter natural gas pipelines (one 7 miles in length and one 27 miles in length), two compressor stations, metering stations, and appurtenant facilities would be required. If approved, the Port Arthur LNG Project would begin operations in the first quarter of 2021. On March 20, 2015, Port Arthur submitted an application to the DOE for authorization to export LNG to FTA nations. Also on March 20, 2015, Texas LNG requested that the FERC initiate the pre-filing process.[30]

We do not consider the Port Arthur LNG Project to be a reasonable alternative to the Lake Charles Liquefaction Project because it would not be completed in a compatible timeframe or have the necessary send-out capacity to meet Lake Charles LNG's customer commitments. Therefore, this system alternative was not evaluated further.

Rio Grande Project

Rio Bravo is planning a liquefaction and LNG export terminal on a 1,000-acre site on the northern shore of the Brownsville Ship Channel in Cameron County, Texas, about 375 miles southwest of the LNG Terminal. The proposed project would include six liquefaction trains with an overall LNG capacity of

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28 On July 17, 2014, the DOE authorized the transfer of Annova LNG, LLC's FTA authorization to Annova LNG Common Infrastructure, LLC.

29 Docket No. PF15-15.

30 Docket Nos. PF15-18-000 and PF15-19-000

approximately 27 MTPA, four 180,000-m^3 LNG storage tanks, two marine berths, and on-site power generation. To supply natural gas required for the terminal, construction of two parallel, 130-mile-long, 42-inch-diameter natural gas pipelines, three compressor stations, and appurtenant facilities would be required. If approved, Rio Bravo anticipates commencing operation during the fourth quarter of 2020.

On March 20, 2015, Texas LNG requested that the FERC initiate the pre-filing process.[31] Rio Bravo anticipates filing an application with the DOE for authorization to export LNG to FTA nations in January 2016.

We do not consider the Rio Grande Project to be a reasonable alternative to the Lake Charles Liquefaction Project because it would not be completed in a compatible timeframe to meet Lake Charles LNG's customer commitments. Therefore, this system alternative was not considered further.

Gasfin LNG Project

Gasfin is planning to develop a liquefaction and LNG export facility on the east side of the Calcasieu Ship Channel in Cameron Parish, Louisiana, about 23 miles south of the Trunkline LNG Terminal. This mid-scale project would have overall LNG storage capacity of 100,000 m^3 and LNG export capacity of 1.5 MTPA. Onshore facilities would be constructed on a 35-acre site and the project would also include a single marine berth, capable of handling LNG carriers.

On March 7, 2013, Gasfin received DOE authorization to export 1.5 MTPA of LNG (equivalent to 0.2 Bcf/d of vaporized natural gas) to FTA countries over 25 years; a December 24, 2013 application to export 1.5 Bcf/d to non-FTA nations over 20 years is pending approval. The project is in the initial development phase and an anticipated schedule has not yet been released. At the time of writing, Gasfin had not requested that the FERC initiate the pre-filing process.

We do not consider the Gasfin LNG Project to be a reasonable alternative to the Lake Charles Liquefaction Project because it would not be completed in a compatible timeframe or have the necessary send-out capacity to meet Lake Charles LNG's customer commitments. Also, based on the relatively small scale of the Gasfin LNG Project, including the LNG carrier size range it is designed to accommodate, fundamental differences are anticipated in the type of market each project serves. Therefore, this system alternative was not considered further.

Waller Point LNG Project

The Waller Point LNG Project is a planned LNG liquefaction and export facility on a 180-acre greenfield site near the mouth of the Calcasieu Ship Channel in Cameron Parish, Louisiana, about 22 miles south of the Trunkline LNG Terminal. The project would include small-scale liquefaction trains with a total LNG export capacity of about 1.5 MTPA, LNG storage capacity of 30,000 m^3, and berthing facilities for LNG barges.

On December 20, 2012, Waller Point received DOE authorization to export 1.25 MTPA of LNG (equivalent to 0.16 Bcf/d of vaporized natural gas) to FTA nations over 25 years; a November 26, 2013 application to export 1.5 MTPA of LNG (equivalent to 0.19 Bcf/d of vaporized natural gas) to non-FTA nations over the same period is pending approval. The project is in the initial development phase and Waller Point LNG has not announced a planned schedule. Furthermore, at the time of writing, initiation of the FERC pre-filing process had not been requested.

[31] Docket No. PF15-20-000

We do not consider the Waller Point LNG Project to be a reasonable alternative to the Lake Charles Liquefaction Project because it would not be completed in a compatible timeframe or have the necessary send-out capacity to meet Lake Charles LNG's customer commitments. Also, based on the small scale of the Waller Point LNG Project and the use of LNG barges instead of ships, fundamental differences are anticipated in the type of market each project serves. Therefore, this system alternative was not considered further.

Delfin LNG Project

Delfin is planning to construct and operate a floating liquefaction and export terminal to be located in the West Cameron Block 167 in the Gulf of Mexico, about 30 miles offshore from Cameron Parish, Louisiana and 54 miles south of the Trunkline LNG Terminal. The facility would qualify as a "deepwater port" under the Deepwater Port Act and, as such, would require a license from the MARAD and the Coast Guard. The terminal would be located near an existing platform and would receive gas via an existing 30-mile-long, 42-inch-diameter Enbridge pipeline that was originally built to transport offshore gas production to onshore connections with ANR Pipeline Company, Transco, NGPL, and nearby gas processing plants. In 2011, based on changing market economics, the pipeline was taken out of service but maintained in an operable state. The on-shore connections would be reinstated and flow reserved to deliver gas to the new terminal.

Delfin indicates that gas would be liquefied by four trains located on FLSO units located close to the offshore terminus of the former Enbridge pipeline and loaded onto LNG carriers for export. The first two trains would each have a capacity of 2.5 MTPA and would be placed in service in 2017 and 2018, respectively; the second two trains would each have a capacity of 5.0 MTPA and would be placed in service in 2019 and 2021, respectively.

On February 20, 2014, Delfin received DOE approval to export 13.0 MTPA of LNG (equivalent to 1.80 Bcf/d of vaporized natural gas) to FTA nations over 20 years; a November 12, 2013 application to export 13.0 MTPA of LNG to non-FTA nations over the same period are pending. At the time of this writing, Delfin has not filed an application with the MARAD and the Coast Guard.

To meet Lake Charles LNG's 15.0 MTPA LNG delivery requirement, Delfin would need to commit the entire capacity of its project (13.0 MTPA) to Lake Charles LNG's customers and install an additional FLSO unit to address the differential (2.0 MTPA). However, since Delfin has not yet filed its applications with MARAD and the Coast Guard, neither the full 13.0 MTPA already planned, nor the additional 2.0 MTPA, would likely be available in a timeframe compatible with Lake Charles LNG's customer commitments. As an offshore ocean facility, environmental impacts are not readily comparable with those of the Lake Charles Liquefaction Project but there is no clear evidence that they would necessarily be less significant. Therefore, the Delfin LNG Project was not evaluated further as a system alternative.

Gulf Coast Liquefaction Project

The Gulf Coast Liquefaction Project would export LNG from a planned liquefaction facility at the Port of Brownsville in Brownsville, Texas, about 374 miles southwest of the Trunkline LNG Terminal. The project would include a new terminal on about 500 acres, four liquefaction trains each capable of producing 4.5 MTPA of LNG (18.0 MTPA total), an unspecified number of LNG storage tanks, a marine berth, and a pipeline interconnect with existing natural gas transmission lines.

On October 16, 2012, Gulf Coast received DOE authorization to export 18.0 MTPA of LNG (equivalent to 2.8 Bcf/d of vaporized natural gas) to FTA nations over 25 years; an application to export 2.8 Bcf/d to non-FTA nations over the same period is pending approval. At the time of writing, Gulf Coast had not requested that the FERC initiate the pre-filing process.

Gulf Coast would have the capacity to meet Lake Charles LNG's 15.0 MTPA requirement; however, given that the project has not yet entered pre-filing, the project's development schedule would not be compatible with Lake Charles LNG's timeline for customer commitments. In addition, as a greenfield facility, the Gulf Coast Liquefaction Project, would be unlikely to provide a significant environmental advantage over the Lake Charles Liquefaction Project. Therefore, this system alternative was not considered further.

Eos LNG Project

Eos is planning to develop an LNG liquefaction and export facility at the Port of Brownsville in Brownsville, Texas. The facility is being designed and permitted for up to six modular floating liquefaction barges with aggregate peak capacity of up to 12.0 MTPA. It would include up to six 35,000-m^3 full containment storage tanks and up to six LNG carrier docks. Each floating liquefaction barge would be moored alongside an LNG carrier that would be utilized solely for storage. LNG would be transferred to and exported by a second carrier, moored alongside the barge and storage carrier. The project would not require land-based liquefaction or storage facilities. Feed gas would be sourced from local pipeline interconnects.

On November 26, 2013, Eos received DOE authorization to export 12.0 MTPA of LNG (equivalent to 1.6 Bcf/d of vaporized natural gas) to FTA nations over 25 years; an application filed on August 23, 2013 to export 12.0 MTPA to non-FTA nations over the same period is pending approval. At the time of writing, initiation of the FERC pre-filing process had not been requested.

We do not consider the Eos LNG Project to be a reasonable alternative to the Lake Charles Liquefaction Project because it would not be completed in a compatible timeframe or have the necessary send-out capacity to meet Lake Charles LNG's customer commitments. Also, based on the small scale of the Eos LNG trains and LNG carriers, fundamental differences are anticipated in the type of market each project serves. Moreover, the Eos LNG Project offers no clear environmental advantage over the Lake Charles Liquefaction Project. Therefore, this system alternative was not considered further.

SCT&E LNG Project

SCT&E LNG is planning an LNG liquefaction and export facility on an about 246-acre site on Monkey Island in Cameron Parish, Louisiana, about 3 miles from the Gulf of Mexico. SCT&E's facility would include six LNG trains with an overall capacity of 12.0 MTPA of LNG. LNG produced by the trains would be stored in multiple on-site LNG storage tanks that may also be used for LNG bunkering and fueling of transportation ships for distribution of LNG.

On July 9, 2014, SCT&E LNG submitted an application to the DOE for authorization to export 12.0 MTPA (equivalent of 1.62 Bcf/d of natural gas) of LNG to FTA nations over 30 years. On July 24, 2014, SCT&E LNG also submitted an application to the DOE for authorization to export 12.0 MTPA of LNG to non-FTA nations. SCT&E LNG received authorization to export to FTA nations on December 15, 2014; the application requesting authorization to export to non-FTA nations is currently pending. At the time of writing, SCT&E has not yet requested initiation of the FERC pre-filing process.

Because the SCT&E LNG Project would not be completed in a compatible timeframe or have the necessary send-out capacity to meet Lake Charles LNG's customer commitments, we do not consider it to be a viable system alternative.

WesPac LNG Project

WesPac is planning an LNG liquefaction and export facility on 40 acres of land located on the Sabine-Neches Waterway near Port Arthur, Texas. On April 18, 2014, Alturas LLC (Alturas), a subsidiary of WesPac, submitted an application to the DOE for authorization to export 1.5 MTPA of LNG to FTA nations over 20 years. As of this writing, the application is still pending. At the time of writing, initiation of the FERC pre-filing process had not been requested. Because the WesPac LNG Project would not be completed in a compatible timeframe or have the necessary send-out capacity to meet Lake Charles LNG's customer commitments, we do not consider it to be a viable system alternative.

3.2.2 Pipeline System Alternatives

To serve as a viable system alternative to Trunkline's proposed pipelines, the system would have to (1) transport all or a part of the volume of natural gas required for liquefaction at the proposed new facility, and (2) cause significantly less impact on the environment than the proposed pipeline expansion. System alternatives to serve Lake Charles LNG's proposed liquefaction facility are those alternatives that could replace all or part of the proposed pipeline segments (Mainline Connector and Mainline 200-3 Loop) by making use of existing natural gas pipeline infrastructure and/or other new pipeline infrastructure. To be considered a legitimate system alternative, the supply infrastructure must either connect directly to the proposed liquefaction facility or to the existing Trunkline pipelines that serve the existing LNG terminal, in the latter case, through new rather than existing connections.

Trunkline's south Louisiana pipeline system provides the only direct connection to the Trunkline LNG Terminal, via a 30-inch- and 36-inch-diameter lateral pipeline (LNG lateral) designed to send out over 2.0 Bcf/d of natural gas through regasification of LNG. Based on the high volumes that the lateral is designed to handle, looping would not be necessary to maintain adequate gas flow for the proposed liquefaction facility, although additional compression would still be required. Therefore, looping for this segment of the proposed pipeline delivery system was not considered a reasonable alternative.

As currently proposed, Trunkline's upstream pipeline systems would be cost effectively expanded to provide up to 2.6 Bcf/d of natural gas to the LNG terminal via the LNG lateral. The 2.6 Bcf/d represents both fuel use and LNG production on a peak day. The DOE export authorization of up to 2.0 Bcf/d represents average LNG production. For a system alternative to be viable, similar supply rates would have to be possible and achieved with the same consideration of cost.

Trunkline's south Louisiana pipeline system currently interconnects with eight major interstate natural gas pipelines in the west Louisiana area: Creole Trail Pipeline, FGT, Gulf South Pipeline Company (Gulf South), NGPL, Tennessee Gas Pipeline Company (TGP), TETCO, Texas Gas Transmission, and Transco. Two of these pipelines (Creole Trail Pipeline and Gulf South), together with a third pipeline (Cameron Interstate Pipeline), cross several of the others and offer actual interconnections or interconnection capability. However, none of these three pipelines is currently capable of transporting 2.6 Bcf/d of gas to the LNG terminal; thus, they would need to undergo significant expansions through looping and compression to achieve this delivery capacity and new segments would have to be constructed to connect directly with the liquefaction facility. Using a straight line configuration, these new segments would measure about 2.5 miles for the Creole Trail Pipeline, 10 miles for the Gulf South Pipeline, and 6 miles for the Cameron Interstate Pipeline. The capacities of each of these three pipelines and their viability as system alternatives are described in the following sections.

3.2.2.1 Creole Trail Pipeline

The Creole Trail Pipeline is a 153-mile-long, 42-inch-diameter pipeline that was originally designed and constructed to transport vaporized LNG from the Sabine Pass LNG Terminal but is being modified to provide bi-directional flow of natural gas to the Sabine Pass Liquefaction Project for liquefaction and export. It extends from the Sabine Pass LNG Terminal in Cameron Parish, Louisiana to interconnections with Bridgeline Holdings, L.P., FGT, NGPL, TETCO, TGP, Transco, and Trunkline.

At a maximum flow rate of 2.6 Bcf/d, the Creole Trail Pipeline can transport sufficient natural gas to allow Sabine Pass LNG to export up to 16.0 MTPA of LNG (equivalent to 2.2 Bcf/d of vaporized natural gas). Because all 16.0 MTPA is committed to Sabine Pass LNG's customers, the Creole Trail Pipeline would not have sufficient capacity to supply natural gas to the Lake Charles Liquefaction Project without substantial looping.

As indicated above, the Creole Trail Pipeline has interconnections with many of the same pipelines as Trunkline's proposed pipelines and, at its closest point, is located about 2.5 miles west of the liquefaction facility site. From this location, a new route segment at least 2.5 miles long would have to be constructed through or around Alcoa's adjacent industrial property to connect with the proposed liquefaction facility. Also, significant looping would be needed to provide the 2.6 Bcf/d required by the Lake Charles Liquefaction Project in addition to satisfying the requirements of the Sabine Pass Liquefaction Project. As a result, environmental impacts would likely be equal to or greater than those of the proposed pipelines. Therefore, the Creole Trail Pipeline would not provide a significant environmental advantage over the proposed pipelines and was not evaluated further as a system alternative.

3.2.2.2 Gulf South Pipeline

The Gulf South Pipeline system includes about 7,360 miles of pipeline and has a capacity of about 6.9 Bcf/d. Markets served in Louisiana include local distribution companies, municipalities, power plants, and industrial end-users; off-system markets are served in the northeastern, mid-western, and southeastern United States through interconnections with third-party pipelines.

Given the supply sources and delivery points of the Gulf South system, it is unlikely that the existing system could provide the 2.6 Bcf/d of natural gas required for operation of the proposed liquefaction facility without extensive looping. In addition, the nearest point on the system to the liquefaction facility site is about 10 miles away, which would require at least 10 miles of new greenfield pipeline to connect directly to the liquefaction facility. We do not expect that the required looping and greenfield pipeline developments would have any significant environmental advantage relative to Trunkline's proposed pipelines. Therefore, the Gulf South Pipeline system alternative was not considered further.

3.2.2.3 Cameron Interstate Pipeline

The 36-mile-long, 42-inch-diameter Cameron Interstate Pipeline extends from the Cameron LNG Terminal in Cameron Parish, Louisiana, through Calcasieu Parish, to the Ragley Compressor Station in Beauregard Parish. The pipeline was constructed as a send-out pipeline for the Cameron LNG Terminal and provides interconnections with the FGT, TGP, TETCO, and Transco systems, through which gas is delivered to end-user markets. To allow the transport of natural gas to Cameron LNG's terminal for liquefaction and export, new pipeline facilities would be installed to increase the flow volume in the Cameron Interstate Pipeline from 1.0 to 2.35 Bcf/d and enable bidirectional flow capability. The new facilities would include the 56,820 hp Holbrook Compressor Station and 20.9 miles of new 42-inch-diameter pipeline extending from the existing interconnection with FGT in Cameron Parish to a proposed interconnect with Trunkline in Beauregard Parish.

At its closest point, the Cameron Interstate Pipeline is located about 6 miles from Lake Charles LNG's liquefaction facility site. As such, at least 6 miles of new greenfield pipeline would need to be constructed to connect with the proposed liquefaction facility, which could involve a crossing of Moss Lake (on the Calcasieu River north of Lake Calcasieu) of up to 1 mile. Also, significant looping would be needed to provide the 2.6 Bcf/d required by the Lake Charles Liquefaction Project in addition to satisfying the requirements of the Cameron LNG Liquefaction Project. As a result, environmental impacts would likely be equal to or greater than those of Trunkline's proposed pipelines. Therefore, the Cameron Interstate Pipeline would not provide a significant environmental advantage over the proposed pipelines and was not evaluated further as a system alternative.

3.3 ALTERNATIVE LIQUEFACTION FACILITY SITES

Based in part on information provided by Lake Charles LNG, we evaluated five alternative sites, including the currently proposed site, for the proposed liquefaction facility. The Trunkline LNG Terminal was established as the focal point of the site selection study area. Proximity to the existing terminal would allow Lake Charles LNG to readily integrate the new facilities with existing terminal infrastructure such as the LNG storage tanks, LNG carrier berths, and LNG transfer facilities. Use of this existing infrastructure would avoid the impacts of constructing and operating duplicate facilities elsewhere. The existing terminal is also connected to a natural gas pipeline system that could be readily modified to supply gas for liquefaction as well as transport gas from the terminal during import mode.

Lake Charles LNG indicated that cost and functionality constrain the length of the cryogenic piping that would be used to transport LNG from the liquefaction facilities to the existing LNG terminal. Two miles was defined as the maximum length of piping, a criterion that was used to define the general dimensions of the study area for identification of alternative sites. The north, south, and eastern boundaries of the study area were defined as about 1 mile from the center of the existing terminal. The study area boundary was arbitrarily extended west for about 3 miles to confer adjacency with the Calcasieu Ship Channel. The study area boundary encompassed about 8.6 square miles, within which the five site location options were identified.

3.3.1 Site Descriptions

The locations of the Liquefaction Facility Sites (LFS) considered (hereinafter referred to as LFS-1 through 5) are depicted in figure 3.3.1-1 and descriptions are provided below.

LFS-1

LFS-1 is located southwest of the existing LNG terminal, across the Industrial Canal. The 164-acre site is bisected by Henry Pugh Boulevard. On the north side of Henry Pugh Boulevard, the site is characterized by a former dredged material placement area that supports extensive scrub and herbaceous cover with some wooded patches. To the west, adjacent facilities include a public recreational area with a boat ramp, fishing pier, store, and restrooms; to the east, adjacent facilities are represented by a construction yard. To the south of Henry Pugh Boulevard, the topography drops sharply; this area does not appear to have been used for dredged material placement in the past and supports more extensive wooded cover than the site's northern section, with a mix of species such as water oak (*Quercus nigra*), loblolly pine (*Pinus taeda*), and Chinese tallow tree (*Triadica sebifera*). The southernmost extent of the site is emergent brackish marsh that borders a tidal bayou adjacent to Calcasieu Lake. LFS-1 is wholly within the FEMA 100-year floodplain. As noted previously, the proposed Magnolia LNG Project site includes a portion of LFS-1.

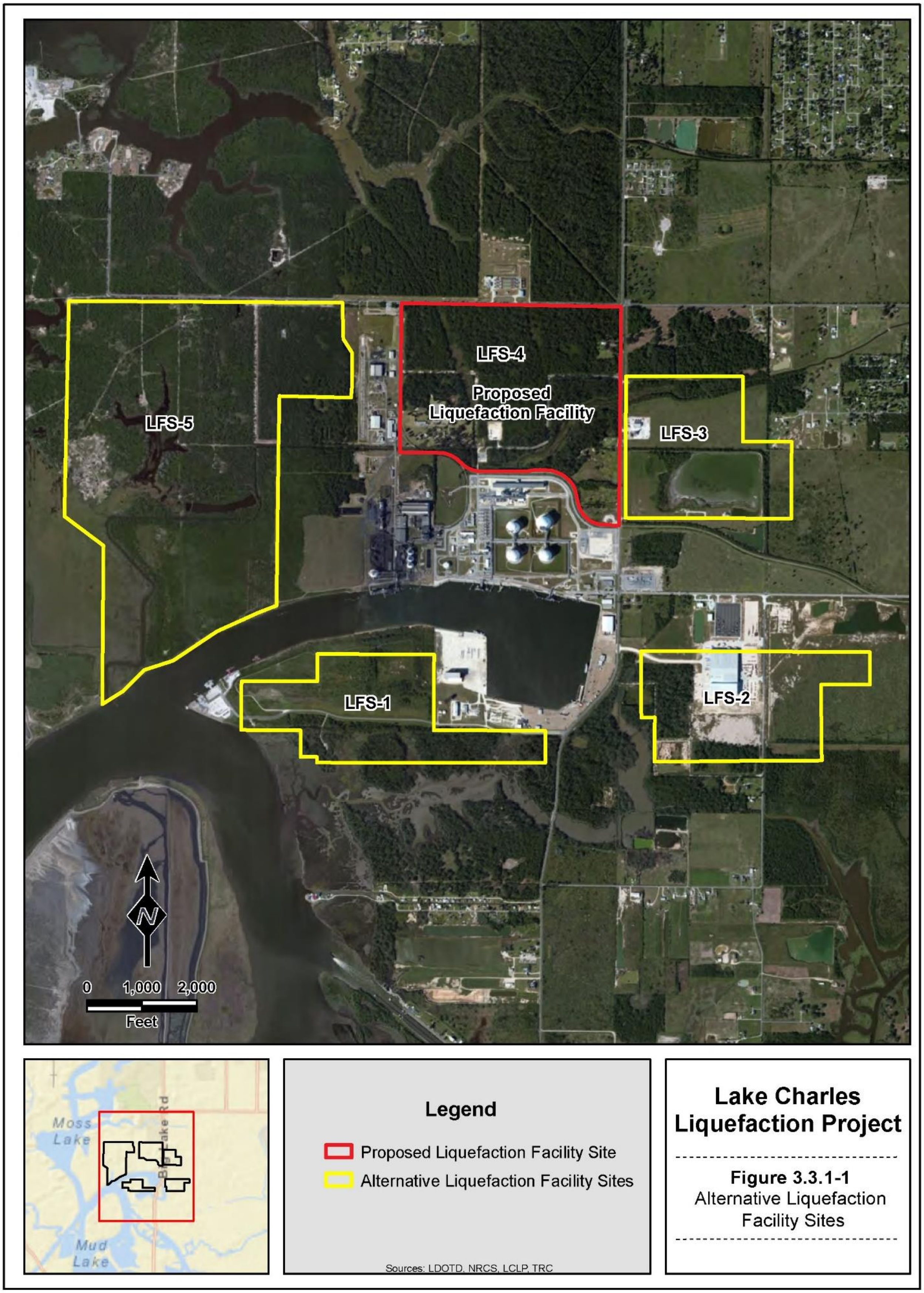


Figure 3.3.1-1
Alternative Liquefaction Facility Sites

LFS-2

LFS-2 is located about 0.4 mile east of LFS-1 and southeast of the existing LNG terminal. The 160-acre site is bounded by Joe Ledoux Road to the south. The majority of LFS-2 is taken up by a manufacturing facility currently owned and operated by Shaw Group, Inc. The remainder of this area has heavy soil disturbance from recent construction activities. Vegetation is characterized by maintained grasses with occasional early successional woody species, such as rattlebush (*Sesbania drummondii*). LFS-2 is wholly within the FEMA 100-year floodplain; however, the foundation pad for the manufacturing facility was likely raised above this level.

LFS-3

LFS-3 is located northeast of the existing LNG terminal. The 163-acre site is bordered to the west by Big Lake Road. The southern sector of the site contains a dredged material placement area that was utilized during development of the marine berthing area at the Trunkline LNG Terminal site; the northern sector is characterized by maintained pasture land. A rural residential community borders the northeastern corner of the site. LFS-3 is wholly within the FEMA 100-year floodplain.

LFS-4

LFS-4, the proposed 286-acre site for the liquefaction facility, is located north of and adjacent to the existing LNG terminal. The site is bordered to the north by West Tank Farm Road and bisected by Granger Road. A wastewater treatment plant operated by the City of Lake Charles is located on the opposite side of West Tank Farm Road. A carbon black facility (Lake Charles Carbon Company) operated by Alcoa is located west of and adjacent to the site.

LFS-4 is heavily wooded with mixed pine and hardwoods (loblolly pine, water oak, and sweetgum [*Liquidambar styraciflua*]) with areas of intermixed wetlands within a mosaic pimple mound setting. LFS-4 is bisected by a drainage ditch that flows from east to west and ultimately into the Industrial Canal. LFS-4 is wholly within the FEMA 100-year floodplain.

LFS-5

LFS-5 is located just beyond the Alcoa facility west of the existing Terminal. LFS-5 has no road access. It is bordered to the south by the Industrial Canal. The 571-acre site is bisected by a drainage ditch that flows from east to west and ultimately into the Industrial Canal. To the north of the drainage ditch, the site is outside of the FEMA 100-year floodplain; however, to the south of the drainage ditch, it is within the floodplain. North of the drainage ditch, LFS-5 supports mixed hardwoods and pines with areas of intermixed wetlands within a mosaic pimple mound setting, similar to LFS-4. South of the drainage ditch, the vegetation transitions to brackish emergent vegetation, such as Gulf cordgrass (*Spartina spartinea*). Brackish emergent vegetation is also located in areas of historic dredged material placement to the west of the site.

3.3.2 Site Selection Analysis

Having identified the five sites based on (1) proximity to the LNG terminal and (2) property considerations (parcel size and contiguity, current ownership and potential availability, etc.), various environmental criteria were applied for site prioritization and selection of the preferred alternative. During project planning, Lake Charles LNG conducted a desktop analysis of all five sites and undertook a concurrent program of landowner outreach, during which time the potential availability of the sites for lease or ownership was investigated. It should be noted that, unlike an authorization granted for a pipeline under section 7 of the NGA, an authorization granted for facilities under section 3 of the NGA (including the currently proposed liquefaction facility) does not grant the applicant eminent domain; thus, we have limited ability to ensure that a recommended alternative site would be available unless the landowner makes it available for purchase or lease.

From a natural resources perspective, there is no evidence to suggest that federally or state-listed species are present at, or reliant on, any of the five sites. Similarly, while there is noticeable inter-site variation in habitat quantity and composition, reflecting differences in both actual acreages and relative percentages of forested and herbaceous cover, disturbed land, wetlands, uplands, etc., there appear to be no strongly discriminating factors that would allow prioritization of sites based on habitat quality or suitability for wildlife or avian use, including use by migratory birds.

With respect to wetlands, NWI information indicates that that there are about 54 acres on LFS-1, 86 acres on LFS-2, 45 acres on LFS-3, 93 acres on LFS-4, and 273 acres on LFS-5. In the context of overall site acreage, the percentage of each site characterized as wetlands is about 33 for LFS-1, 54 for LFS-2, 28 for LFS-3, 33 for LFS-4, and 48 for LFS-5. From a wetlands preservation perspective, LFS-3 represents the lowest acreage impact.

The degree of geographic separation from the nearest residential areas was a selection criterion afforded particular focus. The preclusion of potential adverse impacts (e.g., increased noise, traffic, and dust) associated with facility construction and operation favors a site with no residences in close proximity. The area in which all five sites are located primarily supports industrial facilities interspersed with vegetated, undeveloped, open land; residential development is characterized by isolated houses, small housing clusters concentrated along area highways, and peripheral residential subdivisions. LFS-2 and LFS-3 are the only sites that have residences within the general vicinity: at LFS-2, several isolated residences are located within 0.25 mile of the site's southern boundary; at LFS-3, a small subdivision abuts the northeastern boundary of the site. Therefore, consideration of residential proximity favors LFS-1, LFS-4, and LFS-5, which have no residences in close proximity.

While all five sites are in relatively close proximity to the existing LNG terminal, only one (LFS-4) directly borders the terminal. As such, pipeline routing between the LNG terminal and any of the other four sites would necessarily involve longer connections, crossing of public/and or private land outside of Lake Charles LNG's direct control, and potential environmental or engineering constraints. The cryogenic piping used to transport LNG between the liquefaction facility and the LNG terminal would be installed aboveground, precluding a direct crossing under the Industrial Canal from LFS-1; therefore, pipeline routing from this site would be particularly circuitous. With respect to LFS-5, cryogenic piping would have to cross the intervening Alcoa facility, which could be problematic due to the physical and safety restrictions posed by the presence of existing plant infrastructure. Because of its adjacency to the LNG terminal, LFS-4 represents the most advantageous site from a pipeline routing perspective. The length of cryogenic and support piping would be minimized and all facilities would be on land under Lake Charles LNG's direct control.

Land use and zoning was a selection criterion evaluated for each of the sites. All five sites are wholly or predominantly zoned as heavy industrial, although some on-site agricultural areas may fall outside this category and require rezoning. This industrial/agricultural profile, in itself, was not regarded as sufficiently variable to allow site prioritization. However, the continued presence and operation of existing industrial facilities on two of the sites - a natural gas processing facility on LFS-3 and the facility operated by Shaw Group, Inc. on LFS-2 - would compromise facility layout design, especially in the case of LFS-2, and render the sites unviable from a configuration and available space perspective.

Similarly, the road (Henry Pugh Boulevard) that bisects LFS-1 provides public access to the recreational area west of the site and the continued use of this road would have a significant and potentially insurmountable impact on facility design, presenting serious safety and controllability concerns relating to public access though an industrial plant. Road access is also a significant concern for LFS-5, although in this case, the recognized disadvantage relates to the lack of any peripheral roads providing direct access on to the site.

As facility design evolved and plant acreage requirements were increased accordingly, the relative lack of space afforded by LFS-1, LFS-2, and LFS-3 became an increasingly significant site discriminator. These three sites cover about 164, 160, and 163 acres respectively, whereas revised facility design plans suggested the need for more acreage within the property fenceline to accommodate plant infrastructure and to comply with vapor dispersion and noise limit requirements (see section 3.4). With respect to potential noise concerns, the close proximity of a residential subdivision was considered a significant disadvantage for LFS-3. In addition, ongoing interaction with property owners confirmed that the existing industrial operations at LFS-2 and LFS-3 would continue into the foreseeable future. Given the lack of sufficient property area to ensure compliance with vapor dispersion and/or noise requirements, the exacerbating space and design restrictions imposed by continued industrial operations on LFS-2 and LFS-3, and public road access through LFS-1, these three sites were eliminated from further consideration.

LFS-4 and LFS-5 both have sufficient space to house the proposed facilities and, based solely on this selection criterion, are equally viable. However, as discussed previously, lack of direct road access and LNG pipeline routing constraints represent significant disadvantages for LFS-5. Also, modeling of the potential spill scenarios from the LNG transfer line identified more zonal safety restrictions on LFS-5 site development than the property owners were willing to accept.

Our alternatives analysis concluded that LFS-4 represents the preferred site for the proposed liquefaction facility. It is sufficiently sized to allow optimal facility layout design and contiguity with the existing LNG terminal avoids the need for off-site LNG piping. It is also geographically well separated from area residences, the closest of which are more than 0.4 mile distant. While LFS-4 does contain wetlands and forested cover, the loss of habitat diversity and function resulting from facility development would be generally comparable with that anticipated at the other sites, with the advantage that no estuarine wetlands would be affected (unlike LFS-1 and LFS-5). Of the two sites deemed to be sufficiently sized to accommodate the proposed liquefaction facility, LFS-4 contains a much lower acreage of NWI-mapped wetlands than LFS-5: 93 acres compared with 273 acres. From a visual impact perspective, the new facilities would be integrated into and accord with the industrial backdrop provided by the existing LNG terminal. To further minimize visual impacts, we are recommending that Lake Charles LNG retain a strip of wooded cover on the east side of proposed ACW A to the north of LFS-4, and on the north side of ACW D (see section 4.8.6). This could provide an effective visual screen between the facilities/ACW sand the nearest residences.

3.4 ALTERNATIVE TERMINAL CONFIGURATIONS

Facility design and configuration within the liquefaction facility site is subject to the siting requirements of 49 CFR 193 and other industry or engineering standards. Regulatory requirements stipulate that potential thermal exclusion and vapor dispersion zones remain on site, limiting the potential locations for specific pieces of liquefaction and pretreatment equipment. Similarly, thermal radiation zones for flares require that the flare be set back a minimum distance from other equipment and property lines. The selected location of each of the components of the expanded terminal was based on the relevant regulations, codes, and guidelines. We did not find any alternative configurations that would meet these regulations, codes, and guidelines and at the same time avoid or reduce the impacts associated with the proposed terminal configuration.

The proposed location for the liquefaction trains and pretreatment units, for which most of the modeling for thermal exclusion and vapor dispersion zones was focused, represents the area on site that is farthest from publicly accessible land. This location also represents the area on site that is closest to the existing LNG terminal, thereby minimizing the length of interconnecting LNG transfer piping. While other locations may satisfy regulatory siting requirements equally, these two factors confer a significant advantage for the currently proposed layout.

As part of our analysis of alternative terminal configurations, we considered whether Lake Charles LNG's planned permanent conversion of all land to industrial use is necessary across the entire liquefaction facility site. According to Lake Charles LNG, the perimeter of the site cannot be reduced or adjusted and still meet operational noise and vapor dispersion requirements. Within this perimeter, Lake Charles LNG's grading plan calls for the import of suitable fill material and a significant elevation increase across the whole site to meet safety requirements, within both the operational footprint of plant infrastructure and adjacent construction workspaces. The increased elevation would facilitate maneuverability, staging, fabrication, etc. during construction and would reduce the threat of flooding during both construction and operation.

Since compacted fill material would be distributed across the whole site and construction would continue for about 5 years, successful broad-scale restoration to previous conditions would be difficult, time consuming, and costly. Further, the fill material brought in for construction would have to be removed to and returned to off-site locations. We concur with Lake Charles LNG that, in general, wetland losses on site would be mitigated more effectively through the proposed purchase of mitigation bank credits (see section 4.4.4).

3.5 ALTERNATIVE PIPELINE ROUTES

The Lake Charles Liquefaction Project would include two new pipeline segments: the Mainline Connector and the Mainline 200-3 Loop. The Mainline Connector would be a greenfield segment, defined as a pipeline segment that is constructed cross country and within new right-of-way that does not parallel an existing pipeline or other linear infrastructure. The Mainline 200-3 is a looping segment, defined as a pipeline segment that is laid parallel to another pipeline, and is often used as a way to increase the capacity of a system beyond that provided by the existing pipeline. Route alternative considerations for each of the two proposed pipeline segments are discussed below.

3.5.1 Mainline Connector

As described in section 2.2.2.1, the 11.4-mile-long Mainline Connector would connect Trunkline's existing 300 Mainline and 200 Mainline system pipelines between MLVs 303-A and 203-A, allowing gas to be delivered to the liquefaction facility via the existing LNG lateral, which connects with the 200 Mainline system pipelines at MLV 203-A. Proposed Compressor Station 203-A would be located on the Mainline Connector, just east of MLV 203-A. The new pipeline would be located in Jefferson Davis and Calcasieu Parishes, Louisiana.

The regional landscape between MLVs 203-A and 303-A is rural and there are no existing pipeline corridors or other linear features that offer suitable collocation opportunities for the Mainline Connector pipeline beyond the short section (0.3 mile) between MLV 203-A and Compressor Station 203-A. Thus, Trunkline has indicated that the baseline route for the Mainline Connector was conceived as the shortest distance between existing valve stations that would provide access between the three existing pipeline systems: Mainline 300, Mainline 200, and LNG lateral.

Generally, shorter route lengths are correlated with lower construction costs and fewer environmental impacts, although variables other than pipeline length (e.g., terrain, existing land development, and sensitive natural resources) may weaken these correlations. Starting with the baseline route, Trunkline implemented broad-scale adjustments to avoid or minimize crossings of wetlands, waterbodies, and forested land. This effort resulted in a proposed route running northwest of the baseline route, with a maximum separation of 0.75 mile. Two subsequent deviations were made, between milepost (MP) 0.26 and MP 2.71 to avoid two waterbody crossings and between MP 3.05 and MP 3.67 to allow for a perpendicular crossing of State Highway 383. Both deviations also reduce potential wetland crossing impacts. While the proposed route is about 890 feet longer than the baseline route, it was developed and selected on the basis of these engineering and environmental impact considerations.

We have analyzed the regional setting of Trunkline's proposed Mainline Connector pipeline route and have determined that a different route (which would likely be longer) between other points of interconnection would not offer any environmental advantage, irrespective of engineering feasibility or cost. Also, the proposed pipeline interconnection between MLV 203-A and MLV 303-A is an integral part of a wider system plan involving the construction of new aboveground facilities and modifications to existing aboveground facilities (compressor stations, meter stations, and appurtenant aboveground facilities). We have identified minimal environmental impacts associated with the construction and operation of these facilities and, while selection of a longer route for the Mainline Connector may or may not affect the scope and locations of these planned developments, it would be unlikely to further reduce system-wide environmental impacts. In summary, we did not identify any environmental concerns that indicate a need to identify and evaluate alternative routes for the Mainline Connector, nor were any alternatives suggested during the scoping period.

3.5.2 Mainline 200-3 Loop

The location of the proposed 6.5-mile-long Mainline 200-3 Loop was chosen to fulfill the Lake Charles Liquefaction Project's requirements for gas delivery and to overcome engineering constraints along the existing Kaplan 300 and Kaplan 200 pipelines. By definition, the Mainline 200-3 Loop would be collocated with the existing pipeline to be looped, precluding the need for an alternatives analysis beyond determining the side of the existing pipeline on which to collocate. The entire loop segment parallels the existing pipeline on the western/southern side. Collocation on the northern/eastern side was ruled out early in the planning process because construction would require crossing two existing pipelines and would create a conflict with the Tennessee Kaplan meter station at the northern terminus. The proposed right-of-way for the Mainline 200-3 Loop would partially overlap the previously disturbed right-of-way of the looped pipeline, minimizing environmental impacts.

3.6 ALTERNATIVE ABOVEGROUND FACILITY SITES FOR PIPELINE EXPANSION

We evaluated alternative sites for proposed Compressor Station 203-A and also considered the need to evaluate potential alternative sites for the other aboveground facilities associated with the Non-Liquefaction Facilities. Our assessments were based on information derived from maps, aerial photography, and field observations.

3.6.1 Compressor Station Sites

The proposed Lake Charles Liquefaction Project includes the construction and operation of one new compressor station (Compressor Station 203-A), piping modifications at four existing compressor stations (Longville, Pollock, Epps, and Shaw Compressor Stations) to allow bidirectional gas flow, and increased horsepower at the Longville Compressor Station through the replacement of one compressor unit with a larger unit. Feasible alternatives for the bidirectional piping modifications and the compression upgrade do not exist and, given that construction would take place within the fencelines of the existing facilities, environmental impacts would be minimized.

The location of Compressor Station 203-A is dictated by the gas flow hydraulic properties of the existing Trunkline pipeline infrastructure and the proposed Mainline Connector pipeline. The only viable location for the new compressor station would be one located at or in the immediate vicinity of the southern junction of these facilities (i.e. at MLV 203A), in an area of largely open and undeveloped land.

We evaluated two potential sites for Compressor Station 203-A: the proposed site and the Compressor Station Alternative site 1 (CSA-1), as depicted in figure 3.6.1-1. CSA-1 is located on the west side of Dennison Road and surrounds MLV 203-A; the proposed site lies 0.25 mile east of Dennison Road (see figure 3.6.1-1). Table 3.6.1-1 provides a quantitative comparison of land use and other environmental features for each of two sites.

TABLE 3.6.1-1

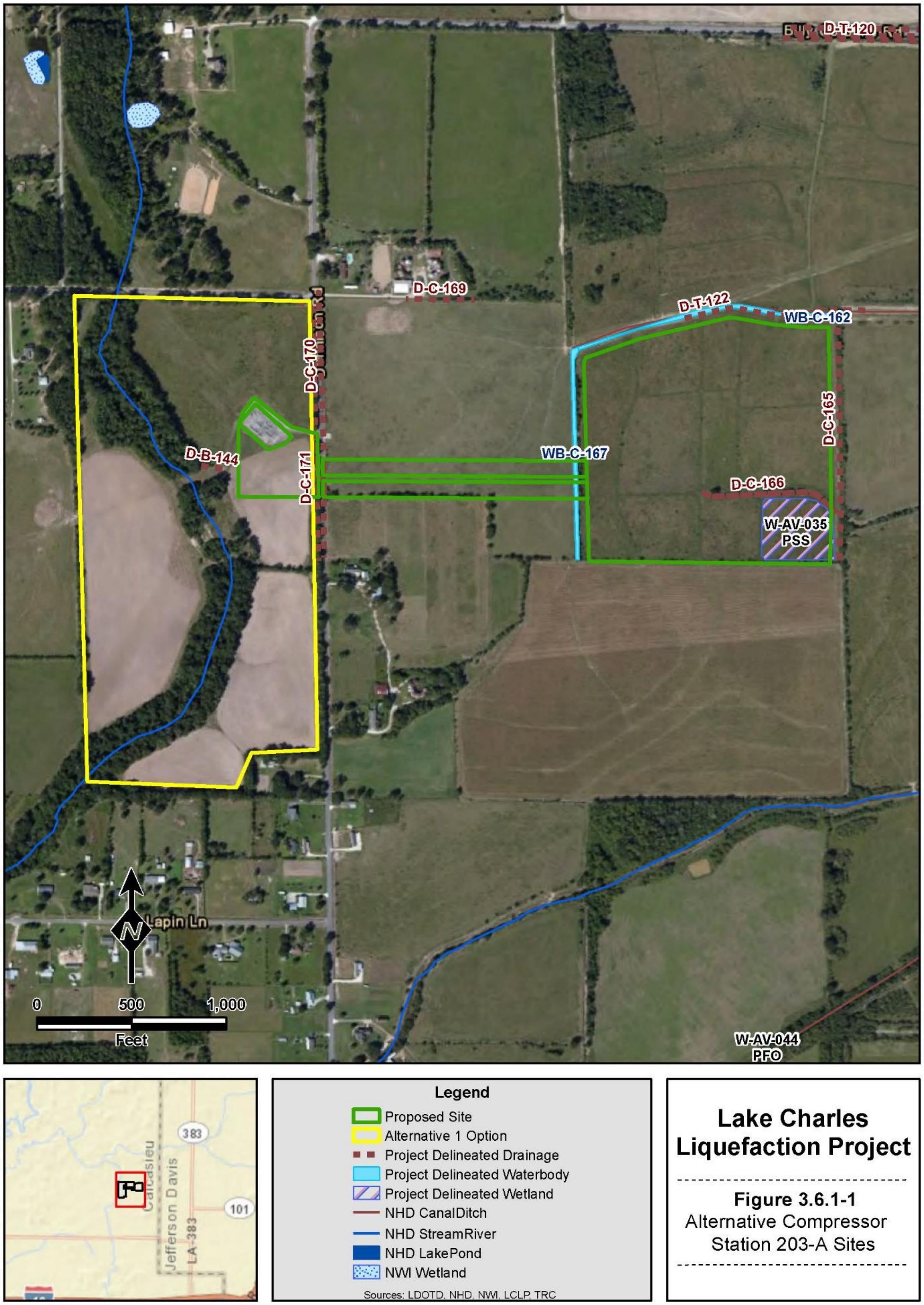
Site Alternatives Comparison for Compressor Station 203-A for the Lake Charles Liquefaction Project

Environmental Features	Units	Proposed Site	CSA-1
Land Use			
Agriculture	Acre	45.6	54.8
Forest land	Acre	0.0	15.0
Industrial/commercial	Acre	1.0	1.1
Total land use[a]	Acre	46.6	70.9
NWI wetlands affected within construction footprint[b]	Acre	0.0	0.0
Field delineated wetlands within construction footprint	Acre	2.6	Not surveyed
Perennial streams with forested banks	Number	0	1
Dry drainage/agricultural canals	Number	1	0
Residences within 0.5 mile of fenceline	Number	10	59
Distance to nearest residence from fenceline	Feet	1,140	145

[a] The total acreage for CSA-1 is larger than that for the proposed site due to the extra land needed for stream rerouting on the property.
[b] Based on NWI data.

CSA-1 has the advantage of immediate adjacency to MLV 203-A, which would allow the consolidation of aboveground facilities at one common location, without the need for an off-site pipeline segment to connect the compressor station with MLV 203-A. However, this advantage is over-ridden by the presence of a perennial stream and associated band of riparian forestland that bisects the site on the north/south axis, and the comparative number of residences in relatively close proximity to the site.

To provide sufficient space for aboveground facilities, site preparation at CSA-1 would necessitate the removal of most of the riparian woodland and rerouting of the perennial stream. The proposed site contains an agricultural ditch and a 2.6-acre scrub-shrub wetland located in the site’s southeast corner in a former agricultural field. Although this ditch would be permanently filled, Trunkline has revised the configuration of the station from the original design to avoid the wetland and the environmental impact would be significantly less than that associated with the riparian woodland removal and stream rerouting that would be required at CSA-1.



Lake Charles Liquefaction Project

Figure 3.6.1-1
Alternative Compressor Station 203-A Sites

Table 3.6.1-1 indicates that the proposed site is located in a less populated area than CSA-1, with 10 residences located within 0.5 mile of the site and the nearest residence being 1,140 feet away. In contrast, 59 residences are located within 0.5 mile of CSA-1 and several of these residences are within close proximity to the site, the closest being 145 feet away. From the perspective of environmental impacts associated with station construction and operation (e.g., increased noise, dust, and air emissions), the comparative lack of nearby residences is favorable.

Based on the above comparison between the two sites, we conclude that CSA-1 would not be environmentally preferable to the proposed location.

3.6.2 Meter Stations

The Lake Charles Liquefaction Project would require modifications to five existing meter stations to provide bidirectional flow capabilities and other upgrades, and the construction of five new meter stations in greenfield locations. Construction activities at four of the five existing meter stations (NGPL–Lakeside, Texas Gas–Woodlawn, Tennessee–Kaplan, and Transco-Ragley) would occur within the existing facility footprints and in ATWS immediately adjacent to the existing facilities, as the proposed activities relate. Following construction at three of these meter stations, the ATWS, which predominantly consists of agricultural and open land, would be allowed to revert to pre-construction condition. At the NGPL–Lakeside Meter Station, about 0.3 acre of the ATWS immediately adjacent to the existing facility boundary would be retained as an addition to the permanent footprint. The proposed upgrades at the TETCO–Allen Meter Station would also require an increase in the permanent facility size, with the new portion located about 0.2 mile from the existing facility. ATWS to be used during construction would be immediately adjacent to the new permanent facility. Because these upgrades would take place at existing facilities, there are no feasible alternatives for these project components.

The new LCLNG Export Meter Station, which would serve as the new meter station for the Trunkline LNG Terminal, would be constructed at the liquefaction facility site. Alternative sites for the LCLNG Export Meter Station are all within either the existing LNG terminal or the liquefaction facility site. Since these two areas are either fully developed or would be fully developed under the proposed action, there is no net difference in anticipated environmental impacts between alternative site locations.

The other four new meter stations are located at existing Trunkline pipeline crossings with Gulf Crossing, Midcontinent Express, Kinder Morgan, and Columbia Gulf Transmission. By necessity of system function and design, the proposed meter stations must be located at or in the immediate vicinity of the intersections between Trunkline and these other suppliers; therefore, materially different alternative sites were not identified for evaluation. The potential impacts of construction and operation of the meter stations would be minimal and we conclude that there are no alternative sites that would provide a significant environmental advantage over the proposed sites.

The locations of the remaining Non-Liquefaction Facilities, including the Mainline 100-3 Modifications and the Mainline 200-1 Modifications, would be located at existing facilities and, as such, there are no feasible alternatives to these locations.

3.7 ALTERNATIVE POWER SOURCES

3.7.1 Liquefaction Facilities

According to Lake Charles LNG, the use of electrically driven motors as an alternative to gas-fired turbines was studied during pre-Front End Engineering Design, with this option being ruled out at the time due to the excessive amount of electrical power required (above 800 megawatts [MW]). If electric-powered motors were to be utilized, power would either have to be generated on site or imported from the municipal power grid, neither of which is a feasible supply source for the reasons described below.

On-site Power Generation

The construction of a single-cycle or a combined-cycle power plant would be required for on-site power generation. Single-cycle power generation technology has no advantages over the base case configuration proposed for the liquefaction facility (gas turbine driven compressors) as both have similar efficiency ratings and both require selective catalytic reduction units to minimize air emissions that would impact ambient air quality. In fact, there would likely be more air emissions associated with a single-cycle power plant due to the requirement for a larger generation capacity to compensate for distribution and motor energy losses. By comparison, a combined-cycle power generation system would have a higher thermal efficiency but would require a larger plot area and would take longer to construct, which would impact the overall project schedule.

The noise levels associated with a power generation system located at the liquefaction facility would be similar to those from gas turbine driven compressors with mitigation measures, such as acoustic insulation, being required in both cases to meet thresholds for acceptable operational noise levels.

In summary, on-site power generation by both single- and combined-cycle plants was ruled out in the design of the Lake Charles Liquefaction Project as these systems would require a larger area to accommodate additional equipment (such as condensers and steam turbines in the case of combined cycle) than that currently available. Also, the introduction of steam generation would increase overall facility complexity and associated risks.

Imported Power

With respect to imported power, air emissions generated at the liquefaction facility itself (either through gas turbine drivers or on-site electrical generation) would be precluded, instead occurring in the area where the power generation system is located. However, there would likely be no net benefit in emissions as a result of using the grid efficiency of the regional electricity provider, Entergy. Operational noise associated with on-site gas turbine drivers or electrical generation would also be precluded.

When considering the imported power case, Lake Charles LNG noted that the power level needed to supply the refrigeration compressors would be significantly higher than the actual compressor requirement, as the voltage losses in transformers and power cables can account for up to 10 percent of the total power required. Therefore, an expansion of the existing power plants that supply the municipal grid could be required. With respect to the transmission lines that supply the existing terminal, the current infrastructure may be inadequate for such a high power demand, leading to further expansions that would have impacts on the environment and local communities. Additionally, the size of the electrical substation required to handle the imported power would be three to four times the size of the substation required for the proposed base case configuration, leading to further issues regarding space limitations.

One consideration that is applicable to both power supply options is the proven maximum size (45 MW) of electric motors for refrigeration compressors. As a result, more electric-driven compressors would be needed than gas turbine-driven compressors. The space requirement for these additional compressors would add more challenges to plant layout design.

Another factor to be considered with electric-driven refrigeration compressors is the need of Variable Frequency Drives (VFD). One VFD would be needed per motor so a large number of VFDs would have to be installed near the compressors. It is expected that the plot area required for each VFD would be about 50 percent larger than the area required for each gas turbine.

For the reasons above, using electric motors to drive the refrigerant compressors would increase the complexity and therefore the inherent risks associated with liquefaction facility operations. Furthermore, space limitations at the proposed site would make this alternative very challenging or potentially unfeasible.

3.7.2 Compressor Station 203-A

Trunkline performed a review of electric motor-driven compressors at Compressor Station 203-A. The electric load for this design would be of a magnitude serviceable only by a high-voltage transmission system for which the nearest potential interconnect is more than 2 miles away. Due to the required capital cost for the electric system expansion and the cost of electricity for facility operation, Trunkline eliminated this option from initial consideration. However, Trunkline indicated that it has requested a high-level feasibility of service analysis from the providing utility (Entergy). **As such, we recommend that:**

- **<u>Prior to the end of the draft EIS comment period</u>, Trunkline should file with the Secretary of the Commission (Secretary) the feasibility of Entergy's electric transmission service analysis for Compressor Station 203-A and a full alternative analysis of electric motor-driven compressor units for this station.**

4.0 ENVIRONMENTAL IMPACT ANALYSIS

The environmental consequence of constructing and operating the Lake Charles Liquefaction Project would vary in duration and significance. Four levels of impact duration were considered: temporary, short term, long term, and permanent. A temporary impact would generally occur during construction, with the resource returning to preconstruction conditions almost immediately afterward. A short-term impact could continue for up to 3 years following construction. An impact was considered long term if the resource would require more than 3 years to recover. A permanent impact could occur as a result of an activity that modifies a resource to the extent that it would not return to preconstruction conditions during the life of the project, such as the construction and operational impact of a new aboveground facility. We considered an impact to be significant if it would result in a substantial beneficial or adverse change in the physical environment.

In this section, we discuss the affected environment, general construction and operational impacts, and proposed mitigation measures for each resource. Lake Charles LNG and Trunkline, as part of their proposals, agreed to implement certain measures to reduce impacts on environmental resources. We evaluated the proposed mitigation measures to determine whether additional measures would be necessary to reduce impacts. Where we identified the need for additional mitigation, the measures appear as bulleted, boldfaced paragraphs in the text. We will recommend that these measures be included as specific conditions to authorizations that the Commission may issue to Lake Charles LNG and Trunkline.

Conclusions in this EIS are based on our analysis of the environmental impact and the following assumptions:

- Lake Charles LNG and Trunkline would comply with all applicable federal laws and regulations;
- the proposed facilities would be constructed as described in section 2.0 of this document; and
- Lake Charles LNG and Trunkline would implement the mitigation measures included in their application and supplemental filings to the FERC.

4.1 GEOLOGY

4.1.1 Geologic Setting

The Lake Charles Liquefaction Project facilities would be located in two sections of the Coastal Plain physiographic province. The liquefaction facility and existing LNG terminal, and the majority of the Non-Liquefaction Facilities, would be within the West Gulf Coastal Plain, while the Shaw and Epps Compressor Stations, MEP–Perryville and Gulf Crossing–Perryville Meter Stations, and the East and West Mississippi Barrel modifications would be located within the Mississippi Alluvial Plain (Fenneman and Johnson, 1946). The Coastal Plain lies along the Atlantic Seaboard and Gulf Coast, stretching 100 to 200 miles inland and 100 to 200 miles offshore to the edge of the Continental Shelf. It comprises an elevated sea bottom with low topographic relief and extensive marsh lands, dipping gently seaward from its highest elevations of about 500 feet (Hunt, 1967). The surface materials of the region are mainly Quaternary-age unconsolidated sand and clay with scattered lignite deposits and small quantities of quartzite and limestone (Stroud and Hanson, 1981). The Mississippi Alluvial Plain intersects the East and West Gulf Coastal Plains and gently slopes seaward (Hunt, 1967). These Quaternary-age alluvial deposits cover the Gulf Coast Plains and form deep fertile soils along flood plains, terraces, and the Mississippi Delta (Hunt, 1967; Stroud and Hanson, 1981).

Geologic formations in the project area consist mainly of unconsolidated alluvial, coastal marsh, and terrace deposits that resulted from fluvial, tidal, littoral (beach or shoreline), and deltaic processes during the Pleistocene and Holocene epochs (see table 4.1.1-1). Elevations in the project area range from less than 10 feet AMSL at the liquefaction facility to more than 200 feet AMSL at the Pollock Compressor Station. Topography in the project area ranges from nearly level to gently sloping, with average slopes ranging from 0 to 3 percent within the liquefaction facility and 0 to 9 percent within the Non-Liquefaction Facilities (Soil Survey Staff, 2014).

Lake Charles LNG performed geotechnical studies to evaluate subsurface conditions within the proposed liquefaction facility site. These investigations included 83 soil borings that ranged in depth from 15 to 125 feet. The borings contained unconsolidated clays and silty sand in the upper 10 feet and clays with intermittent and discontinuous layers of silty and clayey sands from 10 to 125 feet deep. No significant gravel deposits or bedrock were encountered in any of the borings (Professional Service Industries, 2014). Groundwater was encountered between about 0 and 5 feet above sea level.

4.1.2 Mineral Resources

Nonfuel mineral resources in the project area consist mainly of salt and construction sand and gravel (USGS, 2009a, 2009b). Based on a review of the USGS topographical maps, recent aerial imagery, and available databases from the USGS, no active mining or nonfuel mineral resources are located within 1 mile of any of the project facilities (USGS, 2013b; 2013c).

Oil and gas production is prevalent throughout Louisiana and the surrounding region. The proposed project facilities would be located proximate to various oil and gas fields, including the East Moss Lake oil and gas field, which underlies the liquefaction facility site (LDNR, 2007a). Based on a review of LDNR mapping, 17 oil and gas wells are located within 0.25 mile of the liquefaction facility site and LNG terminal (7 of which are within the liquefaction facility site, and 3 of which are within the ACWs). Of these, 15 were listed as plugged and abandoned. One active gas and condensate producing well is located within the proposed liquefaction facility site, and one active producing well is located just east of the ACWs to be used for construction of the liquefaction facility and LNG terminal modifications (LDNR, 2007b).

In May and June 2014, we received comments by telephone and email from Margaret Kuttner, John Bergstedt, and Tom Bergstedt stating that they are royalty owners with an interest in the disposition of the active well within the liquefaction facility site. They expressed concern about how impacts on the well would affect their mineral rights and asked to be kept informed of discussions and decisions regarding the well. In July 2014, Lake Charles LNG stated that they were discussing a buyout of the well with the well owner (i.e., Jordan Oil) and indicated that the well would be plugged and abandoned by Jordan Oil prior to the start of construction. Lake Charles LNG also stated that they had met with Ms. Kuttner and the Bergstedts. However, in a January 2015 letter, Ms. Kuttner and the Bergstedts stated that the issue of their mineral rights had not yet been resolved. In order to confirm the disposition of the well and address the comments of Ms. Kuttner and the Bergstedts, **we recommend that:**

- **<u>Prior to the end of the draft EIS comment period</u>, Lake Charles LNG should file with the Secretary updates on:**

  a. its discussions with Jordan Oil and the outcome of these discussions with respect to the buyout and closure of the active well within the liquefaction facility site and, if applicable, drilling of a new well; and

  b. its communications regarding the mineral rights concerns raised by Margaret Kuttner, John Bergstedt, and Tom Bergstedt.

TABLE 4.1.1-1

Geologic Formations Affected by the Lake Charles Liquefaction Project

Facility	Formation (Symbol)	Unit Age	Dominant Material
Liquefaction Facilities	Prairie Terraces (Qtp)	Pleistocene	Clay/Mud, Silt
Pipelines			
Mainline Connector	Prairie Terraces (Qtp)	Pleistocene	Clay/Mud, Silt
	Alluvium (Qal)	Holocene	Clay/Mud, Sand
Mainline 200-3 Loop	Prairie Terraces (Qtp)	Pleistocene	Clay/Mud, Silt
	Alluvium (Qal)	Holocene	Clay/Mud, Sand
Compressor Stations			
203-A	Prairie Terraces (Qtp)	Pleistocene	Clay/Mud, Silt
Longville	Intermediate Terraces (Qti)	Pleistocene	Clay/Mud, Silt
Pollock	Catahoula Formation (Oc)	Oligocene	Sandstone, Sand
	High Terraces (Qth)	Pleistocene	Clay/Mud, Silt
Epps	Braided Stream Terraces (Qbs)	Pleistocene	Sand, Clay/Mud
Shaw	Alluvium (Qa)	Holocene	Clay/Mud, Sand
Meter Stations			
LCLNG Export	Prairie Terraces (Qtp)	Pleistocene	Clay/Mud, Silt
Kinder Morgan–Lake Charles	Prairie Terraces (Qtp)	Pleistocene	Clay/Mud, Silt
Columbia Gulf–Egan	Prairie Terraces (Qtp)	Pleistocene	Clay/Mud, Silt
NGPL–Lakeside	Prairie Terraces (Qtp)	Pleistocene	Clay/Mud, Silt
TETCO–Allen	Prairie Terraces (Qtp)	Pleistocene	Clay/Mud, Silt
Gulf Crossing–Perryville	Braided Stream Terraces (Qbs)	Pleistocene	Sand, Clay/Mud
MEP–Perryville	Braided Stream Terraces (Qbs)	Pleistocene	Sand, Clay/Mud
Texas Gas–Woodlawn	Prairie Terraces (Qtp)	Pleistocene	Clay/Mud, Silt
Tennessee–Kaplan	Prairie Terraces (Qtp)	Pleistocene	Clay/Mud, Silt
Transco Ragley	Intermediate Terraces (Qti)	Pleistocene	Clay/Mud, Silt
Mainline 100-3 Modifications			
Mississippi Barrel East	Alluvium (Qa)	Holocene	Clay/Mud, Sand
Mississippi Barrel West	Alluvium (Qcm)	Holocene	Gravel, Sand, Clay/Mud
Mainline 200-1 Modifications			
Calcasieu River HDD	Alluvium (Qal)	Holocene	Clay/Mud, Sand
	Prairie Terraces (Qtp)	Pleistocene	Clay/Mud, Silt
US 190 Meter Station	Intermediate Terraces (Qti)	Pleistocene	Clay/Mud, Silt
100’ Overhead Crossing	Prairie Terraces (Qtp)	Pleistocene	Clay/Mud, Silt
MLV 202	Intermediate Terraces (Qti)	Pleistocene	Clay/Mud, Silt

Sources: Stoeser et al., 2005; Louisiana Geologic Survey, 2002 and 2003

The LDNR mapping showed 66 oil and gas wells within 0.25 mile of the Non-Liquefaction Facilities, 64 of which were listed as plugged and abandoned, permit expired/no product, or shut-in production wells. One active gas and condensate producing well and one active oil producing well are located within 0.25 mile of the access roads proposed for the Mainline Connector. With the exception of a plugged and abandoned well within the proposed Compressor Station 203-A site, all of the wells are located outside of the proposed project workspace.

Prior to construction, Lake Charles LNG and Trunkline would perform field investigations to verify the status of all of the plugged and abandoned wells within the proposed project workspace. Wells determined to be unsatisfactorily abandoned would be properly abandoned prior to construction.

4.1.3 Geologic Hazards

Geologic hazards are natural, physical conditions that can result in damage to land and structures or injury to people. Such hazards typically include seismicity (e.g., earthquakes, surface faults, and soil liquefaction), landslides, flash flooding, and ground subsidence. Conditions necessary for the development of other geologic hazards, including avalanches, volcanism, and karst terrain are not present in the project area. In general, the potential for geologic hazards to significantly affect construction or operation of the proposed project facilities is low.

4.1.3.1 Seismicity

Earthquakes and Surface Faults

The majority of significant earthquakes around the world are associated with tectonic subduction zones, where one crustal plate is overriding another (e.g., the Japanese islands), where tectonic plates are sliding past each other (such as in California), or where tectonic plates are converging (e.g., the Indian Sub-Continent). Relative to these highly active tectonic regions, Louisiana and the surrounding areas are seismically quiet.

A belt of hundreds of mostly seaward-facing faults, collectively known as the Gulf-margin normal faults, occur along the Gulf of Mexico. However, these faults exist in sediments and poorly lithified rocks; most of these materials are unable to support the extreme stresses required for the propagation of significant seismic events and ground motion (Crone and Wheeler, 2000). Lake Charles LNG completed a Seismic and Tsunami Hazard Evaluation for the proposed liquefaction facility, which identified an active growth fault about 1.1 miles north of the proposed liquefaction facility site. However, the evaluation did not identify any evidence of surface faulting, scarps, or lineaments within the liquefaction facility site and, therefore, determined that there was a low potential for a fault rupture hazard (URS Corporation, 2014).

The magnitude of an earthquake is measured using the Richter scale, which ranges from 0 to 9, though no real upper limit exists. Earthquakes with magnitude of about 2.0 or less are usually called microearthquakes, and are not commonly felt by people; large earthquakes generally have a magnitude of 8.0 or greater (USGS, 2013a). Historically, there have only been sparse, low-magnitude seismic events recorded within the Gulf-margin normal faults. Only six damaging earthquakes have been reported through 2009, which were located in westernmost Florida (1780), southern Alabama (1993, 1997), southern Louisiana (1930), and eastern Texas (1891, 1932) (Crone and Wheeler, 2000; USGS, 2009c). The 1930 earthquake was the largest earthquake measured in Louisiana; its epicenter was about 60 miles west of New Orleans. The largest recorded earthquake in the vicinity of the Lake Charles Liquefaction Project (in 1983) was a magnitude of 3.8 on the Richter scale, located 10 miles west of Lake Charles, Louisiana (Stevenson and McCulloh, 2001). An event such as this today would cause considerable damage to poorly built structures but only negligible damage to buildings of good design and construction. The most significant seismic source site is the New Madrid Seismic Zone, which is located about 400 miles northeast of the liquefaction facility in the vicinity of New Madrid, Missouri. In 1811 and 1812, the New Madrid Seismic Zone experienced three very large earthquakes with magnitudes estimated to range between 7.2 and 7.6.

The shaking during an earthquake can be expressed in terms of the acceleration due to gravity. Based on USGS seismic hazard mapping, the liquefaction facility, LNG terminal, and Non-Liquefaction Facilities in Louisiana are located in an area where peak horizontal ground accelerations, with 2 percent probability of exceedance in 50 years, are between 2 and 10 percent of gravity (USGS, 2008). In Mississippi and Arkansas where the proposed modifications to the Shaw Compressor Station and the East and West Mississippi Barrels would take place, peak horizontal ground accelerations are between 10 and 14 percent of gravity as they are closer to the New Madrid seismic zone. The USGS peak horizontal ground acceleration values are for rock sites and can be amplified by factors of 2 or more for soft soil sites such as those found at the liquefaction facility site. The newly constructed or modified facilities would be designed for earthquake ground motions; therefore, it is unlikely that they would be affected if an earthquake were to take place.

Soil Liquefaction

Soil liquefaction is a phenomenon often associated with seismic activity in which saturated, non-cohesive soils temporarily lose their strength and liquefy (i.e., behave like viscous liquid) when subjected to forces such as intense and prolonged ground shaking. Areas susceptible to liquefaction generally include sandy or silty soils located along rivers, streams, lakes, and shorelines or in areas with shallow groundwater. Soil conditions necessary for liquefaction to occur would likely be present in the project area. However, because of the low potential for strong and/or prolonged seismic ground shaking in the vicinity of the proposed facilities, the potential for soil liquefaction to occur is also low.

4.1.3.2 Landslides

Landslides involve the downslope movement of earth materials under a force of gravity due to natural or man-made causes. With the exception of the East and West Mississippi Barrels, the project facilities are located in an area considered to have a low incidence of landslides (Radbruch-Hall et al., 1982). An analysis of the county soils data showed that the majority (98 percent) of the soils in the project area have average slopes less than 3 percent and would, therefore, have a low susceptibility to landslides (Soil Survey Staff, 2014). Based on Radbruch-Hall et al. (1982), the areas surrounding the East and West Mississippi Barrels are considered to have a high susceptibility to slumps and earthflow along the river banks due to fine-grained materials underlain by coarse, easily eroded sand at depths which the river can scour. However, the areas prone to slope failure appear to be immediately adjacent to the Mississippi River and outside of the workspace. Due to low topographic relief, there is a low risk for landslides, mudflows, or other mass wasting for any of the Lake Charles Liquefaction Project facilities.

4.1.3.3 Land Subsidence and Sea Level Rise

Common causes of ground subsidence include the presence of karst terrain, underground mining, and significant groundwater or fluid withdrawal. Karst features such as sinkholes, caves, and caverns can form as a result of the long-term action of groundwater on soluble carbonate rocks (e.g., limestone and dolostone). Underground mining poses risks to engineered structures due to the potential for the overlying strata to collapse into the void formed by the extraction of minerals. Based on a review of available information, there are no underground mining activities or potential to encounter karst terrain in the project area (USGS, 2013b, 2013c; Epstein et al., 2002). Therefore, subsidence associated with these causes is not anticipated.

Subsidence could occur in the project area, particularly at the liquefaction facility and ACWs, due to oil and gas extraction and groundwater withdrawal. As discussed above, the liquefaction facility would be located within the East Moss Lake oil and gas field, which is actively producing oil and gas. In addition, the liquefaction facility would be located in the vicinity of (greater than 400 feet from) several water supply wells as discussed in section 4.2.1. Lake Charles LNG's Marine Statistical Analysis (Moffatt & Nichol, 2014) estimated that regional subsidence proximate to the proposed liquefaction facility will be about 0.18 inch per year. This subsidence combined with an estimated sea level rise of 0.12 inch per year would equate to a loss in elevation of about 7.5 inches (0.63 feet) over the 25-year life of the project. Lake Charles LNG stated that monitoring can be done through periodic topographic surveying of the site, but did not commit to conduct such monitoring because it does not anticipate that any mitigation would be required based on the estimated subsidence rate. However, we believe that periodic monitoring should be completed; therefore, **we recommend that**:

- **<u>Prior to the end of the draft EIS comment period</u>, Lake Charles LNG should file a ground subsidence monitoring plan with the Secretary, including possible mitigation measures to be implemented at the liquefaction facility site.**

4.1.3.4 Flooding/Storm Damage/Tsunamis

FEMA produces Flood Insurance Rate Maps for municipalities across the nation. The maps depict zones with assigned probabilities of experiencing a flood event during any 1-year period. The 100-year flood represents a river channel water level that, based on an analysis of the historic record, is likely to be equaled or exceeded every 100 years, meaning that there is a 1 percent chance that the water level will be equaled or exceeded in any individual year during a flood event. The lowest mapped probability of flooding is 0.2 percent, which would have an average flooding recurrence interval of 500 years.

We evaluated the potential for flooding at the proposed project facilities using FEMA's Map Service Center, the associated Flood Insurance Rate Maps, and the National Flood Hazard Layer. The liquefaction facility would be situated on a 100-year floodplain (FEMA, 2014). Some of the Non-Liquefaction facilities, including the Kinder Morgan–Lake Charles, Columbia Gulf–Egan, and NGPL–Lakeside Meter Stations, would also be located in the 100-year floodplain, and portions of the Mainline Connector and Mainline 200-3 Loop would be at risk of flooding as they cross 100- and 500-year floodplains near streams and rivers. The remaining project facilities would be located outside of the 500-year floodplain. To mitigate the risk of flooding, Lake Charles LNG has committed to constructing critical liquefaction facilities at an elevation above the 500-year floodplain and sensitive aboveground facilities at the liquefaction facility and the compressor and meter stations at a final grade elevation that exceeds the 100-year floodplain.

The proposed liquefaction facility site is subject to periodic hurricanes. Hazards associated with hurricanes include storm surges, heavy rainfall, inland flooding, high winds, tornadoes, and rip currents. Hurricane intensity is measured on the Saffir-Simpson Scale and ranges from a Category 1 storm with winds from 74 to 95 miles per hour (mph) that produce some damage, to a Category 5 storm with winds greater than 157 mph that produce catastrophic damage (National Weather Service, 2014). Lake Charles LNG has completed an investigation of storm surge for the Lake Charles Liquefaction Project. Based on historical data, it was found that the liquefaction facility site is located in an area where the return period for a hurricane to strike is about 13 to 14 years and the return period for a major hurricane (Category 3 or higher) strike is about 33 to 34 years. This means that in a given year there is about a 3 percent chance for a major hurricane to make landfall within the general vicinity of the proposed liquefaction facility (HDR Engineering, 2012). FEMA has published probabilistic storm surge study maps which indicate that a storm surge still water elevation of +9.6 feet (NAVD 88) has a 1 percent annual probability of being exceeded while a storm surge still water elevation of +14.2 feet (NAVD 88) has a 0.2 percent annual probability of being exceeded (500-year flood level) at the liquefaction facility site. Therefore, because the liquefaction buildings and critical equipment would be constructed at an elevation of 15 feet, the facility would be able to withstand storm surges without damage from a Category 3 hurricane.

Lake Charles LNG's Seismic and Tsunami Hazard Evaluation report described the potential for a tsunami or seiche (i.e., a condition in which a body of water is caused to rock, causing wave action) to impact the liquefaction facility. Because the liquefaction facility site is located 24 miles north of the Gulf of Mexico shoreline and given the low probability of strong seismic events in the Gulf, the report concluded that the potential for a seismically generated tsunami or seiche hazard to impact the liquefaction facility is non-existent (URS Corporation, 2014). We concur with this determination. Tsunamis could also be generated by offshore landslides; however, the maximum estimated run-up values are significantly less than those from storm surge and therefore the tsunami hazard is inherently considered since the facility is designed for storm surge.

4.1.4 Design and Construction of the Project Facilities

4.1.4.1 Liquefaction Facility

Site Grading

The liquefaction facility site would be cleared, grubbed, and prepared using standard earthmoving and compaction equipment. Existing site grade elevations range between +6.4 feet and +7.6 feet (NAVD 88). The burning of brush, vegetation, and trees or burying of any these materials would not be permitted on site. Imported structural fill would be used to raise the site elevation to +11.0 feet in the process areas and +8.0 feet for the balance of the site. It is estimated the consolidation settlements of this fill material would range between 2 and 3 inches over the project life. The elevation of +11.0 feet is based upon a 100-year floodplain elevation of +9.0 feet provided in the FEMA Flood Insurance Rate Maps for the site plus an additional 2 feet to compensate for sea level rise, surface soil layer consolidation, and regional area subsidence for a 25-year project design life.

Foundations

Foundations used for this project would range from shallow foundations for lightly loaded structures to deep foundations for heavy equipment and settlement-sensitive equipment and structures. Deep foundations would either be driven precast concrete piles or auger cast-in-place concrete piles. The length of the piles would be determined during final design and would depend on pile type and size, downdrag loads, and allowable settlement of the structure. In the process areas of the liquefaction facility, the top of concrete (operating level) pedestals for structure and equipment supports would generally be at an elevation of +12.0 feet (NAVD 88). However, the top of concrete elevation for all critical equipment (e.g., transformers, substations, switchgears, remote instrument enclosure units, mixed refrigerant and propane compressors, BOG compressors, cryogenic heat exchanges, propane vaporizers) would be at an elevation of +15.0 feet. The top of the concrete elevations for critical equipment would be above the maximum elevations anticipated from a Category 3 hurricane strike.

The control building floor slab would have two top of concrete elevations. The majority of the control building floor slab top of concrete elevation would be +12.5 feet while the recessed areas for computer access floors would have top of concrete elevation of +11.0 feet, which would be above the 100-year floodplain elevation.

Facility and Structure Design

The liquefaction facilities would be constructed to satisfy the design requirements of 49 CFR 193, NFPA 59A-2001, 2009 International Building Code, and American Society of Civil Engineers

(ASCE) 7-05. For seismic design, the facility would be designed to satisfy the requirements of NFPA 59A-2006 and ASCE 7-05.

Wind Design

LNG facilities as defined in 49 CFR 193 would be designed for a sustained wind speed of 150 mph. Other non-LNG facilities associated with the liquefaction facility would be designed for a 110-mph, 3-second gust wind speed in accordance with ASCE 7-05.

Seismic Design Ground Motions

Geotechnical investigations of the liquefaction facility site determined that the site is classified as Site Class E (soft clay) in accordance with the International Building Code and standard ASCE 7-05 based on a site average shear wave velocity that ranged between 163 and 181 meters per second (URS, 2014). Sites with soil conditions of this type would experience significant amplifications of surface earthquake ground motions.

URS performed a site-specific seismic hazard study for the site. The study concluded that earthquake ground motions at the ground surface of the site that have 2 percent probability of being exceeded in 50 years have a 0.2-second spectral acceleration value of 0.214 g, while the 1.0-second spectral acceleration at the site is 0.141 g (URS, 2014). These predicted spectral accelerations are relatively low compared to other locations in the United States.

Submittal of Final Design Documents

The design of the facility is currently at the front-end engineering design (FEED) level of completion. Lake Charles LNG has proposed a feasible design and committed to conducting a significant amount of detailed design work for the proposed liquefaction facility if the project is authorized by the Commission. Information regarding the development of the final design, as detailed below, would need to be reviewed by FERC staff in order to ensure that the final design addresses the requirements identified in the FEED. Further, the timing of the production of this information should occur prior to the stage Lake Charles LNG has indicated in its application and subsequent filings. Therefore, **we recommend that:**

- **Lake Charles LNG should file with the Secretary the following information, stamped and sealed by the professional engineer-of-record:**

  a. site preparation drawings and specifications;

  b. LNG liquefaction facility structures and foundation design drawings and calculations; and

  c. quality control procedures to be used for civil/structural design and construction.

  In addition, Lake Charles LNG should file, in its Implementation Plan, the schedule for producing this information.

4.1.4.2 Compressor Station 203-A

Compressor Station 203-A would be a large, greenfield facility capable of producing 98,685 hp and would be located in an area underlain by clay or mud. Therefore, a geotechnical investigation is recommended. Trunkline stated that it will be conducting geotechnical investigations of the site. Accordingly, **we recommend that:**

- **<u>Prior to the end of the draft EIS comment period</u>, Trunkline should file with the Secretary the following information, stamped and sealed by the professional engineer-of-record:**

  a. the results of the geotechnical investigation Trunkline conducted at the Compressor Station 203-A site evaluating the existing site conditions; and

  b. any resulting foundation and site improvement recommendations.

4.1.5 General Impacts and Mitigation

The overall effect of the project on topography and geology would be minor. The primary impacts would be limited to construction activities and would include disturbance of slopes within the work areas. Such impacts resulting from grading and trenching operations along the pipeline rights-of-way would be temporary because Trunkline would restore these areas to preconstruction contours to the maximum extent practicable. However, impacts at the liquefaction facility and other aboveground facilities would be permanent where grading and filling is required to create a safe and stable land surface to support the facilities. Additionally, Lake Charles LNG does not plan to restore the ACWs to preconstruction contour, therefore, impacts within these areas would also be permanent (see section 4.2.3).

Utilization of the HDD method would eliminate impacts on existing geologic conditions between the HDD entry and exit points at the locations where this method is used. Trunkline has not yet conducted geotechnical surveys for the proposed HDD crossings to evaluate the suitability of the geologic materials. Trunkline proposes to conduct these investigations within 1 year prior to construction of the proposed pipelines, and would provide the results of these studies and proposed mitigation measures, as necessary, when they become available. Therefore, **we recommend that:**

- **<u>Prior to construction</u>, Trunkline should file with the Secretary the geotechnical investigations, stamped and sealed by the professional engineer-of-record, which are necessary to evaluate the suitability of the proposed HDD crossings.**

Based on the low probability of localized seismic ground shaking in the vicinity of the project, we do not anticipate any problems attributable to seismicity. Studies of earthquake performance of gas transmission pipelines in southern California indicate that modern, arc-welded, ductile steel pipelines have performed very well in earthquakes with magnitudes greater than or equal to 5.8 (O'Rourke and Palmer, 1996). These studies addressed the effects of 11 earthquakes between 1933 and 1994 with magnitudes ranging from 5.8 to 7.7. Pipelines and associated aboveground facilities are designed and installed in accordance with DOT standards, including those in 49 CFR 192, *Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards*. Each facility would be designed and constructed to provide adequate protection from washouts, floods, unstable soils, or other hazards that could cause it to move or sustain abnormal loads.

Based on available soils and geologic maps and the geotechnical investigations conducted by Lake Charles LNG, we do not anticipate that any blasting would be required for the construction of the project facilities.

Based on the above discussion, and in consideration of Trunkline's and Lake Charles LNG's proposed mitigation and design criteria, we conclude that the Lake Charles Liquefaction Project would not significantly impact or be impacted by geological conditions in the area.

4.2 SOILS

4.2.1 Existing Soil Resources

The soils affected by the proposed project were identified and assessed using various data sources including digital soils data (e.g., the Soil Survey Geographic [SSURGO] database) and published soil surveys for the applicable parishes and counties, where available (see table 4.2.1-1). The SSURGO database is a digital version of the original county soil surveys developed by the U.S. Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS) for use with geographic information systems (GIS). It provides the most detailed level of soils information for natural resource planning and management. The attribute data within the SSURGO database provides the proportionate extent of the component soils and their properties for each soil map unit.

Liquefaction Facility, Existing LNG Terminal, and Additional Construction Workspaces

The proposed liquefaction facility is located on a largely undeveloped, about 285.9-acre site just north of the existing LNG terminal. Construction of the liquefaction facility and LNG terminal modifications would also require the disturbance of about 325.2 acres of land encompassed by the ACWs. Soils within the liquefaction facility site and ACWs consist of very deep, fine to very fine textured, very poorly to somewhat poorly drained soils that formed in alluvial, eolian, and marine deposits (Soil Survey Staff, 2014).

The soils within the existing LNG terminal site are predominantly mapped as urban land, which is defined as areas where more than 85 percent of the surface is covered by asphalt, concrete, buildings, or other impervious surfaces (Soil Survey Staff, 2014). The proposed modifications to the existing LNG terminal required for the project would occur almost entirely within previously disturbed areas of the terminal and would have minimal, if any, impacts on soil resources. Construction of the two TCDs would require dredging of about 26,000 cubic yards of sediment in the Industrial Canal/Turning Basin east of the Calcasieu Ship Channel. The overall extent of dredging is expected to be 22.1 acres, extending about 2,800 feet along the waterfront and southward to the existing navigation channel. Lake Charles LNG anticipates using a cutter suction dredge to hydraulically pump the dredge materials through a temporary pipeline to an approved onshore disposal site located about 0.75 mile to the northeast. Impacts associated with sediment resuspension and turbidity during dredging activities are discussed in section 4.3.2.

Non-Liquefaction Facilities

The proposed Mainline Connector pipeline, Mainline 200-3 Loop, Compressor Station 203-A, and other new or modified aboveground facilities would be located on soils that consist of very deep, fine textured, poorly to moderately well drained soils that formed in alluvium, fluviomarine, and eolian deposits (Soil Survey Staff, 2014). The proposed modifications within the boundaries of existing aboveground facilities (i.e., where temporary construction workspace is not required outside of the previously disturbed areas) would have negligible impacts on soil resources.

TABLE 4.2.1-1

Characteristics of Soils in the Lake Charles Liquefaction Project Area (in acres)

Facility	Total[a]	Prime Farmland[b]	Highly Erodible Water[c]	Highly Erodible Wind[d]	Compaction Prone[e]	Revegetation Concerns[f]
LIQUEFACTION FACILITIES						
Liquefaction Facility	285.9	243.5	0.0	0.0	202.4	0.0
Additional Construction Workspaces	325.2	276.3	0.0	0.0	256.6	0.0
Subtotal	**611.1**	**519.8**	**0.0**	**0.0**	**459.0**	**0.0**
NON-LIQUEFACTION FACILITIES						
Pipelines						
Mainline Connector	244.1	232.7	0.0	0.0	209.6	0.0
Mainline 200-3 Loop	101.3	97.7	0.0	0.0	100.8	0.0
Compressor Stations						
Compressor Station 203-A	46.6	46.6	0.0	0.0	46.6	0.0
Meter Stations [g]						
Kinder Morgan–Lake Charles	2.4	2.4	0.0	0.0	2.4	0.0
Columbia Gulf–Egan	4.6	4.6	0.0	0.0	4.6	0.0
NGPL–Lakeside	2.9	2.9	0.0	0.0	2.9	0.0
TETCO–Allen	4.5	3.5	0.0	0.0	2.2	0.0
Gulf Crossing–Perryville	3.2	3.2	0.0	0.0	2.3	0.0
MEP–Perryville	5.5	5.5	0.0	0.0	5.5	0.0
Texas Gas–Woodlawn	2.1	2.1	0.0	0.0	2.1	0.0
Transco Ragley	1.4	1.4	0.0	0.0	1.3	0.0
Mainline 200-1 Modifications						
Calcasieu River HDD	63.7	28.9	0.0	0.0	30.0	0.0
US 190 Meter Station	1.2	1.2	0.0	0.0	0.0	0.0
Subtotal	**483.5**	**432.7**	**0.0**	**0.0**	**410.3**	**0.0**
Project Total	**1,094.6**	**952.5**	**0.0**	**0.0**	**869.3**	**0.0**

a Existing aboveground facilities and the proposed contractor yard, a currently graveled lot, are not included and should be considered as disturbed urban land (no limitations data available).

b As designated by the NRCS. Includes soils that are considered prime if a limiting factor is mitigated (e.g., artificial drainage).

c Includes land in capability subclasses IVe through VIIe, which have severe to extreme erosion limitations for agricultural use, and soils with an average slope greater than 8 percent.

d Includes soils in wind erodibility groups 1 and 2, which includes soils with poor aggregation that are particularly susceptible to wind erosion.

e Includes soils in somewhat poor, poor, and very poor drainage classes with surface textures of sandy clay loam or finer.

f Includes coarse-textured soils (sandy loams and coarser) that are moderately well to excessively drained and soils with an average slope greater than 8 percent.

g Soil characteristics and associated acreage for the LCLNG Export Meter Station are included in those shown for the new liquefaction facility site.

Source: Soil Survey Staff, 2014

4.2.1.1 Prime Farmland

The USDA defines prime farmland as "land that has the best combination of physical and chemical characteristics for producing food, feed, fiber, and oilseed crops" (Soil Survey Staff, 1993). This designation includes cultivated land, pasture, woodland, or other lands that are either used for food or fiber crops, or are available for these uses. Urbanized land, built-up land, and open water cannot be designated as prime farmland. Prime farmland typically contains few or no rocks, is permeable to water and air, is not excessively erodible or saturated with water for long periods, and is not subject to frequent, prolonged flooding during the growing season. Soils that do not meet the above criteria may be considered prime farmland if the limiting factor is mitigated (e.g., by draining or irrigating).

About 87 percent (952.5 acres) of soils that would be affected by the Lake Charles Liquefaction Project are designated as prime farmland. However, the majority of this soil (about 728.2 acres), including 519.8 acres within the liquefaction facility site and ACWs, is within land that is not classified as agricultural land use. Of the prime farmland affected, 243.5 acres would be permanently converted to urban land for operation of the liquefaction facility and 57.2 acres would be similarly converted due to operation of the other aboveground facilities. An additional 276.3 acres of prime farmland soils in the ACWs would be permanently impacted due to the deposition of fill within the workspaces, which Lake Charles LNG proposes not to restore to preconstruction condition. The remaining 375.5 acres of prime farmland soils would be restored to preconstruction conditions and are anticipated to retain their former productivity.

4.2.1.2 Erosion

Erosion is a continuing natural process that can be accelerated by human disturbance. Factors such as soil texture, structure, slope, vegetative cover, rainfall intensity, and wind intensity can influence the degree of erosion. Soils most susceptible to erosion by water are typified by bare or sparse vegetative cover, non-cohesive soil particles with low infiltration rates, and moderate to steep slopes. Soils typically more resistant to erosion by water include those that occupy low relief areas, are well vegetated, and have high infiltration capacity and internal permeability. Wind erosion processes are less affected by slope angles than water erosion processes. Wind-induced erosion often occurs on dry soils where vegetative cover is sparse and strong winds are prevalent.

Based on the soil properties reviewed, none of the soils in the Lake Charles Liquefaction Project area are considered highly susceptible to erosion by wind or water.

4.2.1.3 Compaction Potential

Soil compaction modifies the structure and reduces the porosity and moisture-holding capacity of soils, which increase runoff potential. Construction equipment traveling over wet soils could disrupt soil structure, reduce pore space, and cause rutting. The degree of compaction depends on moisture content and soil texture. Fine-textured soils with poor internal drainage that are moist or saturated are the most susceptible to compaction and rutting.

About 75 percent (459.0 acres) of the soils within the liquefaction facility and ACWs and 85 percent (410.3 acres) of the soils within the Non-Liquefaction Facilities are prone to compaction.

4.2.1.4 Revegetation Potential

Successful restoration and revegetation are important for maintaining soil productivity and protecting the underlying soil from potential damage, such as erosion. The revegetation potential of soils affected by the Lake Charles Liquefaction Project was evaluated based on the soil surface texture, slope, and drainage class. Droughty soils that have a coarse surface texture and are moderately well to excessively drained may be difficult to revegetate. Drier soils have less water to aid in the germination and eventual establishment of new vegetation. Coarser textured soils have a lower water holding capacity following precipitation, which could result in moisture deficiencies in the root zone and unfavorable growing conditions for many plants.

Due to the fine textured soils and nearly level topography in the project area, no revegetation concerns were identified.

4.2.2 Soil Contamination

Based on a review of the EPA's Toxic Release Inventory Program sites in Louisiana, one hazardous waste site is located within 0.25 mile of the Lake Charles Liquefaction Project. The Lake Charles Carbon Company, located directly west of the proposed liquefaction facility, is listed as being in Significant Violation for releases of benzoperylene, hydrogen fluoride, lead, mercury, and polycyclic aromatic compounds (EPA, 2006). Lake Charles LNG conducted soil contamination investigations along the western border of the LNG terminal property (bordering the Lake Charles Carbon Company) to characterize the extent of polycyclic aromatic hydrocarbons (PAH) and polychlorinated biphenyls (PCB) contamination in soils within Lake Charles LNG's property. The results of these investigations indicate that 29 percent of samples screened for PAHs and 6 percent of samples screened for PCBs were above the LDEQ's industrial site standards (Tetra Tech, 2014). Ground disturbance from construction activities in this area has the potential to expose these contaminated soil materials.

Lake Charles LNG stated that impacted media would be managed and disposed of in accordance with all applicable regulations and in coordination with Alcoa (the current owner of the Lake Charles Carbon Company) and the LDEQ. If previously unidentified contaminants are encountered during construction, Lake Charles LNG and Trunkline would follow the steps outlined in their *Plan for Unanticipated Discovery of Contaminated Soils or Groundwater* (see appendix E). This plan specifies that EIs and construction contractor personnel would be trained in hazard identification and worker protection, lists indicators of possible contamination, requires preconstruction inspections prior to beginning work in each area of the project, and identifies measures to be implemented in the event that suspected contamination is encountered.

4.2.3 General Impacts and Mitigation

Construction activities such as clearing, grading, trench excavation, backfilling, and the movement of construction equipment may affect soil resources. Clearing removes protective vegetative cover and exposes the soil to the effects of wind and rain, which increases the potential for soil erosion and sedimentation of sensitive areas. Grading, spoil storage, and equipment traffic can compact soil, reducing porosity and increasing runoff potential.

To reduce the impacts of construction on soils, Lake Charles LNG and Trunkline would implement the FERC Plan and Procedures except where alternative measures are warranted. The Plan and Procedures include measures to control erosion and sedimentation during construction and to ensure proper restoration of disturbed areas following construction. Relevant mitigation measures specified in the Plan and Procedures include:

- sediment barriers, such as silt fencing and/or straw bales, would be installed before ground-disturbing activities to prevent sediment flow from construction areas into waterbodies, wetlands, and roads;

- temporary erosion control measures, such as temporary slope breakers and mulch, would be installed during construction;
- permanent erosion control measures, such as permanent slope breakers, trench breakers, and revegetation of the disturbed areas, would be maintained following construction;
- temporary and permanent trench plugs would be constructed to reduce runoff velocities in the trench during construction and reduce subsurface groundwater movement after the trench is backfilled;
- erosion control fabric would be placed at dike and drainage swale outlets, on steep slopes, and adjacent to roads and waterbodies as necessary; and
- dust suppression, via water application, would be used as necessary to control soil loss from wind erosion.

Rutting and compaction would be minimized by avoiding construction during periods of heavy rainfall or unusual soil saturation, to the extent practicable, and by utilizing low-ground weight construction equipment and/or timber mats.

Construction debris (e.g., used filter bags, skids, trash) would be removed from the right-of-way unless the landowner or land management agency approves otherwise, and temporary work areas (except the ACWs) would be restored to preconstruction conditions. Post-construction monitoring of mitigation measures would be conducted to ensure their successful implementation. Disturbed areas would be monitored following construction for the first and second (as necessary) growing seasons in upland areas and at least 3 years in wetlands to ensure successful restoration (see section 2.6.2).

As agreed upon by the landowner, Lake Charles LNG anticipates that they would stabilize the ACWs with gravel or vegetation, and would install additional temporary or permanent erosion control devices to prevent off-site erosion and sedimentation. Lake Charles LNG also stated that final detail designs of these locations would be completed by the selected contractor and permitted as necessary prior to disturbance and use. To ensure that the ACWs are adequately stabilized and runoff accounted for to avoid impacts on surrounding areas, **we recommend that**:

- **<u>Prior to construction</u>, Lake Charles LNG should file with the Secretary, for review and written approval by the Director of the Office of Energy Projects (OEP), final design plans for the ACWs that detail how each ACW would be stabilized after construction is complete to prevent off-site erosion impacts on the surrounding areas, and any planned mitigation to address altered drainage patterns resulting from the modified elevation and clearing of these sites.**

Soil contamination from non-EPA-regulated volumes of spills or leaks of fuels, lubricants, and coolant from construction vehicles would be avoided by following the Spill Prevention and Response (SPAR) Plan prepared by Lake Charles LNG and Trunkline and the measures in our Plan and Procedures. The SPAR plan identifies measures to be taken for spill preparedness and prevention, emergency response procedures, designated coordinators and duties, reporting procedures, and contact numbers for local emergency officials. The contractor(s) hired by Lake Charles LNG and Trunkline would use the SPAR Plan for minimum guidelines to create a project-specific Spill Prevention, Control, and Countermeasure (SPCC) Plan(s) for EPA-regulated volumes of fuels or hazardous materials. The contractor's SPCC Plan(s) would also need to comply with section IV.A of our Procedures. Lake Charles LNG and Trunkline have also prepared a *Plan for Unanticipated Discovery of Contaminated Soils or*

Groundwater. As described above, this plan outlines response measures to be taken by the EIs and contractors if previously unidentified hazardous materials are encountered during construction. We have reviewed the SPAR Plan and the *Plan for Unanticipated Discovery of Contaminated Soils or Groundwater* provided with Trunkline and Lake Charles LNG's application and find them generally acceptable, but the SPAR plan has not yet been updated to include project-specific emergency contacts and local authorities. Additionally, the project-specific SPCC Plan(s) is not yet available because it would be prepared by the construction contractor(s). Therefore, **we recommend that**:

- **<u>Prior to construction</u>, Lake Charles LNG and Trunkline should file with the Secretary an updated SPAR Plan that includes project-specific emergency contacts and local authorities, and the project-specific SPCC Plan(s) for review and written approval by the Director of OEP.**

As discussed in section 2.5.1, Lake Charles LNG and Trunkline would employ EIs to verify compliance with the FERC Plan and Procedures, SPAR Plan, and other project-specific plans and specifications during construction and restoration. The EIs would have the authority to stop work and order corrective actions for activities that violate the environmental conditions of the FERC Certificate and other authorizations.

4.3 WATER RESOURCES

4.3.1 Groundwater Resources

The majority of the Lake Charles Liquefaction Project facilities are located in the coastal lowlands aquifer system, while the Gulf Crossing–Perryville and MEP–Perryville Meter Stations, Epps and Shaw Compressor Stations and the Mississippi Barrel East and West are located in the Mississippi River Valley alluvial aquifer system (USGS, 2003).

The coastal lowlands aquifer system is a wedge-shaped, gulf-ward-thickening, semi-consolidated aquifer composed of discontinuous bands of sands, silts, and clays ranging in age from the Oligocene to Holocene epochs. This aquifer reaches depths of up to 14,000 feet in southern Louisiana; however, depths associated with the project areas are generally between 6,000 and 10,000 feet (USGS, 1998). The Pollock Compressor Station is located at the landward edge of the coastal lowlands aquifer system where it borders the Mississippi embayment aquifer system and depths are generally less than 2,000 feet (USGS, 1998; USGS 2003). The coastal lowlands aquifer system is capable of supplying large quantities of water from properly constructed wells. Maupin and Barber (2005) estimated that about 2,370 million gallons per day were withdrawn from the coastal lowlands aquifer system in 2000 (Maupin and Barber, 2005). Based on development in the region it is assumed that current withdrawals are significantly higher than those in 2000.

The Mississippi River Valley alluvial aquifer system is the largest surficial aquifer system (about 33,000 square miles) in Louisiana, Arkansas, and Mississippi (USGS, 1998). It formed from the deposition of glacial outwash in the river valley carved by the ancestral Mississippi River. This water bearing, braided sequence of gravels and coarse sands was then confined by fine, post-glacial alluvial deposits laid down by the meandering river system we know today. The thickness of this confining unit averages between 20 and 30 feet, but is missing in some places where the rate of erosion supersedes deposition (USGS, 1998). Below the confining layer, the aquifer extends to depths of 150 feet or more (USGS, 1998). This aquifer system is also capable of supplying large quantities of water from properly constructed wells. Total withdrawals from the Mississippi River Valley alluvial aquifer were estimated to be 9,290 million gallons per day in 2000 (Maupin and Barber, 2005). Based on development in the region it is assumed that current withdrawals are significantly higher than those in 2000.

4.3.1.1 Sole Source Aquifers

The EPA defines a sole or principal source aquifer (SSA) as one that supplies at least 50 percent of the drinking water consumed in the area overlying the aquifer. EPA guidelines require that SSAs can have no alternative drinking water source(s) that could physically, legally, and economically supply all those who depend upon the aquifer for drinking water (EPA, 2012).

The Mississippi River Alluvial aquifer, in which the Gulf Crossing–Perryville and MEP–Perryville Meter Stations, Epps and Shaw Compressor Stations, and the Mississippi Barrel East and West are or would be located, is not listed as an SSA. All of the remaining Lake Charles Liquefaction Project facilities are or would be located in the Chicot SSA (EPA, 2008). The Chicot aquifer system is about 9,000 square miles and composed of productive, saturated coarse sands and gravels and the adjoining silt and clay deposits that confine them (Louisiana Department of Transportation and Development [DOTD] and USGS, 2004). In 2010, 648.5 million gallons per day were withdrawn from the Chicot aquifer, which accounted for 41 percent of Louisiana's total groundwater usage (DOTD and USGS, 2011). Three units of the Chicot aquifer are present in Lake Charles: the 200-foot sand, the 500-foot sand, and the 700-foot sand. In some areas, groundwater withdrawals from the Chicot aquifer are causing lowered water levels and saltwater encroachment. In the Lake Charles industrial district, intense pumping of the 500-foot sand has lowered water levels and formed a deep cone of depression centered under the district. Chloride levels have remained relatively stable since the mid-1970s; however, elevated chloride levels (i.e., greater than 100 milligrams per liter) observed at public supply wells in eastern and southern Lake Charles suggest that additional upconing of salt water from the 700-foot sand to the 500-foot sand may occur in the future (DOTD and USGS, 1999; LDEQ, 2009a).

4.3.1.2 Water Supply Wells

Louisiana's Wellhead Protection Program is a component of the LDEQ's Drinking Water Protection Program and is designed to protect the quality of public drinking water supplies obtained from community water wells. The LDEQ delineates a drinking water protection area around each well, ranging from a 1,000-foot-radius to a 1-mile-radius, depending on well screen depth, construction date, or aquifer source. A Management Plan is then created for each well to minimize the potential risks to public water supplies, which can include ordinances, source prohibitions, and/or education of the public.

Based on consultation with the LDEQ, the liquefaction facility and the LCLNG Export Meter Station would be located within eight drinking water protection areas (LDEQ, 2013a). Each of the drinking water protection areas is centered on a wellhead and has a 1-mile radius because the protected well depths are less than 1,000 feet. Two of the wells supply water to the existing LNG terminal, three industrial supply wells are located on the Alcoa property adjacent to and west of the liquefaction facility site, two public supply wells are located southwest of the existing LNG terminal across the Industrial Canal, and one public supply well is located east of the liquefaction facility. Additionally, the contractor yard and Kinder Morgan–Lake Charles Meter Station are each located within two public supply wellhead protection areas, and the Longville Compressor Station is within the limits of one additional public supply wellhead protection area (LDEQ, 2013a).

Based on review of USGS quadrangles, field surveys, the LDNR's Strategic Online Natural Resources Information System (SONRIS) database (2014), and correspondence with the LDEQ, Lake Charles LNG and Trunkline identified seven active private water wells and one public supply well within 150 feet of the Lake Charles Liquefaction Project (see table 4.3.1-1).

TABLE 4.3.1-1			
Water Wells Within 150 Feet of the Lake Charles Liquefaction Project			
Water Well Number	Use	Facility	Distance and Direction
019-5305Z	Domestic	Liquefaction facility	Within footprint
019-12170Z	Domestic	Liquefaction facility	93 feet east
019-5596Z	Domestic	Liquefaction facility	116 feet west
019-14640Z	Domestic	ACW Area B	Within footprint
019-715	Domestic	ACW Area C	Within footprint
019-7665Z	Domestic	ACW Area D	86 feet northeast
019-656	Domestic	Contractor yard	21 feet north
043-182	Rural Public Supply	Pollock Compressor Station	Within footprint

Lake Charles LNG proposes to install two new water wells within the liquefaction facility footprint to provide water needed for construction and operation of the facility. During operation, the wells would supply the combination freshwater/firewater tank that would be used for utility service water and process water. In addition, Trunkline proposes to install a new water well at the Compressor Station 203-A site to provide water for non-potable activities.

4.3.1.3 Contaminated Groundwater

The LDEQ runs an Aquifer Sampling and Assessment Program to monitor the quality of groundwater produced in Louisiana's major freshwater aquifers. The program samples about 200 wells across 14 aquifers every 3 years and presents the results in a triennial report. Under the Federal Safe Drinking Water Act, the EPA has established the Primary Maximum Contaminant Level (MCL) for pollutants that may pose a health risk in public drinking water. A Primary MCL is the highest level of a contaminant that the EPA allows in public drinking water. Secondary MCLs have also been set by the EPA, but are defined as non-enforceable guidelines for taste, odor, or appearance (LDEQ, 2009a, 2009b).

The Chicot aquifer was shown to produce hard, but good quality water. There were no wells sampled by the LDEQ in 2008 that exceed the Primary MCL of any of the 90 contaminants regulated by the EPA. However, there were 4 wells that exceeded the Secondary MCL for pH, 3 wells for chloride, 3 wells for color, 5 wells for total dissolved solids, and 17 wells for iron. Over the past 12 years, the Chicot aquifer has shown an average increase in six analytical parameters: pH, alkalinity, chloride, hardness, barium, and iron. The aquifer has exhibited an average decrease in temperature, total phosphorus, and nitrogen. The LDEQ currently does not recommend any course of corrective action, but rather to continue scheduled monitoring (LDEQ, 2009a).

The Mississippi River Alluvial aquifer was found to be a source of very hard water. The Primary MCL for arsenic was exceeded in 6 of 23 wells sampled. The data also shows that the aquifer is of poor quality with 33 Secondary MCLs exceeded in 19 wells, including pH, chloride, sulfate, color, total dissolved solids, and iron. Over the past 12 years, pH, temperature, specific conductance, salinity, sulfate, hardness, and iron have increased in the Mississippi River Alluvial aquifer. Chloride, color, total dissolved solids, ammonia, nitrogen, barium, copper, zinc, and total phosphorus have decreased on average across the aquifer. The LDEQ provides owners of wells with Primary MCL violations with information about the compound, its health effects, and possible treatment methods (LDEQ, 2009b).

4.3.1.4 Groundwater Impacts and Mitigation

The installation of piles for the liquefaction facilities, which are anticipated to be driven to a depth of 70 feet, is not expected to have direct impacts on the underlying aquifer, which is about 200 feet below the surface. Other construction activities are not likely to significantly impact groundwater resources because the majority of construction would involve shallow, temporary, and localized excavation. However, shallow aquifers could sustain minor, indirect impacts from changes in overland water flow and recharge caused by clearing and grading of the proposed work areas. In addition, near-surface soil compaction caused by heavy construction vehicles could reduce the soil's ability to absorb water in these areas. Lake Charles LNG and Trunkline would use specialized construction techniques such as sheet piling and earthen berms to control surficial water flow and infiltration. During construction, local water table elevations could be affected by trenching and backfilling. In areas where groundwater is near the surface, trench excavation may intersect the water table in low-lying areas. Lake Charles LNG and Trunkline would use well pointing, which consists of closely spaced small-diameter shallow wells to temporarily lower the water table in the immediate area, and/or pit-to-pit dewatering techniques to reduce impacts on groundwater in these circumstances. These minor, direct, and indirect impacts would be temporary and would not significantly affect groundwater resources. Lake Charles LNG and Trunkline would further minimize or avoid potential impacts on groundwater by implementing measures outlined in the FERC Plan and Procedures (e.g., temporary and permanent trench plugs and interceptor dikes). After installation of the proposed facilities, the ground surface in areas that would not be paved or graveled for aboveground facilities would be restored as closely as practicable to original contours and any exposed soils would be revegetated to ensure restoration of preconstruction overland flow and recharge patterns except within the ACWs. As noted previously, Lake Charles LNG anticipates that the ACWs would be graveled or converted to vegetated surfaces based on landowner agreements.

Unconfined aquifers and shallow groundwater areas could be vulnerable to contamination caused by inadvertent surface spills of hazardous materials used during construction. Accidental spills and leaks of hazardous materials associated with equipment trailers; the refueling or maintenance of vehicles; and the storage of fuel, oil, and other fluids pose the greatest risk to groundwater resources. If not cleaned up, contaminated soil could continue to leach and contaminate groundwater after a spill has occurred. Implementation of Lake Charles LNG's and Trunkline's SPAR and SPCC Plans would minimize the potential for groundwater impacts associated with an inadvertent spill of hazardous materials (see section 4.2.3). In addition, these plans address the storage and transfer of hazardous materials and petroleum products. Therefore, we conclude that the potential for the Lake Charles Liquefaction Project to contaminate local aquifers or water supply wells would be minimal.

Water required for construction and operation of the existing LNG terminal modifications and liquefaction facility would be provided from the two existing and two new on-site wells. Uses include hydrostatic testing of new piping systems, construction personnel sanitation, and other general utility uses. Lake Charles LNG estimates that about 45 million gallons of water would be withdrawn from the Chicot aquifer during construction. Typical flow rates would be 56 gallons per minute (gpm), with peak consumption of about 166 gpm. These withdrawal rates would be negligible relative to the more than 10 million gpm that are currently withdrawn from the Chicot aquifer (DOTD and USGS, 2011). At the liquefaction facility, potable water during construction would be provided from the City of Lake Charles Department of Public Works for on-site concrete production, hydrostatic testing, and personnel consumption. The city obtains water from 17 wells that are drilled in the 500-foot and 700-foot sands of the Chicot aquifer. The wells supply residents with about 12 million gallons of water each day. Lake Charles LNG has received approval from the city for the use of about 20 million gallons of municipal water, which would be used at an average flow rate of 24 gpm, with a peak flow of 60 gpm.

Water used during construction of the Non-Liquefaction Facilities would be obtained from municipal and surface water sources as discussed further in section 4.3.2.2. Non-potable water required at Compressor Station 203-A would be obtained from the new well to be installed on site. Trunkline would not require any potable water sources at Compressor Station 203-A or the other non-liquefaction facilities.

Operational uses of water for the completed liquefaction facility would be supplied from the local municipal system and from the two new wells on the liquefaction facility property. These wells would be equipped with pumps capable of extracting 3,000 gpm to fill a tank that would be used for freshwater and for the plant's fire suppression system. The average water consumption for plant operations would be 14,400 gallons per day for potable water to serve the 247 on-site employees, 95,040 gallons per day for utility/service water, and 48,960 gallons per day for plant process water. Lake Charles LNG has committed to coordinating with the city and other developers as needed to ensure that the local systems can provide an adequate supply of water.

Lake Charles LNG and Trunkline have stated that they would continue to coordinate with the LDEQ and local agencies to ensure that construction and operation of the project facilities within the eight wellhead protection areas would be consistent with the applicable regulations.

Lake Charles LNG and Trunkline would conduct pre- and post-construction monitoring of well yield and water quality for all water supply wells located within 150 feet of construction activities. If the project results in adverse impacts, Lake Charles LNG or Trunkline would provide a temporary source of water to those affected and repair or replace the affected water wells. To document any project impacts on water wells and verify that they are appropriately addressed, **we recommend that:**

- **<u>Within 30 days of placing facilities in service</u>, Lake Charles LNG and Trunkline should file with the Secretary a report identifying all public or private water supply wells/systems damaged by construction and how they were repaired. The report should also include a discussion of any other complaints concerning well yield or water quality and how each problem was resolved.**

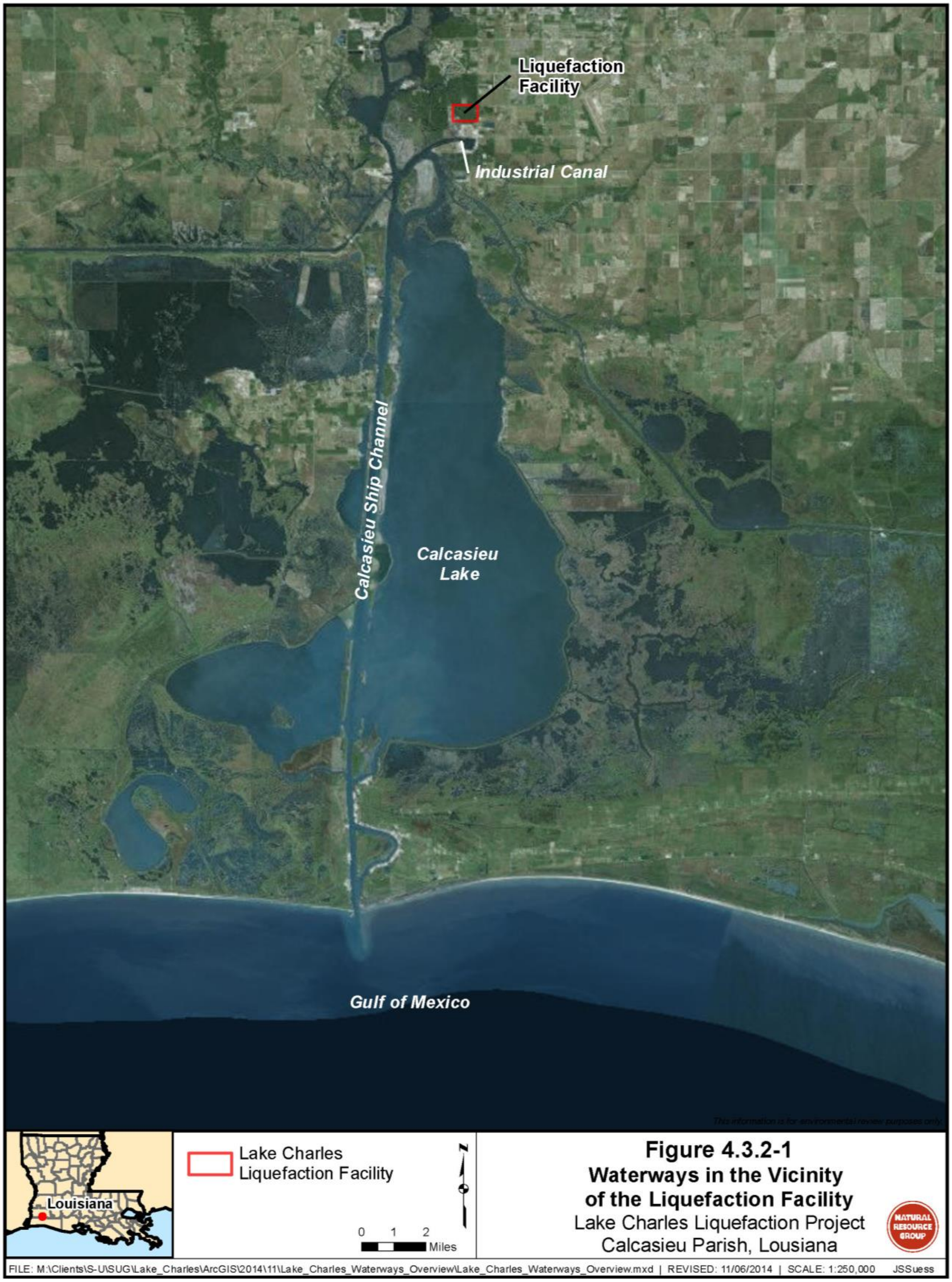
4.3.2 Surface Water

4.3.2.1 Existing Surface Water Resources

Liquefaction Facility and LNG Terminal

The liquefaction facility would be located immediately north of the existing LNG terminal, adjacent to the Industrial Canal/Turning Basin, which discharges into Calcasieu Lake via the Calcasieu River (see figure 4.3.2-1). In addition to the Calcasieu River, numerous bayous, smaller rivers, and the surrounding marshlands discharge freshwater into Calcasieu Lake. Other sources of freshwater in the estuary system include streams and stormwater runoff; municipal, industrial, and agricultural return flow; and direct precipitation. Tidal exchange between the Gulf of Mexico and Calcasieu Lake occurs through the Calcasieu Ship Channel, which has been extensively modified for navigation purposes (e.g., the channel is generally maintained at a depth of 40 feet) (COE, 2015).

The Industrial Canal/Turning Basin, located adjacent to the existing LNG terminal, has been designated as EFH, which is described in section 4.6.3. The Industrial Canal/Turning Basin has also been designated as a Navigable Waterway under section 10 of the Rivers and Harbors Act.



Liquefaction Facility
Industrial Canal
Calcasieu Ship Channel
Calcasieu Lake
Gulf of Mexico
Louisiana
Lake Charles Liquefaction Facility
0 1 2 Miles
N
Figure 4.3.2-1
Waterways in the Vicinity of the Liquefaction Facility
Lake Charles Liquefaction Project
Calcasieu Parish, Lousiana
NATURAL RESOURCE GROUP
FILE: M:\Clients\S-U\SUG\Lake_Charles\ArcGIS\2014\11\Lake_Charles_Waterways_Overview\Lake_Charles_Waterways_Overview.mxd | REVISED: 11/06/2014 | SCALE: 1:250,000 JSSuess

In addition to the Industrial Canal/Turning Basin, 15 unnamed waterbodies are present within the liquefaction facility site. These include 1 pond, 1 perennial waterbody, 2 intermittent waterbodies, and 11 roadside drainages (see table 4.3.2-1). None of the waterbodies affected by the liquefaction facility are listed as Wild and Scenic Rivers, or contain federally or state-listed species. Designated uses of the Industrial Canal/Turning Basin, pond, perennial waterbody, and intermittent waterbodies include primary contact recreation, secondary contact recreation, propagation of fish and wildlife, and agriculture (LDEQ, 2013c). However, because the Industrial Canal (located within LDEQ subsegment LA031101) does not support its designated use for primary contact recreation or fish and wildlife propagation, it is included on the State of Louisiana's 2012 CWA §303(d) List of Impaired Waters (303(d) list) (LDEQ, 2013c). The causes of impairment include chloride, sulfates, total dissolved solids, and water temperature due to changes in tidal circulation/flushing, drought-related impacts, and impacts from hydrostructure flow regulation or modification. None of the other waterbodies that would be affected at the liquefaction facility site are included on the 303(d) list. Drainages do not have a state-designated uses. A full list of waterbodies affected by the project, including waterbody name, type, classification, crossing width, and crossing method is provided in appendix F.

Non-Liquefaction Facilities

A total of 106 waterbodies, including 18 perennial, 12 intermittent, 8 ephemeral, 4 open water (pond), and 64 agricultural ditches and canals would be crossed or otherwise affected (e.g., matted) by construction of the Non-Liquefaction Facilities (see table 4.3.2-1). The agricultural drainages do not have state-designated uses. Designated uses of the remaining waterbodies include primary and secondary contact recreation, propagation of fish and wildlife, and agriculture.

TABLE 4.3.2-1

Surface Waters Affected by the Lake Charles Liquefaction Project

Project Component	Open Water	Perennial	Intermittent	Ephemeral	Agricultural Ditches and Canals	Total
LIQUEFACTION FACILITY AND LNG TERMINAL						
LNG terminal	1	0	0	0	0	1
Liquefaction facility	1	1	2	0	11	15
SUBTOTAL	**2**	**1**	**2**	**0**	**11**	**16**
NON-LIQUEFACTION FACILITIES						
Pipelines						
Mainline Connector	4	7	9	7	29	56
Mainline 200-3 Loop	0	5	1	0	29	35
Mainline 200-1 modifications, Calcasieu River HDD	0	6	0	1	0	7
Aboveground Facilities						
Compressor Station 203-A	0	0	1	0	4	5
Columbia Gulf–Egan Meter Station	0	0	1	0	2	3
SUBTOTAL	**4**	**18**	**12**	**8**	**64**	**106**
PROJECT TOTAL	**6**	**19**	**14**	**8**	**75**	**122**

At the proposed crossing location, the Calcasieu River is also designated as an Outstanding Natural Resource Water by the LDEQ, as a Louisiana Natural and Scenic River by the LDWF, and as a Navigable Waterway under section 10 of the Rivers and Harbors Act (LDEQ, 2013b; LDWF, 2012; COE, 2013a). However, this segment of the river (located within LDEQ subsegment LA030201) is listed on the 303(d) list because it is not supporting its designated uses for primary contact recreation, fish and wildlife propagation, and Outstanding Nature Resource. Causes of impairment include chloride, lead, sulfates, total dissolved solids, turbidity, and fecal coliform due to drought-related impacts, agricultural activities, and runoff (LDEQ, 2013c).

East Bayou Lacassine (MP 176.5 of Mainline 200-3 Loop, within LDEQ subsegment LA050601) is also included on the 303(d) list because it does not meet its designated use for fish and wildlife propagation. This waterbody is listed as impaired for chloride, sulfate, and total dissolved solids due to drought-related impacts and agricultural activities (LDEQ, 2013c).

The Kinder Morgan–Lake Charles Meter Station in Calcasieu Parish and NGPL–Lakeside Meter Station in Cameron Parish are located within the 2012 Louisiana Coastal Zone (Louisiana Regular Session 49:214.24); however, no waterbodies occur within either meter station site (see additional discussion in section 4.8.7). None of the waterbodies impacted by the Non-Liquefaction Facilities are listed as National Wild and Scenic Rivers, designated as EFH, or contain federally or state-listed species.

4.3.2.2 Surface Water Impacts and Mitigation

Liquefaction Facility and LNG Terminal

Table 4.3.2-1 summarizes the surface waters that would be affected as a result of construction and operation of the liquefaction facility. Potential impacts on surface waters due to construction activities at the existing LNG terminal would occur within the Industrial Canal/Turning Basin and would be associated with the TCDs and berth modifications (i.e., dredging, pile installation, spills or leaks of hazardous materials, and removal of the TCDs) and vessel traffic (i.e., barge traffic and ballast water discharge). Potential impacts on surface waters at the liquefaction facility site include waterbody modification/fill, increased stormwater runoff, and spills or leaks of hazardous materials. The following sections describe these potential impacts as well as measures proposed by Lake Charles LNG to minimize impacts on surface waters.

<u>LNG Terminal</u>

Temporary Construction Docks and Berthing Dock Modifications

Construction of the two TCDs would require dredging a 22.1-acre area in the Industrial Canal/Turning Basin, driving sheet piles, and installing the TCD surface features. Modification of the existing berthing docks would include installation of berthing structures (e.g., addition of mooring dolphins, installation of larger vapor return arms from each dock to the LNG storage tanks).

The primary impacts on water quality resulting from these activities would be associated with dredging. As described in additional detail in section 2.6.1, about 26,000 cubic yards of material would be dredged from within the Industrial Canal/Turning Basin. Dredging activities would occur over a 30-day period. Dredged material would be hydraulically pumped through a 0.5-mile-long temporary, aboveground dredge pipe into Lake Charles LNG’s existing dredged material disposal area located immediately east of ACW Area B. Once placed into the disposal area, dredged materials would be allowed to dewater through a conventional weir system that would return the decanted water back to the Industrial Canal/Turning Basin in accordance with LDEQ and EPA requirements.

Impacts on water quality resulting from dredging include temporary increases in suspended sediment and turbidity levels as well as potential resuspension of contaminated sediments. The COE and Lake Charles Harbor and Terminal District partner to conduct maintenance dredging within the Industrial

Canal/Turning Basin; in order to maintain deep draft access, dredging is expected to occur every other year (COE, 2015). This routine dredging, combined with existing vessel traffic associated with operation of existing facilities, causes sustained high and variable turbidity levels within the Industrial Canal/Turning Basin. Lake Charles LNG proposes to conduct their dredging activities using a hydraulic dredge with a suction cutter head. This dredging method minimizes turbidity from resuspension of the sediment in the water column and other water quality impacts. Additionally, any effects would be minor because they would be temporary (i.e., confined to the period of dredging activity and shortly thereafter) and limited to the area within and immediately around the Industrial Canal/Turning Basin. During dredging and other in-water activities, Lake Charles LNG would routinely measure water quality and would implement additional measures, such as the use of silt curtains, as needed to comply with applicable permit conditions.

Lake Charles LNG stated that information in recent sampling plans conducted by Tetra Tech, Inc. on behalf of Alcoa indicates that sediments within the Industrial Canal/Turning Basin contain contaminants, but that the underlying clay is not impacted. Lake Charles LNG would be required to apply for authorization from the COE New Orleans District under section 404 of the CWA and section 10 of the Rivers and Harbors Act to dredge and/or fill waters of the United States (see discussion in section 4.4). Lake Charles LNG would be required to implement the measures incorporated into the COE permit, including any special requirements/procedures for handling contaminated sediments (e.g., silt curtains or other in-water controls that may be included as conditions of the permit). Lake Charles LNG has stated that a surface water and sediment sampling study is being conducted within the Industrial Canal/Turning Basin. In order to better identify potential impacts and appropriate mitigation measures associated with the disturbance of contaminated sediments, **we recommend that**:

- **<u>Prior to the end of the draft EIS comment period</u>, Lake Charles LNG should file with the Secretary the results of the contaminated sediment sampling study for the Industrial Canal/Turning Basin, as well as an interpretation of the results that includes but is not limited to a summary of the findings; the fate of contaminated sediment disturbed during construction; any potential impacts not previously identified that could result from the resuspension of contaminated sediments, disposal, and dewatering of dredged material; and any additional mitigation measures proposed.**

Construction of the two TCDs and modification of the existing berths would result in localized, temporary increases in turbidity and suspended sediment levels. A combination of conventional in-water marine construction equipment (e.g., barges, cranes, pile driving equipment) and shore-based construction equipment (e.g., backhoes, bulldozers) would be used to install steel sheet pilings, backfill the TCD footprint with structural fill, and install over-water structures. Removal of the TCDs following the 5-year construction period would be accomplished primarily using shore-based equipment. To minimize impacts on water quality, excavation of backfill material and removal of the anchor system would occur prior to the steel sheet piles being extracted. The shoreline would be restored to approximately the preconstruction grade and shoreline protection would be reinstalled, if needed. Therefore, the activities associated with the TCDs and berthing dock modifications would result in temporary and minor increases in turbidity and sediment levels in the immediate vicinity of construction activities, but no permanent or long-term water quality impacts.

Spills, leaks, or other releases of hazardous materials during in- or over-water construction activities could adversely impact water quality. To protect surface water resources from inadvertent releases of fuel and other mechanical fluids, Lake Charles LNG would implement their SPAR and SPCC Plans (see section 4.2.3 for further discussion of these plans). Furthermore, Lake Charles LNG would enforce refueling restrictions, hazardous material storage, and equipment parking restrictions within

100 feet of surface waters in accordance with our Procedures. With the implementation of the project-specific spill plans and our Procedures, the expected impacts on water quality in the event of a spill or leak would be minor.

Vessel Traffic

Throughout construction of the project, barges and support vessels would deliver large equipment and materials to the TCDs. Lake Charles LNG anticipates an average of five barge deliveries per day and less than one bulk carrier per week over the 5-year construction period. This traffic may increase shoreline erosion and resuspension of bottom sediments, resulting in temporary increases in turbidity levels within the Industrial Canal/Turning Basin and along vessel transit routes. The Calcasieu Ship Channel was specifically created to provide deepwater access for maritime commerce. It is managed by the Port of Lake Charles, a deepwater seaport, and is maintained by regular dredging (Port of Lake Charles, 2014). As such, use of the channel by barges and support vessels to deliver materials during construction of the liquefaction facility would be consistent with the planned purpose and use of this active shipping channel, and associated impacts on water quality within the channel would be minor.

Lake Charles LNG is not proposing to change the frequency or size of LNG carriers, and the impacts associated with the transit of these vessels to and from the terminal during operation of the project would not change. However, operation of the LNG terminal as an export facility rather than an import facility would require that LNG carriers discharge ballast water (for LNG loading) rather than take on ballast water (for offloading of LNG). Therefore, an analysis of potential impacts on water quality due to ballast water discharge is included below.

During operation of the project, up to 225 LNG carriers would call on the LNG terminal per year, each of which could discharge up to 16,907,250 gallons of water (depending on LNG carrier size) into the Industrial Canal/Turning Basin during LNG loading. As required by Coast Guard regulations (33 CFR 151.2026), vessels equipped with ballast tanks must implement one of five options to control the introduction of nonindigenous species into waters of the United States. The International Maritime Organization has adopted this regulation, which requires each vessel to install and operate a ballast water management system (option 1 as currently defined). Compliance dates associated with this International Maritime Organization requirement will be phased, but will apply to all vessels beginning in 2016.[1] Until this rule is fully implemented, Lake Charles LNG has stated that they would require LNG carriers to conduct a complete ballast water exchange at least 200 nautical miles from any shoreline (option 4 as currently defined), except in extraordinary circumstances causing safety or stability concerns that would require a ballast exchange closer to the shoreline, which is authorized under 33 CFR 151.2040. Therefore, ballast water discharged into the Industrial Canal/Turning Basin would be composed of open ocean water, and potential impacts on water quality would include changes in temperature, pH, dissolved oxygen, and salinity levels.

Depending on hydrologic conditions at the time of discharge, the physio-chemical composition of ballast water may be very similar to or different from the ambient water within the Industrial Canal/Turning Basin. The primary potential impact on water quality due to ballast water discharge would be a temporary increase in salinity level. Because the Industrial Canal/Turning Basin is located within the Calcasieu River estuary (about 23 miles north of the Gulf of Mexico), these differences may not be measurable under normal tidal cycles. However, during periods of heavy rainfall, salinity levels may decrease in the Industrial Canal/Turning Basin. Ballast water would be discharged near the bottom of the

[1] This regulation (33 CFR 151.2026) currently applies to all new vessels as well as existing vessels with ballast water capacity between 1,500 and 5,000 m^3 that have been drydocked since January 1, 2014. Compliance by existing vessels with ballast water capacity less than 1,500 m^3 or greater than 5,000 m^3 will be required as of the vessel's first scheduled drydocking after January 1, 2016.

marine berth where relatively dense saltwater from the Gulf of Mexico characteristically underlies freshwater from inland sources. Furthermore, the amount of ballast water discharged into the Industrial Canal/Turning Basin during each LNG carrier visit to the LNG terminal would represent a very minor influence on the overall system.

Another physio-chemical water quality parameter that may be influenced by ballast water discharges is dissolved oxygen level. As described above, ballast water would be discharged near the bottom of the marine berth and may contain lower levels of dissolved oxygen than the surrounding water. The LDWF collected water quality data from the top, middle, and bottom of the water column from July 2013 through February 2014 at two stations within the Industrial Canal/Turning Basin (entrance and Turning Basin). Throughout the study period, dissolved oxygen levels near the bottom of the Turning Basin ranged from less than 0.1 to 8.7 milligrams per liter (LDWF, 2014a). Because oxygen levels are already suppressed, impacts on dissolved oxygen levels in the area would be minor.

Ballast water is stored in the ship's hull below the waterline; as a result, discharged water temperatures are not expected to deviate significantly from ambient water temperatures. The pH of the ballast water (reflective of sea water in open ocean conditions) is maintained in a fairly narrow range (8.1 to 8.5), which can be substantially higher than water within estuaries (Knezovich, 1994). Water quality data collected by the LDWF from July 2013 through February 2014 documented pH within the Industrial Canal/Turning Basin ranging from 7.1 to 8.6 (LDWF, 2014a). Lake Charles LNG reports that background samples taken at 15 sites within the Turning Basin in March 2014 obtained pH readings ranging from 6.7 to 8.1. Although pH within the Industrial Canal/Turning Basin is generally lower than seawater, it varies over space and time. Due to discharged ballast water representing a relatively minor volume compared to the volume of the Industrial Canal/Turning Basin, this impact is expected to be temporary and minor.

To ensure compliance with U.S. laws and regulations governing ballast water discharges, Lake Charles LNG's marine staff would review any applicable documentation that the visiting ship is or has operating(ed) the LNG carrier in accordance with the federal standards and practices. Therefore, we conclude that significant impacts on surface waters would not occur as a result of ballast water discharge.

Liquefaction Facility

Modification and Fill of Surface Waters

During site preparation activities at the liquefaction facility, the pond and two intermittent waterbodies within the site would be filled. The 11 roadside drainages would be filled, replaced, and/or realigned to accommodate the drainage system at the liquefaction facility. The perennial waterbody (an unnamed tributary to the Calcasieu River) present along the southern boundary of the liquefaction facility site would be armored and redirected as part of the facility's stormwater system improvements, as discussed in additional detail below (see Stormwater Runoff). Impacts on these surface waters would be mitigated through implementation of Lake Charles LNG and Trunkline's final Compensatory Mitigation Plan (see discussion in section 4.4.4).

About 84 million gallons of water would be used for dust control and as a soil additive during site preparation, if needed due to dry soil conditions at the time of construction. Water would be appropriated from two existing ponds adjacent to ACW Area B and from an existing drainage ditch within the liquefaction facility site. The smaller of the two ponds is located adjacent to, and southeast of ACW Area B. Appropriation of water from this pond during construction would result in a temporary reduction in water depth until replenished by rainfall or groundwater recharge, but is not likely to result in significant impacts on surface water quality. The pond located adjacent to and east of ACW Area B is an existing, COE-permitted dredged material disposal area that Lake Charles LNG proposes to use for dredged material placement associated with construction of the TCDs. As described above, the drainage ditch would be permanently modified as a result of the project. Therefore, we conclude that impacts on surface waters due to temporary water appropriation for these activities would not be significant.

Stormwater Runoff

During construction, land disturbance and vegetation removal could increase stormwater discharges to surface waters at and adjacent to the liquefaction facility, resulting in a temporary increase in suspended sediment levels. Land disturbing activities would be conducted in compliance with the Louisiana Pollutant Discharge Elimination System (LPDES), General Permit for stormwater discharges from construction activities 5 acres or more; the project-specific SWPPP (as required under the CWA). Lake Charles LNG anticipates that best management practices would include (but not be limited to) properly functioning and maintained erosion control devices, the use of contours to control and direct stormwater flow during clearing and grading, and the use of dissipation and filtering devices (e.g., vegetation, hay bales) to ensure that water quality criteria are met.

Operation of the liquefaction facility would increase the amount of impervious surface area at the site, which would result in an increased volume of stormwater runoff. Lake Charles LNG would amend the existing operational SWPPP for the LNG terminal to include the operation of the liquefaction facility. Stormwater would be managed in accordance with LDEQ and EPA requirements. Therefore, we conclude that impacts from stormwater runoff would not be significant.

Spills or Leaks of Hazardous Materials

Spills, leaks, or other releases of hazardous materials during construction and operation of the liquefaction facility could adversely impact water quality. To protect surface water resources from inadvertent releases of fuel and other mechanical fluids, Lake Charles LNG would implement its SPAR and SPCC Plans and the measures specified in our Procedures (see section 4.3.2). With the implementation of these plans, impacts on water quality in the event of a spill or leak are expected to be minor.

Non-Liquefaction Facilities

The surface waters that would be impacted during construction and operation of the Non-Liquefaction Facilities are summarized in table 4.3.2-1 and listed in appendix F. Potential impacts on these surface waters during construction and operation of the project are described in the following sections.

Pipelines

Trunkline would use the open-cut method at 46 waterbody crossings along the Mainline Connector and at 25 waterbody crossings associated with the Mainline 200-3 Loop (see appendix F). The open-cut method of construction would involve clearing and grading stream banks, in-water trenching, trench dewatering, and backfilling. These activities could increase sedimentation, turbidity, and water temperature; decrease dissolved oxygen levels; and release chemical or nutrient pollutants from sediments. The primary impact on water quality due to in-stream trenching and backfilling would be suspension of sediments. The extent of the impact would depend on sediment loads, stream velocity, and sediment particle size at the time of construction. These factors would determine the density, downstream extent, and persistence of the sediment plume. As discussed in additional detail in section 4.6.2.2, impacts on the in-stream aquatic biota and the habitat value of the waterbody would be temporary.

Through the transport of sediment and recruitment of aquatic biota from upstream sources, these resources would be expected to return to preconstruction conditions soon after the completion of in-stream work, backfilling, and restoration.

To minimize surface water impacts, Trunkline would implement the construction and mitigation measures described in our Procedures. Adherence to our Procedures would minimize short- and long-term impacts associated with these waterbody crossings.

Trunkline proposes to conduct six HDD operations. As some of the HDDs would encompass more than one waterbody, a total of 22 waterbodies would be crossed using the HDD method. Of these, 10 crossings would be associated with construction of the Mainline Connector, 10 crossings would be associated with construction of the Mainline 200-3 Loop, and 2 crossings would be associated with the Mainline 200-1 modifications, where the portion of the pipeline crossing the Calcasieu River would be replaced (see additional discussion on the proposed Calcasieu River crossing below). Proposed HDD crossings are listed in table 4.3.2-2.

TABLE 4.3.2-2

Waterbodies Proposed to be Crossed Using the Horizontal Directional Drill Method

Directional Drill Number	Drill Entry Milepost	Drill Exit Milepost	Length of Drill (feet)[a]	Waterbodies Crossed (Feature ID number)
Mainline Connector				
1	1.8	1.1	1,675	Unnamed Tributary to Arceneaux Bayou (S-T-115) Arceneaux Bayou (S-T-117) Unnamed Tributary to Arceneaux Bayou (S-B-139)
2	6.2	5.7	2,683	Unnamed Tributary to Little Bayou (S-B-119) Little Bayou (S-B-109) Unnamed Tributary to Little Bayou (S-B-108B) Unnamed Tributary to Little Bayou (S-B-106) Unnamed Tributary to Little Bayou (S-B-105)
3	9.7	9.1	1,756	Unnamed drainage (D-C-201) Serpent Bayou (S-T-110)
Mainline 200-3 Loop				
1	176.0	177.1	5,691	East Bayou Lacassine (S-A-100) Unnamed drainage (D-T-120) Unnamed drainage (D-T-119) Unnamed drainage (D-T-118)
2	178.8	178.3	2,594	Unnamed drainage (D-B-100) Unnamed drainage (D-T-116) Unnamed drainage (D-C-117) Indian Bayou Canal (S-C-116) Unnamed drainage (D-T-114) Unnamed drainage (D-T-113)
Mainline 200-1 Modifications				
1	194.4	195.0	2,867	Calcasieu River (NHD-1) Unnamed stream (WB-C-CA-621)

[a] Length of drill obtained from the site-specific crossing plans filed by Trunkline.

Trunkline provided site-specific plan and profile drawings for the proposed HDD crossings with its application; however, some of the HDD crossing designs were subsequently modified to reduce impacts on wetlands. Therefore, **we recommend that**:

- **<u>Prior to construction</u>, Trunkline should file with the Secretary copies of the final HDD plan and profile drawings for review and written approval by the Director of OEP.**

The HDD method involves the circulation of a drilling mud to remove cuttings, stabilize the borehole, and cool and lubricate the drill bit (see detailed description in section 2.6.3.3). Drilling mud is composed primarily of freshwater, bentonite clay, and a small percentage of other additives. Trunkline proposes to utilize both municipal and surface water sources for HDD operations; surface water sources, volume requirements, and intake and discharge locations are described in table 4.3.2-3. Trunkline would be required to obtain authorization from the LDWF for the proposed surface water withdrawal from the Calcasieu River because it is a state-designated Natural and Scenic River (see table 1.5-1).

TABLE 4.3.2-3

Surface Water Requirements Associated with Proposed HDD Operations

Directional Drill Number	Intake Milepost	Discharge Milepost	Volume Required (gallons)
Mainline Connector			
Arceneaux Bayou	1.2	1.0	1,399,000
Little Bayou	5.9	5.7	2,225,000
Bayou Serpent	9.5	9.2	1,478,000
Mainline 200-3 Loop[a]			
Lacassine Bayou	176.5	177.2	1,921,000
Mainline 200-1 Modifications			
Calcasieu River[b]	194.8	194.7	1,080,000

[a] Trunkline proposes to use 877,000 gallons of municipal water for HDD Operations at Indian Bayou.

[b] Trunkline proposes to use water from the Calcasieu River; however, municipal water would be utilized in the event that appropriation from the Calcasieu River is not authorized by the LDWF.

The use of the HDD method would eliminate or significantly reduce the potential for construction-related impacts on water quality because the HDD method avoids disturbance of the stream beds, banks, and associated riparian vegetation. There is potential during the drilling process for drilling mud to enter waterbodies through coarse unconsolidated formations, such as sand or gravel, or through fractured rock formations. Because drilling mud is composed of primarily freshwater, a small release would likely dissipate and would not be expected to adversely affect water quality beyond a temporary increase in turbidity. In larger quantities, the release of drilling mud could negatively affect fisheries and/or vegetation, although impacts would generally be less than those associated with an open-cut crossing. To minimize potential impacts on water quality in the event of an inadvertent release of drilling mud, Trunkline has prepared a preliminary HDD Contingency Plan that describes measures Trunkline would implement during drilling activities as well as in the event of an inadvertent release of drilling mud to uplands or surface waters. Trunkline has stated that it would finalize the HDD Contingency Plan with the selected contractor and the final plan would be incorporated into construction compliance documents. Therefore, **we recommend that**:

- **<u>Prior to construction</u>, Trunkline should file its final HDD Contingency Plan with the Secretary for review and written approval by the Director of OEP.**

Calcasieu River Crossing

The proposed Mainline 200-1 modifications include replacing the existing segment of pipeline crossing the Calcasieu River (MP 194.7). Trunkline proposes to complete the about 2,867-foot-long crossing, which would connect the existing Mainline 200-1 to the existing Mainline 200-3, using the HDD method. Due to the Calcasieu River's designation at the crossing location as both a section 10 waterbody and a Louisiana Natural and Scenic River (COE, 2013a; LDWF, 2012), Trunkline would be required to obtain authorization from the COE New Orleans District and the LDWF, respectively, to install the pipeline beneath this waterbody (see additional discussion in section 4.8.4.2). As described above, Trunkline would also be required to obtain authorization from the LDWF to appropriate water from the Calcasieu River at this location for HDD operations.

Compressor Station 203-A

Construction of Compressor Station 203-A would require filling a man-made agricultural canal and the installation of piping beneath four drainage canals. Temporary impacts on water quality associated with the installation of piping would be similar to those described above and would be minimized through Trunkline's implementation of our Procedures (see Pipelines subsection, above).

Columbia Gulf–Egan Meter Station

Three waterbodies are located within the Columbia Gulf–Egan Meter Station site, including an intermittent waterbody and two drainage canals. Trunkline would place mats over these features to minimize potential impacts during construction at the meter station site. The mats would be removed at the end of construction. Impacts on water quality within these waterbodies would be temporary and insignificant.

Alternative Measures to FERC Procedures

Section V.B.2.A of our Procedures requires that extra work areas be located at least 50 feet away from water's edge except where the adjacent upland consists of cultivated or rotated cropland or other disturbed land. Trunkline has proposed a large ATWS that encompasses a waterbody that runs along its existing right-of-way on the southeast side of the Calcasieu River. The ATWS is required for the HDD exit point, stringing of the HDD pipeline segment, and for removal of a drip. The location of this ATWS is driven by the HDD alignment and the need to tie the HDD segment into the existing pipeline. However, other than indicating it would mat the waterbody, Trunkline has not provided sufficient justification for this proposed deviation or how it would minimize impacts on the waterbody. In order for us to consider Trunkline's proposed deviation from the Procedures at this location, **we recommend that**:

- **Prior to the end of the draft EIS comment period, Trunkline should file with the Secretary a detailed description of the proposed ATWS affecting a waterbody associated with the Calcasieu River crossing (waterbody W-C-CA-621), whether Trunkline could limit the workspace or shift it to avoid all or part of the waterbody, and how Trunkline would minimize unavoidable impacts on the waterbody.**

Hydrostatic Testing

Pipeline segments installed using the HDD method would be hydrostatically tested before installation (known as an HDD pre-test) to ensure structural integrity per DOT standards (49 CFR Part 192). Before being placed into service, the entire Mainline Connector, Mainline 200-3 Loop, and non-cryogenic piping associated with the Non-Liquefaction Facilities would be hydrostatically tested. Trunkline proposes to use both municipal sources and surface waters for hydrostatic testing of the Non-Liquefaction Facilities. Surface water requirements as well as proposed intake and discharge locations are described in table 4.3.2-4. As described above (see *Pipelines*), Trunkline would be required to obtain water use (withdrawal) permits from the LDWF prior to conducting surface water withdrawals. A detailed description of the hydrostatic test process is provided in section 2.6.2.7.

TABLE 4.3.2-4

Surface Water Requirements Associated with Hydrostatic Testing the Proposed Non-Liquefaction Facilities

Water Source	Intake Milepost	Discharge Milepost	Volume Required (gallons)	Proposed Use
Mainline Connector				
Arceneaux Bayou	1.2	1.0	125,000	HDD pre-test
Arceneaux Bayou	1.2	1.0	4,100,000	Mainline hydrostatic test
Little Bayou	5.9	5.7	190,000	HDD pre-test
Bayou Serpent	9.5	9.2	125,000	HDD pre-test
Mainline 200-3 Loop[a]				
Laccassine Bayou	176.5	177.2	140,000	HDD pre-test
Laccassine Bayou	176.5	182.5	775,000	Mainline hydrostatic test
Mainline 200-1 Modifications				
Calcasieu River	194.8	194.7	80,000	HDD pre-test

[a] Trunkline proposes to use 60,000 gallons of municipal water for the HDD pre-test at Indian Bayou.

After the hydrostatic test is successfully completed, each pipeline segment would be de-watered by pushing the water out with air. Trunkline would not add any chemicals to the hydrostatic test water, and the discharged water would be tested in accordance with the requirements of the LPDES Hydrostatic Test Water Discharge Permit. In addition, Trunkline would implement the measures outlined in our Procedures, which include: notifying state agencies prior to testing; screening intakes to avoid entrainment of fish; maintaining adequate stream flow rates to protect aquatic life and provide for all waterbody uses and downstream withdrawals of water by existing users; locating hydrostatic test manifolds outside of wetlands and riparian areas to the maximum extent practicable; regulating discharge rates; using energy dissipation devices; and installing sediment barriers as necessary to prevent erosion, streambed scour, suspension of sediments, or excessive streamflow. With the implementation of these measures, impacts on water quality due to hydrostatic testing would be short term and insignificant.

Spills or Leaks of Hazardous Materials

Spills, leaks, or other releases of hazardous materials during construction and operation of the Non-Liquefaction Facilities could adversely impact water quality. To protect surface water resources from inadvertent releases of fuel and other mechanical fluids, Trunkline would implement its project-specific SPAR and SPCC Plans and the measures specified in our Procedures. With the implementation of these plans and our Procedures, impacts on water quality in the event of a spill or leak are expected to be minor.

Operation

Operation of Compressor Station 203-A and the Columbia Gulf–Egan Meter Station are not expected to affect surface water resources. Impacts on surface waters are not expected during operation of the proposed Mainline Connector, Mainline 200-3 Loop, or Mainline 200-1 crossing of the Calcasieu River because no further in-stream activities would be expected. Because the pipelines would be installed at a sufficient depth below the beds of waterbodies, exposure of the pipe is not anticipated. In the event that a pipeline anomaly (i.e., corrosion, dent, rupture) is detected during routine inspections that could require pipeline excavation or replacement within a waterbody, impacts would be similar to those described above for construction.

4.4 WETLANDS

Wetlands are areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions, commonly known as hydrophytic vegetation (Environmental Laboratory, 1987). Wetlands can be a source of substantial biodiversity and serve a variety of functions that include providing wildlife habitat, recreational opportunities, flood control, and naturally improving water quality.

At the federal level, wetlands are protected under section 404 of the CWA, which establishes standards to evaluate and reduce total and net impacts on wetlands under the jurisdiction of the COE. In general, wetland impacts need to be avoided if possible; if avoidance is not possible, impacts are to be minimized, rectified, reduced, and mitigated in accordance with federal and state regulations, including our Procedures and the COE's section 404(b)1 guidelines, which restrict discharges of dredged or fill material where a less environmentally damaging and practicable alternative exists. COE jurisdictional wetlands potentially affected by the project are subject to review by the COE to ensure that wetland impacts are fully identified and that appropriate wetland restoration and mitigation measures are identified. The proposed project is located in two COE regulatory districts, the New Orleans District and the Vicksburg District. Lake Charles LNG and Trunkline have submitted applications to both COE Districts.

Wetland impacts authorized under section 404 of the CWA also require state water quality certification under section 401 of the CWA and a state-issued CUP for impacts on coastal wetlands, if applicable. For the proposed project, water quality certification would be issued by the LDEQ. The State of Louisiana defines coastal wetlands as wetlands less than 5 feet AMSL that occur within the designated coastal zone (Louisiana Revised Statute 49:214.2). Coastal wetlands are under the jurisdiction of the LDNR Office of Coastal Management and the COE. According to the revised June 7, 2012 Coastal Zone Inland Boundary, project components within the designated coastal zone include the Kinder Morgan–Lake Charles Meter Station in Calcasieu Parish and the NGPL–Lakeside Meter Station in Cameron Parish. However, in a letter dated August 27, 2014, the LDNR Office of Coastal Management determined that a CUP would not be required for the proposed activities at these stations.

Field surveys did not identify any wetlands within portions of the project area in Mississippi and Arkansas. Therefore, neither water quality certifications nor CUPs would be required in Mississippi or Arkansas.

4.4.1 Affected Wetlands

Lake Charles LNG and Trunkline conducted wetland delineations in accordance with the COE's Wetlands Delineation Manual (Environmental Laboratory, 1987). Wetland delineations were performed within the liquefaction facility site in September 2012 and within other project areas (ACWs and Non-Liquefaction Facilities) from March through May 2013, from September 2013 through January 2014, in June 2014, and in July 2014. Wetland types identified within the project area were classified as either palustrine emergent, palustrine scrub-shrub, or palustrine forested wetlands (Cowardin et al., 1979). A full list of wetlands affected by the project, including wetland identification number, wetland type, and type and acreage of impact is provided in appendix G.

Forested wetlands and forested wetland mosaics are the most common wetland type within the project area and occupy large areas associated with the liquefaction facility and ACWs. The forested wetland mosaics that occur within the proposed ACWs are composed of what are frequently called pimple-mound mosaics. These mosaics have complex topography that is distinguished by repeated small changes in elevation occurring over short distances. The tops of ridges and hummocks within these mosaics are often classified as uplands, but are interspersed with wetlands having hydrophytic vegetation, hydric soils, and wetland hydrology (COE, 2010). The dominant canopy species observed in the pimple-mound mosaics include Chinese tallow (*Sapium sebiferum*), live oak (*Quercus virginiana*), water oak (*Quercus nigra*), black willow (*Salix nigra*), slash pine (*Pinus elliotti*), and loblolly pine (*Pinus taeda*). The sub-canopy layer consists of younger individuals of these species, as well as saltbush (*Baccharis halimifolia*), American beautyberry (*Callicarpa americana*), and yaupon (*Ilex vomitoria*). Vines are prolific and include saw greenbrier (*Smilax bona-nox*), yellow jessamine (*Gelsemium sempervirens*), grape vine (*Vitis* spp.), and Virginia creeper (*Parthenocissus quinquefolia*). In herbaceous portions of the mosaics, dominant species include narrow leaf cattail (*Typha angustifolia*), pickerelweed (*Pontederia cordata*), smartweed (*Polygonum hydropiperoides*), slender arrowhead (*Sagittaria graminea*), and wingleaf primrose-willow (*Ludwigia decurrens*).

Forested wetlands are also located along the proposed pipeline routes (Mainline Connector, Mainline 200-3 Loop, and Calcasieu River HDD associated with Mainline 200-1 modifications) and within other aboveground facility sites. Species observed during the field surveys of these wetlands include willow oak (*Quercus phellos*), American hornbeam (*Carpinus caroliniana*), red maple (*Acer rubrum*), Chinese tallow, southern bayberry (*Myrica cerifera*), Alabama supple-jack (*Berchemia scandens*) and Virginia dayflower (*Commelina virginica*).

Small- to medium-sized emergent and scrub-shrub wetlands also occur within the project area. Typical species observed in emergent wetlands during field surveys include Timothy canary grass (*Phalaris angusta*), beach false-foxglove (*Agalinis fasciculata*), little quaking grass (*Briza minor*), vasey grass (*Paspalum urvillei*), bushy bluestem (*Andropogon glomeratus*), soft rush (*Juncus effusus*), American marsh pennywort (*Hydrocotyle americana*), southern blueflag (*Iris shrevei*), bushy seedbox (*Ludwigia alternifolia*), curly dock (*Rumex crispus*), small spikerush (*Eleocharis parvula*), and broom panic grass (*Dichanthelium scoparium*). Species observed in scrub-shrub wetlands during field surveys include eastern false-willow (*Baccharis halimifolia*), Chinese tallow, small spikerush, southern bayberry, bushy bluestem, and soft rush.

4.4.2 Wetland Impacts and Mitigation

4.4.2.1 Liquefaction Facility

Construction of the liquefaction facility would result in the permanent loss of 215.4 acres of wetlands, as shown in table 4.4.2-1. Of this total, 105.3 acres of wetlands are located within the proposed liquefaction facility site, and 110.1 acres are located within ACWs associated with the construction of the liquefaction facility. During site preparation activities, wetlands within the liquefaction facility site would be permanently filled and converted to upland industrial land. Wetlands within ACW Areas A, B, C, and D would be filled, elevated, and converted to industrial use for the 5-year construction period. Lake Charles LNG would not restore the wetlands within the ACWs following construction. The landowners have requested that the fill in these wetlands not be removed to facilitate the potential future use and development of the ACW areas.

TABLE 4.4.2-1

Wetlands Affected by Construction and Operation of the Liquefaction Facility[a,b]

Wetland Classification	Liquefaction Facility	ACW Area A	ACW Area B	ACW Area C	ACW Area D	Total
Emergent	8.0	2.6	0.6	0.0	0.0	11.1
Emergent mosaic	0.0	0.0	7.9	1.7	0.0	9.6
Scrub-shrub	23.6	3.9	4.9	0.0	0.0	32.4
Scrub-shrub mosaic	0.0	0.0	0.0	1.9	1.9	3.8
Forested	21.7	0.0	0.0	0.0	0.0	21.7
Forested mosaic	52.0	69.5	2.2	0.7	12.5	136.8
TOTAL	**105.3**	**75.9**	**15.5**	**4.3**	**14.4**	**215.4**

[a] All units of measurement represent acreage impacted.

[b] The numbers in this table have been rounded for presentation purposes; therefore, the totals may not reflect the sum of the addends.

The majority of the wetlands impacted by the proposed liquefaction facility and ACWs are forested wetland mosaics (pimple-mounds), scrub-shrub wetlands, or forested wetlands. Additional forested wetlands and forested wetland mosaics are located in the project vicinity (generally within the floodplain of the Calcasieu River), but construction of the project would result in the loss of a relatively large portion of the forested wetlands in the immediate area. Lake Charles LNG would be required to mitigate wetland impacts associated with construction and operation of the project as part of its project-specific Compensatory Mitigation Plan, which is discussed further in section 4.4.4.

4.4.2.2 Non-Liquefaction Facilities

Construction of the Non-Liquefaction Facilities would affect a total of 38.9 acres of wetlands (see table 4.4.2-2). The majority of wetland impacts associated with the Non-Liquefaction Facilities (36.6 acres) would be a result of pipeline construction; the remaining wetland impacts would be associated with construction and operation at six meter stations. A wetland present within the southeast corner of the Compressor Station 203-A site would be avoided during construction and operation of the proposed facility.

Pipelines

Based on wetland delineations conducted by Trunkline, construction of the proposed pipelines (Mainline Connector, Mainline 200-3 Loop, and Calcasieu River HDD associated with Mainline 200-1 modifications) would impact an estimated 36.6 acres of wetlands as shown in table 4.4.2-2. Of this total, 6.0 acres are located within the proposed 50-foot-wide permanent easements associated with the pipelines.

The majority of the wetlands impacted by construction of the pipelines (65 percent) would be emergent, which is partly due to the Mainline 200-3 Loop and Calcasieu River HDD routes being constructed within or adjacent to existing rights-of-way. Small and medium sized scrub-shrub and forested wetlands would also be impacted as a result of pipeline construction, comprising 27 percent and 8 percent, respectively, of the wetland impacts associated with pipeline construction.

TABLE 4.4.2-2

Wetlands Affected by Construction and Operation of the Non-Liquefaction Facilities[a,b]

Project Component	Emergent Wetland Const.[c]	Emergent Wetland Oper.	Scrub-Shrub Wetland Const.[c]	Scrub-Shrub Wetland Oper.	Forested Wetland Const.[c]	Forested Wetland Oper.	Total Const.[c]	Total Oper.
Pipelines								
Mainline Connector	4.6	1.2	5.3	2.0	1.7	0.6	11.6	3.8
Mainline 200-3 Loop	1.1	0.1	4.3	2.1	0.3	<0.1	5.7	2.2
Mainline 200-1 Modifications – Calcasieu River HDD	18.2	0.0	0.1	0.0	1.1	0.0	19.3	0.0
PIPELINES SUBTOTAL	23.9	1.3	9.7	4.1	3.1	0.6	36.6	6.0
Meter Stations								
Kinder Morgan–Lake Charles	0.0	0.0	0.4	0.1	0.0	0.0	0.4	0.1
Columbia Gulf–Egan	0.0	0.0	0.0	0.0	0.3	0.2	0.3	0.2
NGPL–Lakeside	0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.1
Gulf Crossing–Perryville	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0
Texas Gas–Woodlawn	0.0	0.0	0.0	0.0	<0.1	0.0	<0.1	0.0
Transco Ragley	1.4	0.1	0.0	0.0	0.0	0.0	1.4	0.1
METER STATIONS SUBTOTAL	1.5	0.2	0.4	0.1	0.4	0.2	2.3	0.5
TOTAL	**25.3**	**1.4**	**10.1**	**4.3**	**3.5**	**0.8**	**38.9**	**6.5**

[a] All units of measurement represent acreage impacted.

[b] The numbers in this table have been rounded for presentation purposes; therefore, the totals may not reflect the sum of the addends.

[c] Construction impacts include impacts within the construction workspace limits, including temporary and permanent right-of-way, ATWSs, and access roads. Wetlands crossed by HDD are not included as they would not be impacted outside of designated construction workspace areas.

Trunkline would typically construct the pipelines using a 75-foot-wide construction right-of-way in wetlands. The only exceptions would be where the use of a 100-foot-wide construction corridor is warranted due to site-specific conditions (see section 4.4.3). Excavation of the pipeline trench, stockpiling of the trench spoil, and backfilling of the trench would disturb soils and could temporarily affect the rate and direction of water movement within wetlands. If contours and elevations are not properly restored, these effects could adversely impact wetland hydrology and revegetation by creating soil conditions that may not support wetland communities and hydrophytic vegetation at preconstruction levels. If soils are not properly segregated during construction, the resulting mixed soil layers could alter biological components of the wetland and affect the reestablishment of native wetland vegetation. The temporary stockpiling of soil and movement of heavy machinery across wetlands could also lead to inadvertent compaction and furrowing of soils, which could alter natural hydrologic patterns, inhibit seed germination, and increase seedling mortality. Equipment could also introduce non-native and invasive species to the disturbed soil. Altered surface drainage patterns, stormwater runoff, runoff from the trench, accidental spills, and discharge of hydrostatic test water could also negatively affect wetland regeneration.

The effects of construction would be greatest during and immediately following construction. Generally, once the pipelines are in place, wetland vegetation communities would transition back to a community with a function similar to that of the wetland prior to construction. In emergent wetlands, the impact of construction would be relatively minor and short term, because the herbaceous vegetation would regenerate quickly (generally within 1 to 2 years). Scrub-shrub wetland impacts would also be minor and short term, but these wetlands could take 2 to 4 years to reach functionality similar to preconstruction conditions depending on the age and complexity of the wetland system. In forested wetlands, the impact of construction would be long term due to the long regeneration period of these vegetative types (30 years or more).

Within the 50-foot-wide permanent easement associated with the Mainline Connector and Mainline 200-3 Loop pipelines, Trunkline would maintain up to a 10-foot-wide corridor centered over each pipeline in an herbaceous state during operation to facilitate pipeline inspections and maintenance. In accordance with our Procedures, Trunkline may selectively remove trees within a 30-foot wide corridor centered over each pipeline with roots that could compromise the integrity of the pipeline coating. The remaining 20 feet within the permanent easement would be allowed to revegetate naturally. As a result, a 10-foot wide corridor through both scrub-shrub and forested wetlands would be permanently converted to emergent wetland. An additional 20-foot-wide corridor (extending 10 feet on either side of the 10-foot-wide corridor centered over each pipeline) through forested wetlands would be permanently converted to scrub-shrub wetlands. Wetland conversion within the permanent easement would convert about 6.0 acres of forested wetland to scrub-shrub or emergent wetlands. While the conversion would not constitute a wetland loss, it would represent a potential permanent change in wetland function.

Trunkline would minimize wetland impacts by collocating the 6.5-mile Mainline 200-3 Loop with an existing pipeline and overlapping the rights-of-way, and by placing temporary workspaces associated with the Calcasieu River HDD within the existing permanent easement for Mainline 200-1, which would minimize impacts on previously undisturbed wetlands. Section 2.6.3 provides additional details and typical drawings of right-of-way cross-sections in both collocated and non-collocated areas. Additionally, several wetlands would be avoided by the use of the HDD method. With the exception of a minor cut line path that may be required along the HDD guide wire path, no clearing is proposed between the entry and exit points of the HDDs. Section 2.6.3 describes the specialized construction techniques that Trunkline would implement for construction through wetlands.

Except where alternative measures are justified as discussed in section 4.4.3, Trunkline would implement our Procedures to minimize impacts on wetlands, which include:

- limiting the operation of construction equipment within wetlands to equipment essential for clearing, excavation, pipe installation, backfilling, and restoration;
- limiting removal of stumps and grading in wetlands to directly over the trench, except where necessary to ensure safety;
- segregating topsoil in non-saturated wetlands;
- minimizing the length of time that the trench is open and the topsoil is segregated before it is restored;
- installing trench breakers at the boundaries of wetlands as needed to prevent draining of a wetland and maintain original wetland hydrology;
- prohibiting storage of hazardous materials, chemicals, fuels, and lubricating oils within a wetland or within 100 feet of a wetland boundary; and
- limiting post-construction maintenance of vegetation within herbaceous wetlands to a 10-foot-wide strip of vegetation centered over the pipeline, and in forested areas, limiting tree removal to those that are within 15 feet of the pipeline centerline.

As discussed in additional detail in section 4.4.4, Trunkline would also be required to mitigate wetland impacts associated with construction and operation of the project through its project-specific Compensatory Mitigation Plan. With the implementation of the above measures and the Compensatory

Mitigation Plan, we believe that construction and operation of the proposed pipeline facilities would have minimal impacts on wetlands.

Meter Stations

Construction of the meter stations would affect a total of 2.3 acres of wetlands as shown in table 4.4.2-2. Of this, 1.4 acres of emergent wetlands are located within the Transco Ragley Meter Station site and small wetland areas totaling 0.9 acre are located within the Kinder Morgan–Lake Charles, Columbia Gulf–Egan, NGPL–Lakeside, Gulf Crossing–Perryville, and Texas Gas–Woodlawn Meter Station sites.

During site preparation activities, 0.5 acre of wetland would be permanently filled and converted to upland industrial land. The remaining 1.8 acres of emergent, scrub-shrub, and forested wetlands would be temporarily modified for use as temporary workspace during construction of the meter stations. Impacts on these wetlands would be temporary and similar to, but smaller in scale than, the temporary wetland impacts associated with pipeline construction described above (see *Pipelines*).

Following construction, temporary workspaces would be restored in accordance with our Procedures and allowed to naturally transition back into a community with a function similar to that of the wetland prior to construction. As described above, the impact of construction on emergent wetlands would be relatively short term since herbaceous vegetation would regenerate quickly. Impacts on scrub-shrub wetlands would also be minor and short term, although these wetlands could take longer to fully recover. In forested wetlands, the impact would be extended due to the longer regeneration period associated with forested communities. Overall, construction and operation of the proposed meter stations would have only minor impacts on wetlands.

4.4.3 Alternative Measures to FERC's Procedures

In several locations, Lake Charles LNG and Trunkline propose to use alternatives to the measures described in our Procedures that relate to the construction right-of-way width, the location of ATWS within wetlands, and the location of aboveground facilities within wetlands. The proposed alternative measures are discussed below.

4.4.3.1 Liquefaction Facility

Section VI.A.6 of our Procedures states that aboveground facilities should be located outside of wetlands except where the location of such facilities outside of wetlands would prohibit compliance with DOT regulations. As described above, Lake Charles LNG proposes to construct the new liquefaction facility within a site that contains 105.3 acres of wetlands. Section 3.3 of this EIS provides an analysis of alternative liquefaction facility sites and concludes that, when multiple factors are considered, the proposed site is the environmentally preferable site. As such, we find that the placement of the liquefaction facility within wetlands is reasonable and adequately justified provided that Lake Charles LNG complies with the conditions of its COE permit, including the implementation of compensatory mitigation.

Section VI.B.1.a of our Procedures requires that all extra workspaces (e.g., staging areas and additional spoil storage areas) be at least 50 feet away from wetland boundaries, except where the adjacent upland consists of cultivated or rotated cropland or other disturbed land. Portions of each of the ACWs Lake Charles LNG proposes to use during construction of the liquefaction facility are within wetlands. Use of the ACWs would impact a total of 110.1 acres of wetlands, including 84.9 acres of forested wetland mosaics.

In response to our inquiry about possible alternative locations for the ACWs, Lake Charles LNG said they sought alternative ACW sites within a few miles of the proposed liquefaction facility and on either side of Lincoln, Big Lake, and Tank Farm Roads. An advantage of the proposed ACWs to the east of Big Lake Road is that Lake Charles LNG has existing leases on portions of those sites. Siting ACWs west of the liquefaction facility was not feasible due to the existing Alcoa facility. Lake Charles LNG indicated that a significant disadvantage of siting ACW A to the east of the proposed location was the potential to increase traffic congestion along two primary roads servicing the area, Lincoln Road and Big Lake Road. There is also a rail spur that runs toward the liquefaction facility site from the east. Tank Farm Road to the north of the liquefaction facility site is a less traveled road than Big Lake Road; therefore, utilizing the ACW to the north would reduce the potential risks and congestion associated with moving construction equipment, materials, and construction workers across the roads. Generally, sites in the vicinity of the Liquefaction Facility contain a large percentage of wetlands, and all tracts that Lake Charles LNG reviewed north of Tank Farm Road and to the west were similar to each other. Given the lack of good alternatives in close proximity to the liquefaction facility site, we agree that use of the proposed ACW locations is justified provided that Lake Charles LNG complies with the requirements of their COE permit and implement their COE-approved Compensatory Mitigation Plan.

4.4.3.2 Non-Liquefaction Facilities

Section VI.A.3 of our Procedures states that the width of the construction right-of-way should be limited to 75 feet or less in wetlands. Trunkline has proposed a right-of-way width of 100 feet in the following nine wetlands that would be crossed by the Mainline Connector:

Beginning Milepost	Wetland ID Number
2.5	W-C-137
3.2	WB-D-110
3.5	W-AT-11
3.6	A-AT-12
4.0	W-AT-7
5.0	W-AT-6
6.3	W-AT-15
8.3	W-C-121
10.4	W-AT-3

Trunkline stated that the extra right-of-way width at the above locations is necessary to maintain slope stability of the trench required for the 42-inch-diameter pipeline and to contain excavated spoil within the right-of-way. Based on our review, we have determined that these proposed alternative measures are reasonable and adequately justified at all except one of the requested locations. Wetland W-AT-15 is a forested wetland located immediately northeast of the HDD entry point for the Little Bayou HDD crossing. In order to avoid impacts on this wetland, **we recommend that**:

- **<u>Prior to the end of the draft EIS comment period</u>, Trunkline should evaluate the feasibility of moving the Little Bayou HDD entry point to the northeast beyond the boundary of forested wetland W-AT-15 and file with the Secretary either revised alignment sheets to reflect this change or justification as to why this adjustment is not feasible.**

Trunkline has also proposed alternative measures to sections VI.B.1.a and VI.A.6 of our Procedures to place certain ATWS and aboveground facilities within wetlands. Table 4.4.3-1 lists these locations and facilities, as well as the wetlands affected, Trunkline's site-specific justifications, and our recommendations for approval or denial.

In its initial application, Trunkline proposed to place a number of ATWSs along the Mainline Connector within wetlands. However, Trunkline re-evaluated and subsequently modified certain workspace configurations, including the locations of some HDD entry and exit points, to reduce impacts on wetlands. The alternative measures in table 4.4.3 are those that are currently proposed. Trunkline has also proposed the placement of ATWSs within wetlands at the origin and terminus of the Mainline 200-3 Loop and at one bored crossing of an agricultural ditch. For the reasons shown in the table, we have determined that alternative measures at each of these ATWS locations are reasonable and adequately justified.

Trunkline proposes to place ATWSs in two wetlands for the HDD crossing of the Calcasieu River, which would be part of the Mainline 200-1 modifications. The proposed workspace for the HDD entry would affect about 1.4 acres of wetland W-E-001, an emergent wetland, of which about 1.0 acre would be within Trunkline's existing permanent right-of-way and about 0.4 acre would extend beyond the permanent right-of-way. For the reasons provided in table 4.4.3-1, we find that the proposed location of this workspace is sufficiently justified.

The alignment sheet also shows ATWS in wetland W-E-001 along and immediately adjacent to Trunkline's existing permanent rights-of-way between the HDD entry point and the Calcasieu River, including an area that appears to consist of unmaintained land between two of Trunkline's existing pipelines. Trunkline has not explained why this ATWS is necessary or provided justification for this additional wetland disturbance. It is possible that Trunkline plans to use a portion of its existing right-of-way in this area to obtain water from the river during implementation of the HDD (i.e., for mixing drilling fluid and conducting hydrostatic testing of the HDD pipe segment); however, the amount of workspace depicted in the alignment sheet, which is not clearly quantified, appears excessive for this purpose. Additionally, Trunkline proposes to place an ATWS within wetland W-E-003, a forested wetland that would be crossed by the HDD and extends between the existing and proposed new permanent rights-of-way. Although Trunkline's table of wetland impacts indicates that impacts on this wetland would be small (less than 0.1 acre), the location of the proposed ATWS within this wetland is not clearly depicted on the alignment sheet, and the justification provided is too general for us to evaluate. In order for us to consider Trunkline's proposed deviations from the Procedures at these two locations, **we recommend that**:

- **<u>Prior to the end of the draft EIS comment period</u>, Trunkline should file with the Secretary maps or figures that clarify the location of the proposed ATWS in forested wetland W-E-003 on the Mainline 200-1 modifications and provide additional justification for this ATWS. Trunkline should also provide additional justification for the proposed ATWS depicted in wetland W-E-001 on the west side of the Calcasieu River between approximate MPs 194.6 and 194.7 on the Mainline 200-1 modifications.**

Trunkline proposes to place portions of three aboveground facilities (the Kinder Morgan–Lake Charles, NGPL–Lakeside, and Transco Ragley Meter Stations) within wetlands, which would permanently affect a total of about 0.3 acre of wetlands. The proposed activities at the NGPL–Lakeside and Transco Ragley Meter Stations would involve modifications of existing facilities; therefore, potential alternative configurations are very limited. The wetlands affected at these two stations are emergent wetlands immediately adjacent to the existing facilities and likely do not provide high-quality habitat. The Kinder Morgan–Lake Charles Meter Station location is driven by the intersection of two existing pipelines, and an alternate configuration of the station would not avoid wetland impacts due to the interspersed presence of wetlands and uplands within the area. Therefore, as shown in table 4.4.3-1, we have determined that alternative measures at these locations are reasonable and adequately justified.

TABLE 4.4.3-1

Proposed Locations of Additional Temporary Workspace or Aboveground Facilities Within Wetlands for the Non-Liquefaction Facilities Associated With the Lake Charles Liquefaction Project

Facility/ Milepost	Wetland I.D.	Procedures Section Reference	Deviation Description	Justification for Deviation	FERC Staff Conclusion[a]
Mainline Connector					
2.7	W-C-137	VI.B.1.a	ATWS within wetland	The point of inflection (PI) at this location could not be moved to avoid the wetland due to proximity of a roadway and residence; therefore, the ATWS associated with the PI could not be moved outside of the wetland.	Sufficiently justified. A suitable upland alternative location for the ATWS is not available.
11.3	W-D-125	VI.B.1.a	ATWS within wetland	ATWS at pipeline terminus required for staging area.	Sufficiently justified. A suitable upland alternative for the portion of the ATWS in a wetland is not available.
Mainline 200-3 Loop					
176.0	W-B-200A	VI.B.1.a	ATWS within wetland	This ATWS is at the terminus of the pipeline and includes the HDD entry point for the Bayou Lacassine HDD. The ATWS is located in the middle of a >1.7-mile-long stretch of wetlands and an upland alternative is not available. Erosion control devices would be used and monitored throughout construction.	Sufficiently justified. A suitable upland alternative location for the ATWS is not available.
182.1	W-C-100	VI.B.1.a	ATWS within wetland	This ATWS is necessary to complete the bore of the adjacent agricultural ditch.	Sufficiently justified. A suitable upland alternative location for the ATWS is not available.
182.5	W-C-100	VI.B.1.a	ATWS within wetland	The origin of the pipeline segment is located within this feature. There is no upland alternative for workspace.	Sufficiently justified. A suitable upland alternative location for the ATWS is not available.
Mainline 200-1 Modifications – Calcasieu River HDD					
194.4	W-E-001	VI.B.1.a	ATWS within wetland	This ATWS, required for the Calcasieu River HDD entry point and a PI, is within an extensive stretch of wetlands and an upland alternative is not available.	Sufficiently justified. A suitable upland alternative location for the ATWS needed for the HDD entry point is not available.
194.6	W-E-001	VI.B.1.a	ATWS within wetland	None provided.	Not sufficiently justified; additional information needed.
194.7	W-E-003	VI.B.1.a	ATWS within wetland	This ATWS is necessary to complete the Calcasieu River HDD.	Not sufficiently justified;additional information needed.
Meter Stations					
Kinder Morgan–Lake Charles	W-AV-039 W-AV-041	VI.A.6	Aboveground facility within a wetland	The meter station would be located at the intersection of the Trunkline and Kinder Morgan pipelines. The tract is within a pasture that contains closely intermingled uplands and wetlands throughout. Alternate configurations would not reduce wetland impacts.	Sufficiently justified. A suitable alternative location for the facility that would completely avoid wetlands is not available.

TABLE 4.4.3-1 (cont'd)

Proposed Locations of Additional Temporary Workspace or Aboveground Facilities within Wetlands for the Non-Liquefaction Facilities Associated with the Lake Charles Liquefaction Project

Facility/ Milepost	Wetland I.D.	Procedures Section Reference	Deviation Description	Justification for Deviation	FERC Staff Conclusion [a]
NGPL–Lakeside	W-C-108A	VI.A.6	Aboveground facility within a wetland	The existing NGPL Meter Station is surrounded by wetlands to the north, south, and west, and a road (LA-3056) runs adjacent to the station to the east. Expanding the station in another direction would result in greater wetland impacts than the proposed expansion to the west.	Sufficiently justified. The proposed configuration minimizes wetland impacts as compared to expansion in a different direction.
Transco Ragley	W-B-CA-603	VI.A.6	Aboveground facility within a wetland	The proposed modifications at this existing meter station would require a small amount of permanent wetland fill within the existing meter station site. Because the existing facility is surrounded by wetlands and the modification is at an existing facility, other possible configurations would not reduce the impact on this wetland.	Sufficiently justified. A suitable upland alternative location for the required modification is not available.

[a] Approval of these deviations does not relieve Trunkline from complying with other requirements of our Procedures. Erosion and sedimentation control devices should be monitored and maintained in these areas more frequently than the minimum time intervals required by our Procedures until final grading and revegetation has been completed.

4.4.4 Compensatory Mitigation

The COE has a goal of "no net loss" of wetlands in the United States. This means that unavoidable wetland impacts must be offset by the creation, restoration, enhancement, or preservation of at least an equal amount of wetlands, which is referred to as compensatory mitigation.

As required by 33 CFR 332.3, Lake Charles LNG and Trunkline are required to propose compensatory mitigation that is commensurate with the amount and type of impact resulting from construction and operation of the Lake Charles Liquefaction Project. There are three mechanisms for providing compensatory mitigation: permittee-responsible compensatory mitigation, mitigation banks, and in-lieu fee mitigation. Lake Charles LNG and Trunkline are developing a Compensatory Mitigation Plan that would include credit purchases from COE-approved mitigation banks and permittee-responsible compensatory mitigation, with the amount of compensatory mitigation to be determined based on the COE jurisdictional determinations. The plan would be subject to review and approval by the COE, New Orleans District as part of the section 404/10 permit process. Lake Charles LNG and Trunkline filed their section 404 permit application with the COE, New Orleans District on August 6, 2014; however, the Compensatory Mitigation Plan was not included in the application as it was still in development. Because the project's Compensatory Mitigation Plan has not been finalized and approved by the COE, **we recommend that**:

- **Lake Charles LNG and Trunkline should continue to consult with the COE to finalize the Compensatory Mitigation Plan and, <u>prior to the end of the draft EIS comment period</u>, file with the Secretary a copy of the final Compensatory Mitigation Plan and documentation of COE approval of the plan.**

4.5 VEGETATION

The Lake Charles Liquefaction Project spans portions of three plains' ecoregions, all of which are generally topographically flat, yet slightly varied in climate and substrate. Each ecoregion has a unique geographical position, hydrological connection, and soil composition allowing for the development of distinctive biotic communities.

The majority of the proposed project would be situated in the Western Gulf Coastal Plain ecoregion, including the liquefaction facility; the Mainline Connector; the Mainline 200-3 Loop; the Columbia Gulf–Egan, Kinder Morgan–Lake Charles, NGPL–Lakeside, Texas Gas–Woodlawn, and LCLNG Export Meter Stations; and Compressor Station 203-A. The Western Gulf Coastal Plain occurs along the coastal portions of Texas and Louisiana and is conducive to grasslands and croplands (EPA, 2013c).

The Mainline 200-1 modifications at the Calcasieu River would be located in the transitional area from the Western Gulf Coastal Plain ecoregion into the South Central Plains. This ecoregion encompasses central and northwest Louisiana, east Texas, and southwest Arkansas and is known for its productive loblolly and shortleaf pine plantations, although historically, the South Central Plains comprised mixed pine and hardwood forests (EPA, 2013c). Other Non-Liquefaction Facilities in the South Central Plains ecoregion include the Tennessee–Kaplan, Transco Ragley, and TETCO–Allen Meter Stations; modifications to Mainline 200-1 at the US 190 Meter Station; and the Longville and Pollock Compressor Stations.

To the east of the South Central Plains ecoregion lies the Mississippi Alluvial Plain ecoregion. The northern Non-Liquefaction Facilities, including the Mainline 100-3 modifications, the Gulf Crossing–Perryville and MEP–Perryville Meter Stations, and the Epps and Shaw Compressor Stations, would be situated within the Mississippi Alluvial Plain, where broad flats and poorly drained soils were traditionally occupied by bottomland deciduous forest. Much of this region has been converted to cropland with soybean, cotton, and rice as the primary crops (EPA, 2013c).

4.5.1 Existing Vegetation Resources

4.5.1.1 Liquefaction Facility

Lake Charles LNG reported that the vast majority of the project area associated with the liquefaction facility, including the liquefaction facility site, LCLNG Export Meter Station, and ACWs, are composed of pimple-mound wetland/non-wetland "mosaics." The mosaic areas within the project area are dominated by forest, but also include herbaceous zones. Pimple-mound mosaics, and typical vegetation present within mosaic wetland communities at the liquefaction facility, are described in detail in section 4.4.1.

Herbaceous upland communities are located in the southeast corner of proposed liquefaction facility and within ACW Areas B and C. Typical species within these areas include annual ragweed (*Ambrosia artemisiifolia*), dogfennel (*Eupatorium capillifolium*), sneezeweed (*Helenium amarum*), St. Augustine grass (*Stenotaphrum secundatum*), and swamp sunflower (*Helianthus angustifolius*).

Herbaceous wetland communities occur in the southeastern portion of the liquefaction facility site. Typical vegetation present within herbaceous wetland communities are described in section 4.4.1.

4.5.1.2 Non-Liquefaction Facilities

The proposed work at the existing meter stations and the mainline modifications would primarily be located within the existing facility sites and adjacent agricultural land. The proposed new Compressor

Station 203-A and portions of some of the new meter stations would also be located in agricultural land. In addition, more than half of the land crossed by the Mainline Connector and Mainline 200-3 Loop is agricultural. Based on Trunkline's field surveys, agricultural lands within the project area include pine plantations, pasture land, and crop lands.

Pine plantations are located along the Mainline Connector and Mainline 200-3 Loop routes. Pine plantations are dominated by varying age stands of loblolly pine and used exclusively for timber production. Understory and ground cover within pine plantations varies depending on land management practices. Pasture lands in the area consist of maintained natural herbaceous vegetation for grazing animals or are planted in monocultures of perennial (e.g., Bermuda grass (*Cynodon dactylon*), Bahia grass (*Paspalum notatum*), and dallisgrass (*Paspalum dilatum*)) or annual (e.g., ryegrass (*Lolium multiflorum*), cereal rye (*Secale cereal*), and oats (*Avena sativa*)) grasses for hay production. Crops identified during Trunkline's field surveys included rice, soybeans, and crawfish.

Upland forest communities along the Mainline 200-3 Loop route typically contain Chinese tallow, longleaf pine (*Pinus palustris*), slash pine, southern red oak (*Quercus falcata*), and water oak. Sub-canopy upland species include American beautyberry, American holly (*Ilex opaca*), red maple (*Acer rubrum*), and yaupon.

Forested wetlands are located along the Mainline Connector route and, to a lesser extent, the Mainline 200-3 Loop route. Small areas of herbaceous wetland communities are present along the Mainline Connector and Mainline 200-3 Loop routes, within and adjacent to meter station sites, at the Compressor Station 203-A site, and at the Mainline 200-1 modification sites. Typical species present within these wetland communities are described in section 4.4.1.

Herbaceous upland communities are present along the Mainline 200-3 Loop route, within and adjacent to meter station sites, and at the Mainline 200-1 modification sites. Typical species within these communities include black medick (*Medicago lupulina*), bluestem (*Andropogon* spp.), catchweed (*Galium aparine*), geranium (*Geranium* spp.), johnsongrass (*Sorghum halepense*), little quakinggrass (*Briza minor*), Louisiana vetch (*Vicia ludoviciana*), ragweed, red fescue (*Festuca rubra*), southern dewberry (*Rubus trivialis*), and Timothy canarygrass (*Phalaris angusta*).

4.5.2 Construction and Operation Impacts and Mitigation

As summarized in table 4.5.2-1, a total of about 949.8 acres of vegetation would be cleared during construction of the project. Following construction, about 222.0 acres of vegetation would be allowed to return to vegetated conditions, 727.8 acres would not be restored but would be converted to developed land or stabilized with gravel or vegetation. Overall, the project would have the greatest impact on forest (upland forest and pine plantations [340.9 acres] and forested wetland [162.1 acres]), pasture and row crop agriculture (218.9 acres), and herbaceous upland (135.5 acres) vegetation. Proposed activities within existing facility boundaries (i.e., LNG terminal; contractor yard; Longville, Pollock, Epps, and Shaw Compressor Stations; certain meter stations, and some of Mainline 100-3 modifications) would not affect vegetation because these areas have undergone previous disturbance and/or have been graded and graveled.

TABLE 4.5.2-1

Vegetation Communities Affected by the Lake Charles Liquefaction Project (in acres)

	Agriculture[a]		Herbaceous Upland		Non-Forested Wetland[b]		Forested Wetland		Forested Upland		Pine Plantation		Total	
Facilities	Temp.	Perm.	Temp.	Perm.	Temp.	Perm.	Temp.	Perm.	Temp.	Perm.	Temp.	Perm.	Temp.	Perm.
LIQUEFACTION FACILITY														
Liquefaction Facility	0.0	0.0	0.0	4.8	0.0	31.6	0.0	73.7[c]	0.0	135.3	0.0	0.0	0.0	245.4
Additional Construction Workspaces	0.0	0.0	0.0	86.3	0.0	25.3	0.0	84.9[c]	0.0	126.4	0.0	0.0	0.0	322.9
Subtotal	**0.0**	**0.0**	**0.0**	**91.1**	**0.0**	**56.9**	**0.0**	**158.6**[c]	**0.0**	**261.7**	**0.0**	**0.0**	**0.0**	**568.3**
NON-LIQUEFACTION FACILITIES														
Pipelines														
Mainline Connector	76.5	31.3	0.0	0.0	6.8	3.2	1.1	0.6[c]	12.3	12.3	25.4	18.0	122.1	65.4
Mainline 200-3 Loop	35.8	24.8	9.7	3.5	3.2	2.2	0.3	0.0[c]	1.4	6.6	0.0	0.7	50.4	37.8
Access Roads	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.0
Compressor Stations														
203-A	0.0	45.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	45.6
Meter Stations[d]														
Kinder Morgan–Lake Charles	0.0	0.0	0.7	1.4	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	1.0	1.5
Columbia Gulf–Egan	0.9	0.6	0.8	0.8	0.0	0.0	0.2	0.2	0.0	0.0	0.0	0.0	1.9	1.6
NGPL–Lakeside	2.6	0.3	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	2.6	0.4
TETCO–Allen	0.0	0.0	2.2	1.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.2	1.8
Gulf Crossing–Perryville	0.5	0.0	1.2	1.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.8	1.2
MEP–Perryville	0.0	0.0	2.3	2.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.3	2.1
Texas Gas–Woodlawn	0.0	0.0	1.6	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	1.7	0.0
Transco Ragley	0.0	0.0	0.0	0.0	1.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	0.0
Mainline 200-1 Modifications[e]														
Calcasieu River HDD	0.0	0.0	13.9	0.2	18.2	0.0	1.1	0.0	0.4	1.9	0.0	0.0	33.6	2.1
US 190 Meter Station	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0
Subtotal	**116.3**	**102.6**	**33.4**	**11.0**	**29.9**	**5.6**	**2.7**	**0.8**	**14.3**	**20.8**	**25.4**	**18.7**	**222.0**	**159.5**
PROJECT TOTAL	**116.3**	**102.6**	**33.4**	**102.1**	**29.9**	**62.5**	**2.7**	**159.4**	**14.3**	**282.5**	**25.4**	**18.7**	**222.0**	**727.8**

a For vegetation impact calculations, agriculture includes pasture and row crops. Pine plantations are analyzed separately.

b Includes areas delineated as palustrine emergent and palustrine scrub-shrub wetlands/wetland mosaics.

c Includes areas delineated as forested wetlands and forested wetland mosaics.

d Impacts associated with the LCLNG Export and Tennessee–Kaplan Meter Stations are included with the Liquefaction Facility site and the Mainline 200-3 Loop, respectively.

e Work required for the100-foot overhead crossing and the MLV 202 replacement would occur within the Texas Gas–Woodlawn and Transco Ragley Meter Stations, respectively.

Note: The numbers in this table have been rounded for presentation purposes. As a result, the totals may not reflect the sum of the addends.

4.5.2.1 Liquefaction Facility

A total of 568.3 acres of vegetation would be cleared during construction of the liquefaction facility, including the ACWs. Of this, 245.4 acres would be permanently converted to industrial use associated with operation of the liquefaction facility, resulting in a permanent loss of 135.3 acres of forested uplands, 73.7 acres of forested wetlands (both palustrine forested wetlands and forested mosaics), 31.6 acres of palustrine emergent and palustrine scrub-shrub wetlands/wetland mosaics, and 4.8 acres of herbaceous uplands. Lake Charles LNG has stated that in accordance with the respective landowners' requests, the 322.9 acres of vegetated areas within the ACWs would not be restored to preconstruction elevations or contours, although they would be stabilized as described in section 4.2.3 to prevent off-site erosion and sedimentation. Therefore, although these areas are not within the operational footprint of the liquefaction facility, we consider these impacts on vegetation to be permanent, resulting in the loss or conversion of 86.3 acres of herbaceous upland, 25.3 acres of palustrine emergent and palustrine scrub-shrub wetlands/wetland mosaics, 84.9 acres of forested wetlands, and 126.4 acres of forested uplands.

Although impacts on herbaceous upland vegetation affected by the liquefaction facility would be permanent where converted to industrial land, similar vegetative communities occur within the surrounding area. Therefore, impacts from construction and operation of the liquefaction facility on herbaceous upland vegetation communities would not be significant. Additional forested communities are located in the project vicinity (generally within the floodplain of the Calcasieu River), but construction of the project would result in the loss of a relatively large portion of upland and wetland forested communities in the immediate area. Impacts on wetland vegetation (including forested wetlands and forested wetland mosaics) would be mitigated to less than significant levels through the implementation of Lake Charles LNG's project-specific Compensatory Mitigation Plan, which would require review and approval by the COE, New Orleans District (see section 4.4.2.2). However, the construction of the liquefaction facility would result in the unmitigated loss of about 261.7 acres of upland forest.

4.5.2.2 Non-Liquefaction Facilities

Construction of the Non-Liquefaction Facilities would affect about 381.5 acres of vegetation, including 275.8 acres for the pipelines, and 105.7 acres for aboveground facilities and Mainline 200-1 modifications (see table 4.5.2-1).

Construction of the Mainline Connector and Mainline 200-3 Loop, including access roads, would affect a total of 275.8 acres of vegetation, including 168.4 acres of agricultural vegetation (pasture and row crops), 44.1 acres of pine plantation, 2.0 acres of forested wetland, 15.4 acres of non-forested wetland, 13.2 acres of herbaceous upland, and 32.7 acres of upland forest (see section 4.4.2.2 for further discussion of wetland impacts). Following construction, vegetation within the permanent easements associated with the Mainline Connector and Mainline 200-3 Loop (65.4 and 37.8 acres, respectively), would be subject to routine maintenance.

Trunkline would construct the Mainline Connector within a 125-foot-wide construction right-of-way through upland areas. In accordance with our Procedures, the right-of-way width would be reduced to 75 feet through wetlands, with the exception of those wetland areas where Trunkline's request to use a 100-foot-wide construction right-of-way is justified due to site-specific soil conditions, as described in section 4.4.3. The Mainline 200-3 Loop, which would be installed adjacent to an existing pipeline, would be constructed within a 75-foot-wide construction right-of-way that would overlap the existing maintained right-of-way by 25 feet. Construction of both pipelines would also require the use of ATWS at locations such as road, waterbody, wetland, and foreign pipeline crossings. During construction of the pipelines, Trunkline would remove surface vegetation mechanically or by hand, and grade the construction right-of-way as necessary to facilitate pipeline installation and allow for safe operation of equipment. Tree stumps would be removed from the trench line and cut low to the ground or removed from the right-of-way. Following construction, a 50-foot-wide permanent easement would be maintained over both the Mainline Connector and Mainline 200-3 Loop. The permanent easement for the Mainline 200-3 Loop would overlap the existing permanent easement by 25 feet.

Following construction, Trunkline would restore areas impacted by pipeline construction (e.g., construction rights-of-way, ATWS, and temporary access roads) to preconstruction conditions and contours. Disturbed areas would be restored in accordance with our Plan and Procedures, NRCS recommendations, other agency requirements and permit conditions, and landowner requests. Typically, Trunkline would not reseed actively cultivated crop lands unless requested by the landowner. Within pine plantations, the landowners would be allowed to replant temporary work areas; however, the 50-foot-wide permanent easements would be maintained in an herbaceous state. Trunkline has stated that all disturbed areas would be routinely monitored until restoration and revegetation are successful. At a minimum, on the ground inspections would be performed for 3 years following construction.

The primary impacts on vegetation from construction of the pipelines would be the cutting, clearing, and/or removal of existing vegetation within the construction work areas. The duration and magnitude of impacts would depend on the type and amount of vegetation affected, the rate at which vegetation regenerates after construction, and the frequency of vegetation maintenance conducted on the right-of-way during pipeline operation. In addition, right-of-way revegetation would depend on factors such as local climate, soil types, right-of-way maintenance practices, and land use. There would be minor and short-term impacts on agricultural, scrub-shrub and emergent wetland, and herbaceous upland areas because we would expect these areas to revegetate to a cover similar to preconstruction conditions within one to two growing seasons.

Upland forested areas within the permanent easement would be permanently converted to herbaceous cover. Of the 76.8 acres of upland forest and pine plantation that would be cleared during construction of the pipelines, Trunkline would permanently maintain 37.6 acres in an herbaceous state. Within wetlands, Trunkline would maintain a 10-foot-wide strip over the pipeline in an herbaceous state, and would selectively remove trees located within 15 feet of the pipeline that have roots that could compromise the integrity of the pipeline coating. Of the 2.0 acres of forested wetland that Trunkline would clear during construction, about 0.6 acre would be permanently converted to herbaceous or scrub-shrub wetland within this 30-foot-wide permanently maintained corridor. In temporary work areas where upland forest and forested wetland would be allowed to regrow, impacts would be long term because re-establishment to preconstruction conditions could take 10 to 30 years, depending on the species type.

Trunkline would minimize impacts on vegetative communities affected by pipeline construction by collocating the Mainline 200-3 Loop with an existing pipeline and by overlapping the construction area and permanent right-of-way with the existing maintained right-of-way as described above. Additionally, Trunkline proposes to install the pipelines using the HDD method at six locations, which would avoid or minimize impacts on riparian vegetation and wetland communities, including forested wetlands. No vegetation clearing is proposed between HDD entry and exit locations during construction and operation of the project, with the possible exception of a minor hand-cut line path, which may be necessary to allow for the placement of a tracing wire to ensure HDD accuracy. Trunkline's implementation of our Plan and Procedures, which require the use of temporary and permanent erosion control measures, topsoil segregation in select areas, testing and mitigation for soil compaction, post-construction monitoring, and limited routine vegetation maintenance would further minimize impacts on vegetation. All disturbed areas would be routinely monitored until restoration and revegetation are successful.

Construction of Compressor Station 203-A, new and modified meter stations, and mainline modifications would affect 50.5 acres of agricultural vegetation, 31.2 acres of herbaceous upland, 20.1 acres of non-forested wetland, and 2.4 acres of upland forest, and 1.5 acres of forested wetland. A 2.6-acre forested wetland is present within the Compressor Station 203-A site but would be avoided. Following construction, 56.3 acres of vegetated land would be permanently converted to industrial land for the new aboveground facilities. The remaining 49.4 acres of vegetation within the ATWS would be allowed to revert to preconstruction condition. To minimize impacts on vegetative communities during and after construction of these facilities, Trunkline would conduct much of the work within or adjacent to existing maintained rights-of-way and facility sites. Additionally, Trunkline would install erosion control measures and revegetate temporary workspaces in accordance with our Plan and Procedures. All disturbed areas would be routinely monitored in accordance with our Plan and Procedures until restoration and revegetation are successful.

With the implementation of the mitigation measures described above, we conclude that construction and operation of the Non-Liquefaction Facilities would not have a significant impact on vegetation communities in the project area.

4.5.3 Exotic or Invasive Plant Communities and Noxious Weeds

Exotic plant communities, invasive species, and noxious weeds can out-compete and displace native plant species, thereby negatively altering the appearance, composition, and habitat value of affected areas. In accordance with the Plant Protection Act of 2000 (7 USC 7701), 13 plants have been federally designated as noxious weeds that could occur in Louisiana (NRCS, 2012), and the State of Louisiana has designated one plant as a noxious weed, Chinese tallow (Louisiana Revised Statutes Title 3 Part 1791). In addition to those species designated as noxious at the federal or state level, an email dated February 14, 2014 from the NRCS to TRC, Lake Charles LNG and Trunkline's environmental consultant, identified the following nuisance species: Chinese privet (*Liqustrum sinense*), giant sylvania (*Salvinia* sp.), Japanese climbing fern (*Lygodium japonicum*), and purple loosestrife (*Lythrum salicaria*).

Field surveys for the Lake Charles Liquefaction Project identified Chinese tallow, Chinese privet, and Japanese climbing fern within the project area. Lake Charles LNG and Trunkline identified Chinese tallow within project areas associated with both the liquefaction facility and Non-Liquefaction Facilities. This species was found to be one of the dominant canopy species observed within the pimple mound wetland/non-wetland mosaics. This nonnative tree grows quickly and spreads quickly. When cut, the trees produce multiple stump sprouts. Intensive herbicide application is necessary to control this species as fire and mechanical removal (chopping and root removal) fail to control the aggressive seedlings (USGS, 2000).

Chinese privet and Japanese climbing fern were identified along the Mainline Connector route. Chinese privet is a nonnative shrub and prolific seed producer that matures rapidly, displacing native vegetation. Manual removal, including roots, is an effective control measure (NRCS, 2005). Japanese climbing fern thrives in moist soils with potential for dense canopy cover which, in turn, suppresses understory plant growth and recruitment. Control measures for this species include manual removal followed by herbicide application (USFS, 2014).

Lake Charles LNG and Trunkline would implement our Plan and Procedures, which require post-construction monitoring for the first and second growing seasons in uplands, and for 3 years in wetlands, to evaluate the success of revegetation. As part of this monitoring program, Lake Charles LNG and Trunkline would be required to examine the project area for the presence of invasive species. In non-agricultural upland areas, revegetation would be considered successful if the density and cover of non-nuisance species within the areas disturbed during construction are similar to the density and cover in adjacent undisturbed areas. Wetland revegetation would be considered successful if all of the following criteria are satisfied:

a. the affected wetland satisfies the current federal definition for a wetland (i.e., soils, hydrology, and vegetation);

b. vegetation is at least 80 percent of either the cover documented for the wetland prior to construction, or at least 80 percent of the cover in adjacent wetland areas that were not disturbed by construction;

c. if natural rather than active revegetation was used, the plant species composition is consistent with early successional wetland plant communities in the affected ecoregion; and

d. invasive species and noxious weeds are absent, unless they are abundant in adjacent areas that were not disturbed by construction.

In addition, our Plan and Procedures require that Lake Charles LNG and Trunkline coordinate with the appropriate land management and/or state agencies to prevent the introduction or spread of invasive species, noxious weeds, and soil pests. In email correspondence with TRC dated January 15, 2014, the NRCS provided typical suggestions for the removal and control of Chinese tallow and stated that control and prevention recommendations for nuisance and invasive species would come from the LDWF. Lake Charles LNG and Trunkline have not proposed measures to be implemented during construction and operation of the project to control the spread of noxious weeds; therefore, **we recommend that**:

- **<u>Prior to construction</u>, Lake Charles LNG and Trunkline should coordinate with the NRCS and LDWF to develop a project-specific noxious weed control plan. The plan should be filed with the Secretary for review and approval by the Director of OEP.**

4.5.4 Vegetative Communities of Special Concern

Vegetative communities of special concern may include ecologically important natural communities, threatened or endangered plant species, or other rare or imperiled plants in need of special protection or minimal disturbance. Potential impacts on such communities in Louisiana are discussed below. The proposed project activities in Mississippi and Arkansas would occur within existing industrial facilities; therefore, no impacts on vegetation communities of special concern are anticipated in those states. Federally and state-listed plant species potentially occurring within the project area are discussed in section 4.7.

4.5.4.1 Natural Communities of Louisiana

The LDWF, Louisiana Natural Heritage Program (LNHP) (2009) recognizes 68 natural vegetative communities across 6 ecoregions in Louisiana. During coordination with Lake Charles LNG and Trunkline, the LNHP identified three of these natural communities, including Coastal Prairie, Flatwoods Pond, and Western Acidic Longleaf Pine Savannah, as being recorded in the vicinity of the proposed Non-Liquefaction Facilities. None of these natural communities were identified within the project work areas during field surveys. Therefore, we would not anticipate impacts on these communities during construction or operation of the Lake Charles Liquefaction Project.

Although not identified by the LNHP during project-related coordination, field surveys conducted by Trunkline and Lake Charles LNG identified two forested wetland communities within the project area that meet the description of recognized natural vegetative communities, Bayhead Swamp and Bottomland Hardwood Forest. Bayhead Swamp is associated with depressional areas, drainages, or headwaters with typical overstory species including bald cypress, laurel oak, longleaf pine, red maple, slash pine, swamp blackgum, sweet bay magnolia, and sweetgum (LNHP, 2014). Potential Bayhead Swamp communities occur adjacent to Arceneaux Bayou (MP 1.2) and at MP 5.3 along the Mainline Connector route (a total of 11.2 acres impacted) and adjacent to Bayou Lacassine (MP 178.5) along the Mainline 200-3 Loop (0.4 acre impacted). A total of 4.5 acres of Bayhead Swamp would be located within the pipeline easements; of this, 2.7 acres would be permanently converted to emergent wetland to facilitate pipeline inspections and maintenance, the remaining 1.8 acres would be allowed to naturally revegetate. Trunkline would minimize impacts on potential Bayhead Swamp communities by using the HDD method to install the Mainline 200-3 Loop beneath the potential communities adjacent to Bayou Lacassine and to install portions of the Mainline Connector beneath this community adjacent to Arceneaux Bayou. See additional discussion of forested wetland impacts and proposed mitigation measures in sections 4.4.2.2 and 4.5.2.2.

Bottomland Hardwood Forest occurs in floodplains of large river systems and contains a mix of broadleaf deciduous, needleleaf deciduous, and evergreen trees and shrubs (LNHP, 2014). Those forested wetlands systems impacted by the project that are not classified as forested mosaic wetlands or potential Bayhead Swamps meet the description of Bottomland Hardwood Forest. These natural communities occupy a total of 29.6 acres within the liquefaction facility site, along the Mainline Connector, and at three meter stations (Columbia Gulf–Egan, TETCO–Allen, and Texas Gas–Woodlawn). Of this, 22.8 acres would be located within the liquefaction facility and meter station sites, which would be permanently converted to industrial use; 1.7 acres would be located within the permanent easement associated with the Mainline Connector and would be converted to emergent wetland due to routine maintenance associated with pipeline operation; the remaining 5.1 acres would be allowed to revegetate to pre-existing conditions. See additional discussion of forested wetland impacts and proposed mitigation measures in sections 4.4.2.2 and 4.5.2.2.

4.5.4.1 Kisatchie National Forest

The Kisatchie National Forest, which surrounds the Pollock Compressor Station, contains recovering populations of the longleaf pine as well as other pine (e.g., loblolly, slash, and shortleaf pine) and hardwood species (USDA, 2014). The proposed project would not affect vegetative communities within the Kisatchie National Forest; all activities at the Pollock Compressor Station would be conducted inside existing facility boundaries.

4.6 WILDLIFE AND AQUATIC RESOURCES

4.6.1 Wildlife Resources

Wildlife species inhabiting the project area are characteristic of the habitats provided by the plant communities that occur in the vicinity of the project. Detailed information on vegetation types present within the project area is included in section 4.5. Habitat types were identified based on aerial photography and field surveys. Aquatic resources are discussed in section 4.6.2. Protected wildlife species are discussed in section 4.7.

4.6.1.1 Existing Wildlife Habitat

The wildlife habitat types present within the project area include wetlands, upland forest, open water, open land, and agricultural land. Typical wildlife occurring within these habitat types is described below.

Wetland habitats present within the project area include palustrine emergent, palustrine scrub-shrub, palustrine forested wetlands, and palustrine forested wetland mosaics. Wetlands support a diverse ecosystem that provides nutrients, cover, shelter, and water for a variety of terrestrial and aquatic wildlife species, including waterfowl, wading birds, raptors, mammals, reptiles, and amphibians. Typical wildlife associated with palustrine forested and scrub-shrub wetlands include white-tailed deer (*Odocoileus virginianus*), raccoon (*Procyon lotor*), river otter (*Lutra canadensis*), armadillo (*Dasypus novemcinctus*), wood thrush (*Hylocichla mustelina*), common yellowthroat (*Geothlypis trichas*), wood duck (*Aix sponsa*), prothonotary warbler (*Protonotaria citrea*), wild turkey (*Meleagris gallopava*), red-shouldered hawk (*Buteo lineatus*), and cottonmouth (*Agkistrodon piscivorus*). Typical wildlife associated with palustrine emergent wetlands include the species listed above, as well as rice rat (*Oryzomys palustris*), least bittern (*Ixobrychus exilis*), green heron (*Butorides striatus*), red-winged blackbird (*Agelains phoeniceus*), southern leopard frog (*Rana utricularia*), bullfrog (*Rana catesbeiana*), mud turtle (*Kinosteron* sp.), chicken turtle (*Deirochelys reticularia*), and pygmy rattlesnake (*Sistrurus miliarius*) (Sutton and Sutton, 1985; Burt and Grossenheider, 1976; Peterson, 1980).

Upland forest habitat present within the liquefaction facility site and ACWs is composed of large stands of mature, mixed hardwood forest. In addition, mixed pine-hardwood forest, natural pine stands, and managed pine plantations are present within areas that would be affected by the Non-Liquefaction Facilities. Tree and shrub layers provide shelter and foraging habitat for various bird species and larger mammals. Organic material on the forest floor provides habitat for various invertebrates, reptiles, smaller mammals, and amphibians. Mammals typically associated with upland forest habitat in the project area include the white-tailed deer, gray fox (*Urocyon cinereoargenteus*), gray squirrel (*Sciurus carolinensis*), cotton mouse (*Sigmodon hispidus*), and striped skunk (*Mephitis mephitis*). Typical bird species include the Carolina chickadee (*Parus carolinensis*), loggerhead shrike (*Lanius ludovicianus*), eastern kingbird (*Tyrannus tyrannus*), hairy woodpecker (*Picoides villosus*), brown-headed nuthatch (*Sitta pusilla*), pine warbler (*Dendroica pinus*), Northern bobwhite (*Colinus virginianus*), tufted titmouse (*Parus bicolor*), and wild turkey. Amphibians and reptiles include the rat snake (*Elaphe obsolete*), garter snake (*Thamnophis sirtalis sirtalis*), black racer (*Coluber constrictor*), pigmy rattlesnake (*Sistrurus miliarius*), and green tree frog (*Hyla cinerea*) (Sutton and Sutton, 1985; Burt and Grossenheider, 1976; Peterson, 1980).

Open water habitats present within the liquefaction facility site include the Industrial Canal/Turning Basin, 1 perennial stream, 2 intermittent streams, 1 pond, and 11 roadside drainages. Open water habitats associated with the Non-Liquefaction Facilities include 4 freshwater ponds, 14 perennial streams, 12 intermittent streams, 8 ephemeral streams, and 62 drainage ditches/canals. Typical wildlife associated with open water habitat includes wading birds, waterfowl, beavers, otters, nutria (*Myocastor coypus*), snakes, and other wildlife species dependent on an aquatic environment (see additional discussion in section 4.6.2).

Open lands within the project area consist primarily of grasses, forbs, and shrubs. Mammals typically associated with open lands include white-tailed deer, striped skunk, eastern spotted skunk (*Spilogale putorius*), cotton mouse, armadillo, raccoon, and eastern harvest mouse (*Reithrodontomys humulis*). Bird species include northern bobwhite, eastern bluebird (*Sialia sialis*), dickcissel (*Spiza americana*), rusty blackbird (*Euphagus carolinus*), red-tailed hawk (*Buteo jamaicensus*), northern harrier (*Circus cyaneus*), American robin (*Turdus migratorius*), cattle egret (*Bubulcus ibis*), and red-winged black bird. Typical reptiles and amphibians include chorus frog (*Pseudacris* sp.), box turtle (*Terrapene* *carolina carolina*), rat snake, and garter snake (Sutton and Sutton, 1985; Burt and Grossenheider, 1976; Peterson, 1980).

Agricultural lands affected by the project include those used for the cultivation of crops such as rice, soybeans, and crawfish. Agricultural lands do not provide high quality habitat for cover or nesting, but do provide foraging opportunities for several species. Irrigation ditches, ponds, and flooded fields provide habitats for shorebirds, wading birds, and waterfowl. Many species capable of inhabiting open lands would also utilize agricultural lands. Typical mammal species observed foraging in agricultural lands in the project area include white-tail deer, striped skunk, eastern spotted skunk, cotton mouse, armadillo, raccoon, and eastern harvest mouse. Bird species observed on agricultural lands include red-tailed hawk, northern harrier, American robin, cattle egret, red-winged black bird, and mourning dove. Typical amphibians and reptiles include rat snake, garter snake, and chorus frog (Sutton and Sutton, 1985; Burt and Grossenheider, 1976; Peterson 1980).

4.6.1.2 Impacts and Mitigation

Liquefaction Facility, LNG Terminal, and Additional Construction Workspaces

Clearing of the liquefaction facility site and ACWs would affect a total of 574.7 acres of wildlife habitat, including 568.3 acres of vegetated habitat, as described in section 4.5.2.1 and summarized in table 4.5.2-1, and about 6.3 acres of open water habitat. Following construction, 251.6 acres of wildlife habitat would be permanently converted to industrial land for the new liquefaction facility, in which most of the vegetated and open water habitats would be replaced with surfacing materials such as concrete or gravel. The 322.9 acres of vegetated areas within the ACWs would not be restored to preconstruction elevations or contours and would be stabilized with graveled or vegetated surfaces. Therefore, although these areas are not within the operational footprint of the liquefaction facility, we anticipate that impacts on wildlife habitat within the ACWs would also be permanent.

Impacts on wildlife from construction of the liquefaction facility would include displacement, stress, and direct mortality of some individuals. Potentially suitable cover, nesting, and foraging habitat for some wildlife species would be reduced due to clearing of vegetation. Individuals of smaller, less mobile wildlife such as reptiles and amphibians could be inadvertently injured or killed by construction equipment. More mobile wildlife such as birds and mammals may relocate to similar habitats nearby when construction activities commence. The permanent reduction in available habitat within the area as well as the influx of individuals to other nearby areas may increase population densities for certain species, resulting in increased inter- and intra-specific competition and reduced reproductive success of individuals. The greatest impact on wildlife habitat would result from the permanent conversion of about 420.3 acres of forested uplands and forested wetlands within the liquefaction facility site and ACWs, which would result in a permanent reduction in forested habitat in the general vicinity of the liquefaction facility, where the surrounding area is largely composed of developed, open, and agricultural lands. Based on final review and approval by the COE, Lake Charles LNG would provide compensatory mitigation for permanent impacts on the about 158.6 acres of forested wetland that would be permanently converted to upland; however, the loss of 261.7 acres of upland forest would not be mitigated.

Operation of the liquefaction facility would result in increased noise, lighting, and human activity that could disturb wildlife in the area. However, due to current industrial activities at the existing LNG terminal and other industrial facilities in the vicinity, most wildlife in the area are acclimated to the noise and artificial lighting associated with these activities. Therefore, we expect impacts due to noise, light, and human activity during operation of the liquefaction facility to be negligible. (See section 4.6.1.3 for further discussion of lighting at the liquefaction facility).

The proposed modifications at the existing LNG terminal would occur within the fenced industrial facility. The existing LNG terminal provides minimal wildlife habitat that would not be substantially affected by the proposed project activities with the exception of the work to be done in the Industrial Canal/Turning Basin as discussed in section 4.6.2.1.

To minimize project-related impacts on wildlife, Lake Charles LNG would implement our Plan and Procedures, as well as its SPAR Plan for volumes of materials not regulated by the EPA, and a SPCC Plan for materials regulated by the EPA (see additional discussion of these plans in section 4.3.2.2). In addition, the COE New Orleans District would require compensatory mitigation for wetland impacts that cannot be avoided (see section 4.4.4). Although the implementation of these mitigation measures would lessen impacts on wildlife species, we have determined that construction and operation of the proposed liquefaction facility would have long-term impacts on wildlife species due to the loss of forested habitat.

Non-Liquefaction Facilities

About 2.9 acres of open water wildlife habitat and 381.5 acres of vegetated wildlife habitat would be affected by construction of the Non-Liquefaction Facilities. The majority of the impacts on wildlife habitat would be associated with construction of the proposed pipeline facilities and construction and operation of the new and expanded aboveground facilities as discussed below. Proposed activities within existing facility boundaries (i.e., Longville, Pollock, Epps, and Shaw Compressor Stations; Mainline 100-3 modifications, and some of the Mainline 200-1 modifications), as well as the use of the proposed contractor yard, would not affect wildlife habitat as these areas have undergone previous disturbance and/or have been graded and graveled.

<u>Pipelines and Calcasieu River HDD</u>

Construction of the Mainline Connector and Mainline 200-3 Loop would result in both temporary and permanent impacts on wildlife and wildlife habitat. Construction would affect a total of 275.8 acres of vegetated wildlife habitat consisting of the vegetation communities described in section 4.5.2.1, and 2.5 acres of open water habitat. Following construction, about 173.6 acres of temporary work areas would be allowed to revert to preconstruction condition, and about 104.7 acres would be retained as permanent, maintained right-of-way. The primary wildlife habitats affected by construction of the pipelines would be agricultural lands (61 percent), pine plantations (16 percent), and forested uplands (12 percent).

The impact of pipeline construction on terrestrial wildlife and wildlife habitats would vary depending on the type of habitat affected, the requirements of each species, the timing of construction, and types of construction techniques used. Noise and human disturbance during construction would cause most wildlife to avoid areas of active construction; however, this would be a short-term effect as construction activities proceed along the right-of-way. The greatest effect on wildlife habitat would result from cutting, clearing, and/or removal of existing vegetation, which would reduce the amount of available wildlife habitat in the project area and may result in direct mortality of less mobile wildlife such as small rodents and reptiles. Larger or more mobile wildlife, such as birds and large mammals, would relocate into adjacent similar habitats.

Following construction, disturbed areas would be restored, and the permanent right-of-way maintained, in accordance with our Plan and Procedures. The duration of impacts on terrestrial wildlife habitat would depend on the rate at which vegetation regenerates after construction. Agricultural lands would be available for replanting during the growing season immediately following pipeline construction. Open land and emergent wetland habitats would generally revegetate within 2 to 4 years after construction is completed. Open water habitats would revert to preconstruction condition shortly after the completion of in-water work (see section 4.6.2.2 for further discussion of impacts on aquatic resources). Therefore, impacts from construction and operation of the proposed pipelines on wildlife that use agricultural, open land, emergent wetland, and open water habitats would be short-term and minimal.

Impacts on affected forested habitat within temporary construction work areas would be long term because forested lands can take decades to regenerate. Species that use early successional communities may benefit from the clearing and revegetation process, as additional habitat of this type would be created during construction. Additionally, non-woody, early successional vegetation may provide seeds and foliage as food for small mammals and birds, as well as habitat for ground-nesting birds, mammals, and reptiles.

Within the permanent rights-of-way, upland forested habitat would be permanently converted to open land due to routine pipeline maintenance activities. The majority of forested wetland areas within the permanent rights-of-way would be permanently converted to either emergent or scrub-shrub wetlands because our Procedures do not allow routine vegetation clearing in wetlands. However, our Procedures do allow for the maintenance of a 10-foot-wide strip over the pipeline in an herbaceous state and selective cutting and removal of trees within 15 feet of the pipeline with roots that could compromise the integrity of the pipeline coating.

Impacts on forested habitat would be greatest along the greenfield Mainline Connector route, where the conversion of forested lands to open lands would result in some new forest fragmentation and create edge habitat. In the limited locations where the Mainline 200-3 Loop crosses forested land, the edge habitat would be shifted, but no new fragmentation would occur. Trees adjacent to the cleared areas would be exposed to windier conditions, which may increase the frequency of blowdowns.

Edge habitats are used by several wildlife species, such as white-tailed deer and various small mammals. Many species adapt well to this habitat shift and could take advantage of the edge habitats. Predatory species such as red-tailed hawk and coyote commonly use utility rights-of-way for hunting, and other species, such as eastern cottontail, northern bobwhite, mourning dove, eastern meadowlark, white-eyed vireo, white-tailed deer, and American crow, would benefit from the transition to early successional habitat for foraging. Although the increase in edge habitat may be advantageous for some species, it could adversely affect interior forest species or species that prefer large tracts of unbroken forest. Additionally, nesting success may be denied or diminished for one annual breeding cycle for adult birds that normally breed in the area but would avoid it during construction activities.

The slow regeneration of forested communities within temporary construction areas would result in the long-term reduction in forested habitat for species that use these communities. However, abundant similar habitats are available for wildlife adjacent to the proposed pipeline facilities.

Land disturbing activities for the Calcasieu River HDD, which Trunkline would conduct as part of the Mainline 200-1 modifications, would occur within temporary workspace that is located within Trunkline's existing pipeline easement and would affect about 38.2 acres of mostly open land and 0.4 acre of open water. Following construction, the temporary workspaces would revert to preconstruction condition. Impacts on wildlife habitat resulting from the Calcasieu River HDD would be largely similar to those described above. In particular, the noise and activity associated with HDD operations would cause wildlife to avoid the area during construction.

Trunkline attempted to minimize crossing of forested land during routing and design of the Mainline Connector. In addition to the Calcasieu River HDD, Trunkline proposes to conduct five HDD crossings during construction of the pipelines (some of which would encompass more than one waterbody), which would minimize impacts on open water and adjacent riparian habitats. To further minimize impacts on wildlife and wildlife habitat, Trunkline would not maintain the rights-of-way between HDD entry and exit points. Additionally, the Mainline 200-3 Loop would be entirely collocated with an existing pipeline, and Trunkline would overlap the Mainline 200-3 Loop construction and permanent right-of-way with the existing pipeline right-of-way by 25 feet. With these measures and the implementation of the measures specified in our Plan and Procedures, we conclude that construction and operation of the proposed pipelines would not significantly affect wildlife.

Aboveground Facilities and Modification of US 190 Meter

Construction of the proposed aboveground facilities, including the work to be done at the existing US 190 meter station as part of the proposed Mainline 200-1 modifications, would affect a total of 70.0 acres of vegetated wildlife habitat consisting of the communities described in section 4.5.2.1 and summarized in table 4.5.2-1. Impacts on wildlife and habitat during construction of the aboveground facilities would be similar to those described above for the pipelines. Following construction, about 54.2 acres of habitat would be permanently converted to industrial land for operation of the new and expanded facilities.

Construction of Compressor Station 203-A would occur entirely within the permanent boundaries of this proposed new facility and would result in the permanent conversion of 45.6 acres of agricultural land to industrial use. Construction would require filling of a man-made agricultural canal; other drainages on the site would not be permanently affected because station piping would be installed beneath them, though availability of these features for use by wildlife would be limited during operation of the fenced facility. Although any habitat at the compressor station site would be permanently removed for most wildlife use due to the loss of vegetation and installation of security fencing, abundant agricultural habitat is available adjacent to the site. During operation, increased noise levels in the vicinity of the compressor station may result in avoidance of the area by wildlife until they become acclimated to the increase.

Construction activities associated with new and modified meter stations would impact a total of 23.4 acres of wildlife habitat. Following construction, 14.8 acres of temporary workspace would revert to preconstruction condition, and 8.6 acres at the new and expanded meter station sites would be permanently converted to industrial land. The majority of the impacts on wildlife habitat associated with these facilities would be on open and agricultural lands; however, construction activities at the Columbia Gulf–Egan Meter Station would also impact small amounts of forested habitat. Activities at each meter station site would affect relatively small amounts of wildlife habitat ranging from about 1.3 to 4.4 acres at any given site, would occur adjacent to existing maintained rights-of-way and facilities, and would be located in areas where surrounding habitat could accommodate the potential influx of displaced wildlife.

Although individuals of some wildlife species would be affected by construction and operation of the proposed aboveground facilities, most impacts on wildlife would be short-term and limited predominantly to the construction period. With the implementation of our Plan and Procedures, and due to the fact that abundant similar habitat is available for wildlife adjacent to the affected areas, we conclude that construction and operation of the Non-Liquefaction Facilities would not have a significant impact on local wildlife populations or habitat.

4.6.1.3 Unique and Sensitive Wildlife Resources

Unique or sensitive wildlife resources, such as migratory birds, colonial waterbird nesting areas, and managed wildlife areas, may be present in the vicinity of the proposed project and are discussed below. Species protected under the ESA, BGEPA, and state endangered and threatened species regulations are discussed in section 4.7.

Migratory Birds

Migratory bird species nest in the United States and Canada during the summer months and then migrate south to the tropical regions of Mexico, Central and South America, and the Caribbean for the non-breeding season. Some species migrate from breeding areas in the north to the Gulf Coast for the non-breeding season. Migratory birds are protected under the MBTA and bald and golden eagles are additionally protected under the BGEPA. The MBTA prohibits the take or killing of individual migratory birds, their eggs and chicks, and active nests. The MBTA provides that it is unlawful to pursue, hunt, take, capture, kill, possess, sell, purchase, barter, import, export, or transport any migratory bird, or any part, nest, or egg of any such bird. Executive Order 13186 (January 2001) directs federal agencies to consider the effects of agency actions on migratory birds and determine where unintentional take is likely to have a measurable negative effect on migratory bird populations, and to avoid or minimize adverse impacts on migratory birds through enhanced collaboration with the FWS. Executive Order 13186 states that emphasis should be placed on species of concern, priority habitats, and key risk factors, and that particular focus should be given to addressing population-level impacts.

On March 30, 2011, the FWS and the Commission entered into a Memorandum of Understanding (MOU) that focuses on avoiding or minimizing adverse impacts on migratory birds and strengthening migratory bird conservation through enhanced collaboration between the two agencies. This voluntary MOU does not waive legal requirements under the MBTA, BGEPA, ESA, Federal Power Act, NGA, or any other statute and does not authorize the take of migratory birds.

In order to accurately identify bird species with the greatest conservation priority and stimulate action by federal/state agencies and private parties, the FWS Migratory Bird Office issued a report describing the Birds of Conservation Concern (BCC) (FWS, 2008a). The report identifies priority bird species at the national, regional, and Bird Conservation Region (BCR) levels. The Lake Charles Liquefaction Project is located within three BCRs, including BCR 37-Gulf Coastal Prairie, BCR 25-West Gulf Coastal Plain/Ouachitas, and BCR 26-Mississippi Alluvial Valley (FWS, 2008a). Appendix H identifies the BCC that have been documented or are cited as probable to occur in the vicinity of the project.

Project Area in Relation to Migratory Bird Flyways

Migratory birds follow broad routes called flyways between breeding grounds in Canada and the United States and wintering grounds in Central and South America, and the Caribbean. Additionally, several species migrate from breeding areas in the north to winter along the Gulf Coast and remain throughout the non-breeding season. The proposed project is located within the Mississippi Flyway and along the eastern edge of the Central Flyway.

The Central and Mississippi Flyways both terminate at the Gulf Coast, making it one of the most important waterfowl areas in North America. Of the 650 species of birds known to occur in the United States, nearly 400 species occur along the Gulf Coast (Esslinger and Wilson, 2003). The Gulf Coast provides wintering and migration habitat for significant numbers of continental duck and goose populations that use both the Central and Mississippi Flyways. The coastal marshes of Louisiana, Alabama, and Mississippi regularly hold half of the wintering duck population of the Mississippi Flyway (Esslinger and Wilson 2003).

Impacts and Mitigation

The vegetative communities in the project area provide potential habitat for migratory bird species, including songbirds, waterbirds, and raptors. Much of the vegetated land associated with the

Non-Liquefaction Facilities is previously disturbed and/or currently maintained by mowing and other land management practices that reduce nesting habitat value. However, the undisturbed areas contain higher quality nesting habitat which would be more attractive to breeding bird species. Mature mixed-pine forested habitats within the liquefaction facility and ACWs potentially provide large tracts of high quality nesting habitat for migratory birds. In an email dated November 27, 2012 regarding the proposed liquefaction facility site, the FWS commented that the site, which is mostly mature mixed pine hardwoods, is expected to provide nesting habitat for bird species of concern (i.e., brown-headed nuthatch (*Sitta pusilla*), Chuck-will's-widow (*Antrostomus carolinensis*), Kentucky warbler (*Geothlypis formosa*), and painted bunting (*Passerina ciris*)) (FWS, 2012).

Construction of the liquefaction facility would result in the permanent loss of 420.3 acres of forested habitat, which would directly impact the available nesting and foraging habitat for migratory birds including the above-listed species of concern. Adjacent similar forested habitat is available north and west of the liquefaction facility site; however, the spatial extent of the habitat is limited. Lake Charles LNG would provide compensatory mitigation for impacts on forested wetlands, which would offset some of this habitat loss. Additionally, to minimize impacts from vegetation clearing on migratory birds, the FWS recommended that no habitat alteration work be performed during the nesting period (March 1 to July 31) (FWS, 2012). Lake Charles LNG and Trunkline have stated that they would initiate clearing activities outside the nesting season.

While Lake Charles LNG and Trunkline have indicated that they would initiate clearing outside of the migratory bird nesting season, **we recommend that**:

- **<u>Prior to the end of the draft EIS comment period</u>, Lake Charles LNG and Trunkline should confirm that they would not conduct any clearing during the migratory bird nesting period between March 1 and July 31 unless approved in writing by the FWS.**

During project operation, Trunkline would not conduct routine vegetation mowing or clearing over the full width of the permanent rights-of-way in uplands more frequently than every 3 years, and routine vegetation mowing or clearing would not occur during the majority of the migratory bird nesting season between April 15 and August 1 unless specifically approved in writing by the FWS.

Other impacts on migratory birds and their habitat due to construction and operation of the project would be similar to impacts on general wildlife resources (see section 4.6.1.2). Additionally, birds could be affected by flaring and lights at the liquefaction terminal. Flaring would be required during startup of the liquefaction facility, which may require up to 1 month for each liquefaction train. During operation, use of the marine and emergency flares would only occur occasionally. The FWS has not raised flaring as an issue of concern in the area and we are not aware of any reported significant impacts of flaring on migratory birds in the project area. As a result, we believe that the temporary flaring during construction and the occasional flaring during operation would not represent a significant impact on migratory birds passing through the area.

Many migratory birds use natural light from the sun, moon, and stars for navigation. Artificial lighting can hide natural light sources, having unknown effects on birds at the population level. Fatalities to avian species due to artificial light are well documented. Avian fatalities are associated with attraction to light sources, especially in low light, fog, and when there is a low cloud ceiling (Orr et al., 2013). The proposed liquefaction facility would require adequate lighting for operations and safety. Due to the presence of facility lighting at the existing LNG terminal, the overall increase in nighttime lighting during construction and operation of the liquefaction facility would be minor. Outdoor lighting at the compressor and meter stations would be limited and likely contain floodlights affixed to pole or building structures to facilitate operations work at night or during inclement weather. Security lighting for on-ground facilities and equipment would be down-shielded to keep light within the boundaries of the site, as recommended by the FWS, to minimize the effects of artificial lighting on migratory birds.

With the implementation of the mitigation measures described above, we conclude impacts on migratory birds would not be significant.

Colonial Waterbird Nesting Areas

Colonial waterbirds, a subset of migratory birds, include a large variety of bird species that share two common characteristics: 1) they tend to gather in large assemblies, called colonies or rookeries, during the nesting season, and 2) they obtain all or most of their food from the water (FWS, 2002). Colonial waterbirds demonstrate nest fidelity, meaning that they return to the same rookery year after year. Rookeries are typically established in marshes or near the shores of ponds or streams. Although some colonial waterbirds will nest in developed areas (e.g., least terns), many waterbirds are wary of human activity (e.g., great blue heron and great egrets).

During coordination with Trunkline in March 2013, the LDWF, LNHP identified records of two colonial waterbird nesting areas (or rookeries) within 1 mile of proposed workspaces associated with the Mainline 200-3 Loop and the NGPL–Lakeside meter station. The LDWF stated that a field visit should be conducted no more than 2 weeks prior to commencing construction if construction would commence during nesting season. If the field visit identifies nesting colonies within 400 meters (700 meters for brown pelicans) of the project, a survey should be performed and further consultation with the LDWF should be conducted. The LDWF also provided specific distance and timing restrictions to be observed to minimize disturbance of colonial nesting birds depending on the species present.

In March 11, 2013 comments provided to Trunkline's environmental consultant, the FWS also recommended that Lake Charles LNG and Trunkline contact the FWS and LDWF if surveys identify undocumented rookeries during nesting season. No rookeries were identified within the project area during environmental field surveys conducted during 2012, 2013, and 2014. To minimize disturbance of colonial nesting birds, the FWS stated that activities within 1,000 feet of a rookery should be restricted to non-nesting season (with the specific season depending on the species present).

Trunkline and Lake Charles LNG have stated that they would consult with the LDWF and FWS for guidance and recommendations in the event that an active rookery is observed within a distance expected to have a potential impact on the nesting species. To further clarify this commitment, **we recommend that**:

- **<u>Prior to the end of the draft EIS comment period</u>, Lake Charles LNG and Trunkline should confirm in a filing with the Secretary that if construction would commence during the nesting season for colonial waterbirds, they would conduct field visits within 2 weeks prior to starting construction and would consult with the FWS and LDWF if nesting colonies are found within 400 meters (700 meters for brown pelicans) of the construction areas.**

With this condition and the implementation of the measures recommended by the FWS and LDWF, we conclude that impacts on colonial waterbirds would be avoided.

Managed Wildlife Areas

No public or conservation lands have been identified within the proposed project area. Based on information from the LNHP, no wildlife management areas operated or managed by the LDWF are located within 0.25 mile of the project area.

The closest National Wildlife Refuge (NWR) to the project is the Lacassine NWR, which is located 0.4 mile south of the NGPL–Lakeside meter station in Cameron Parish, Louisiana. The Lacassine NWR was established in 1937 as a refuge and breeding ground for migratory birds and other wildlife. Proposed activities at the NGPL–Lakeside meter station would occur within the existing facilities and in adjacent agricultural areas. Due to the distance between the meter station and the refuge, impacts on wildlife within the Lacassine NWR would be limited to increased noise during construction activities. Habitat between the two facilities is composed of forested wetland, which would likely buffer noise levels to less than significant levels. See section 4.8.4.2 for additional information on the Lacassine NWR.

Although the Pollock Compressor Station is located on land owned by Trunkline, it is surrounded by the Kisatchie National Forest. Construction activities associated with the Pollock Compressor Station would be located entirely within the fenceline of the existing facility. In general, impacts on wildlife within the forest would be short term and similar to those described above (see section 4.6.1.2). Potential impacts on sensitive wildlife (e.g., red-cockaded woodpecker) within the Kisatchie National Forest are discussed further in section 4.7.1.1.

4.6.2 Aquatic Resources

4.6.2.1 Liquefaction Facility

Existing Aquatic Resources

All waterbodies within the project area support warmwater fisheries and, with the exception of the Industrial Canal/Turning Basin, which is estuarine, all waterbodies in the project area are freshwater. Of the waterbodies located within the liquefaction facility site, only the Industrial Canal/Turning Basin and the one perennial stream provide year-round habitat for aquatic resources; the remaining waterbodies (i.e., freshwater pond, intermittent streams, and drainage ditches) provide limited habitat value for aquatic resources due to restricted water flow regimes, which are likely dependent upon precipitation.

In the vicinity of the proposed construction docks where dredging would occur, water depth within the Industrial Canal/Turning Basin is about 38 feet and substrates are composed mainly of estuarine subtidal unconsolidated bottom sediment. Unconsolidated sediments provide foraging habitat for benthic organisms and demersal fish and are designated as EFH for red drum, shrimp, reef fish, and coastal migratory pelagic species. EFH is discussed in section 4.6.3. Substrates within the Industrial Canal/Turning Basin are considered early successional due to frequent disturbance from maintenance dredging, propeller wash, and vessel traffic.

One perennial stream is located along the southern boundary of the proposed liquefaction facility site. This unnamed tributary to the Calcasieu River is about 6 feet deep and substrates are composed of freshwater unconsolidated bottom sediment.

Representative fish species found in the project area are presented in table 4.6.2-1. Those species with a fishery classification of "estuarine" commonly occur in the Industrial Canal/Turning Basin, whereas those species with a fishery classification of "freshwater" are typical of perennial freshwater streams in the project area.

TABLE 4.6.2-1 **Representative Fish Species Potentially Occurring in the Vicinity of the Lake Charles Liquefaction Project**		
Common Name	Scientific Name	Estuarine/Freshwater
Shellfish		
Blue crab	*Callinectes sapidus*	Estuarine
Brown shrimp	*Farfantepenaeus aztecus*	Estuarine
White shrimp	*Litopenaeus setiferus*	Estuarine
Finfish		
Alligator gar	*Atractosteus spatula*	Freshwater
Black crappie	*Pomoxis nigromaculatus*	Freshwater
Blue catfish	*Ictalurus furcatus*	Freshwater
Channel catfish	*Ictalurus punctatus*	Freshwater
Common carp	*Cyprinus carpio*	Freshwater
Creek chubsucker	*Erimyzon oblongus*	Freshwater
Freshwater drum	*Aplodinotus grunniens*	Freshwater
Gafftopsail catfish	*Bagre marinus*	Estuarine
Golden shiner	*Notemigonus crysoleucas*	Freshwater
Green sunfish	*Lepomis cyanellus*	Freshwater
Largemouth bass	*Micropterus salmoides*	Freshwater
Mosquitofish	*Gambusia affinis*	Freshwater
Red drum	*Sciaenops ocellatus*	Estuarine
Redear sunfish	*Lepomis microlophus*	Freshwater
Redfin pickerel	*Esox americanus*	Freshwater
River carpsucker	*Carpiodes carpio*	Freshwater
Sheepshead	*Archosargus probatocephalus*	Estuarine
Spotted sucker	*Minytrema melanops*	Freshwater
Striped bass	*Morone saxatilis*	Freshwater
Striped mullet	*Mugil cephalus*	Estuarine
Warmouth	*Lepomis gulosus*	Freshwater
White bass	*Morone chrysops*	Freshwater
Yellow bullhead	*Ameiurus natalis*	Freshwater

No significant fisheries resources are located within the project area; however, recreational fishing occurs within the Industrial Canal/Turning Basin. Recreational fishing is discussed in additional detail in section 4.8.4.1.

Impacts and Mitigation

Potential impacts on aquatic resources during construction and operation of the liquefaction facility include those associated with the two TCDs and berthing dock modifications, waterbody modifications and water withdrawals within the liquefaction facility area, ballast water exchanges, inadvertent spills, and barge traffic.

Lake Charles LNG is not proposing to increase the authorized number or size of LNG carriers, and the associated impacts would not change. Therefore, these activities are not addressed in this EIS.

<u>Temporary Construction Docks and Berthing Dock Modifications</u>

Construction of the two TCDs and berthing dock modifications would require dredging a 22.1-acre area in the Industrial Canal/Turning Basin, driving sheet piles, and installation of the docks' surface features and berthing structure modifications. Potential impacts on aquatic resources due to these activities are described below.

Most fish species are highly mobile and would be expected to leave the vicinity of the project area during in- and over-water activities. However, dredging would result in direct mortality of benthic organisms such as mollusks and crustaceans within the dredge footprint. Slower, less mobile benthic invertebrates would also be directly affected, while larger, more mobile species, such as blue crab and redfish, would experience temporary displacement. Following construction activities, aquatic resources would be expected to return to the newly dredged area, which would be similar to the existing habitat, but would have an increased water depth of 43 feet (with an overdredge of 2 feet).

Dredging and pile driving activities would also temporarily increase noise, turbidity, and suspended solids within the water column, which can adversely affect fish eggs and juvenile fish survival, benthic community diversity and health, foraging success, and suitability of spawning habitat. Additionally, sediments in the water column could be deposited on nearby substrates, burying aquatic macroinvertebrates (an important food source for many species of fish). Impacts on aquatic resources due to increased turbidity and suspended solid levels would vary by species; however, the aquatic resources present within the project area are likely accustomed to regular fluctuations in noise and turbidity levels from industrial activity and regular maintenance dredging (every other year) within the existing Industrial Canal/Turning Basin. Further, Lake Charles LNG would use a cutter head suction dredge, which would minimize resuspension of sediments and the resulting increases in turbidity and suspended sediment levels. Due to the small volume of materials being dredged (about 26,000 cubic yards), short duration of dredging activities (30 days), and limited deepening of the existing open water habitat, we have determined impacts on aquatic resources from dredging would be localized, temporary, and minor.

Studies have shown that the sound waves from pile driving may result in injury or trauma to fish, sea turtles, and other animals with gas-filled cavities, such as swim bladders, lungs, sinuses, and hearing structures (Abbott and Sawyer, 2002). The intensity of the sound pressure levels produced during pile driving depends on a variety of factors such as the type and size of the pile, the substrate into which the pile is being driven, the depth of water, and the type of pile-driving equipment being used. Lake Charles LNG's Construction Noise Assessment Report does not address anticipated underwater noise levels associated with pile driving within the liquefaction facility and with the installation of the steel sheet piling for the TCDs. In order to allow for an accurate analysis of potential impacts on aquatic resources during pile driving, **we recommend that**:

- **<u>Prior to the end of the draft EIS comment period</u>, Lake Charles LNG should file with the Secretary a description of the proposed in-water pile installation process, including the number and type of pile driver(s) (e.g., impact or vibratory hammer), duration of in-water pile driving activities, anticipated peak and cumulative underwater sound pressure levels, and measures proposed to minimize impacts on aquatic resources in the vicinity of on-land and in-water pile driving activities.**

Over-water activities associated with installation of the Construction of the two TCDs and berthing dock modifications surfaces and modifications of the existing berthing docks may cause avoidance of the area by mobile species due to noise and movement, but this impact would be minor and temporary. During the 5-year project construction period, the two TCDs would create aquatic habitat in the form of additional hard substrate areas, allowing for the growth of attached organisms. Over-water dock structures may also provide a source of refuge for some aquatic species. Following construction of the liquefaction facility, the construction docks would be removed using shore-based equipment. Backfill material would be removed prior to extracting steel sheet piles, thereby minimizing impacts on aquatic resources associated with increased suspended sediment and turbidity levels in the water column. Although temporary avoidance of the area during dock removal activities is anticipated, this impact would be temporary and fisheries use of the area would revert to pre-project conditions upon completion of removal activities.

Waterbody Modifications and Water Withdrawals

Construction of the liquefaction facility would involve permanently filling 1 freshwater pond and 2 intermittent waterbodies, armoring and realigning 1 perennial waterbody, and filling and replacing 12 drainage ditches. Additionally, the perennial waterbody would be utilized as a water source for dust control and fill material additive during construction activities (see section 4.3.2.2). The perennial waterbody, an unnamed tributary to the Calcasieu River, is located along the southern boundary of the liquefaction facility and would be armored and realigned as part of the proposed stormwater system improvements. This waterbody has been historically altered and channelized and, therefore, offers minimal limnological or riparian function. Fish within the perennial waterbody and ponds at the time of water withdrawal could suffer from impingement or entrainment; those within the waterbodies during site preparation and dredged material placement are likely to suffer mortality. Following construction, fisheries use of the stream is expected to resume.

As described above (see Existing Resources), only the perennial stream provides year-round habitat for aquatic resources; the remaining waterbodies provide limited habitat value due to restricted water flow regimes. Because these features offer limited resources for aquatic resources, project-related impacts would not be significant.

Ballast Water

The effects of ballast water discharges on four ambient water quality parameters (temperature, pH, dissolved oxygen, and salinity) are described in section 4.3.2.2. Resident species within the Industrial Canal/Turning Basin are euryhaline (able to live in waters with a wide range of salinity) and are well adapted to natural spatiotemporal variation in salinity and oxygen levels. This adaptability and the ability to move over a short distance to more suitable conditions minimizes adverse impacts on aquatic resources associated with ballast water discharges.

U.S. regulations require that all vessels equipped with ballast water tanks that enter or operate in U.S. waters maintain a vessel-specific ballast water management plan and assign responsibility to the master or appropriate official to understand and execute the ballast water management strategy for that vessel (33 CFR 151.2026). Under these requirements, vessels must implement strategies to prevent the spread of exotic aquatic nuisance species in U.S. waters. These strategies include retaining ballast water on board, minimizing uptake or discharge at certain times or locations, and exchanging ballast water from coastal sources with mid-ocean seawater. Vessels that have operated outside of the U.S. Exclusive Economic Zone must either retain their ballast water on board or undergo a mid-ocean (greater than 200 nautical miles from shore and at a water depth greater than 6,562 feet) ballast water exchange in accordance with applicable regulations. Lake Charles LNG would discharge all ballast water under federal oversight and in accordance with federal regulations.

With the implementation of the mandatory practices required by the Coast Guard, we conclude that the impacts on aquatic resources from ballast water discharges associated with the project would not be significant.

Inadvertent Spills

Aquatic resources could be adversely affected by an accidental spill or leak of hazardous materials into or near a waterbody. To minimize potential impacts on aquatic resources, Lake Charles LNG would implement their SPAR Plan and SPCC Plan (see section 4.2.3). Implementation of the SPAR and SPCC Plans would minimize the potential for releases to occur. Should a spill or leak occur, implementation of the response measures in the SPAR and SPCC Plans would reduce response time and ensure appropriate cleanup, thereby minimizing impacts on aquatic resources.

Barge Traffic

Construction of the liquefaction facility would require an average of five barge deliveries per day over the 5-year construction period. Increases in barge traffic have the potential to increase shoreline erosion and suspended sediment concentrations due to increased wave activity. Because the barges would transit existing, industrial channels and are typically slow moving vessels, project-related increases in shoreline erosion or suspended sediment concentrations within the Industrial Canal/Turning Basin would not be significant.

4.6.2.2 Non-Liquefaction Facilities

Existing Aquatic Resources

Table 4.3.2-2 lists the waterbodies that would be crossed or affected by the Non-Liquefaction Facilities as well as the proposed crossing method and water quality classification for each feature. All of the waterbodies affected by the Non-Liquefaction facilities are freshwater and classified as warmwater fisheries. Of the 36 waterbodies impacted, 22 are classified as intermittent, ephemeral, or drainages/ canals, which typically provide limited value or marginal fishery habitat due to restricted water flow regimes. The remaining 14 waterbodies are classified as either perennial or open water and have the potential to provide suitable habitat for and support aquatic resources. Representative fish species found in these waterbodies are presented in table 4.6.2-1. No sensitive fish species, fisheries of concern, or EFH have been identified within the waterbodies affected by the Non-Liquefaction Facilities.

Impacts and Mitigation

Impacts on aquatic resources resulting from construction and operation of the Non-Liquefaction Facilities could include loss or modification of habitat, increased sedimentation and turbidity levels, and alteration of vegetative cover resulting from waterbody crossings; entrainment of small organisms during withdrawal of hydrostatic test water; and introduction of pollutants as a result of inadvertent spills or leaks of hazardous materials. These impacts are discussed in the following sections.

Waterbody Crossings

As detailed in section 4.3.2.2, construction of the proposed new pipelines and the Calcasieu River HDD would require crossing 18 perennial streams and 4 ponds that provide suitable habitat for aquatic resources. Trunkline proposes to conduct six HDD operations that would cross 8 of these perennial waterbodies. The remaining perennial waterbodies and the ponds would be crossed using the open-cut method (see table 4.3-2).

Installing the proposed pipelines using the HDD method would avoid or minimize impacts on fisheries, fish habitat, and other aquatic resources within and adjacent to waterbodies unless an inadvertent release of drilling mud were to occur. An inadvertent release of drilling mud into a stream would affect water quality and could impede fish movement, potentially resulting in stress, injury, and/or direct mortality of fish present in the vicinity of the release. If an inadvertent release occurs, Trunkline would implement the corrective action and cleanup measures outlined in its HDD Contingency Plan to minimize potential impacts on aquatic resources (see appendix D), including the installation of berms, silt fence, and/or hay bales to prevent silt-laden water from flowing into waterbodies, or in the event of an in-water release, the use of temporary dams to isolate the drilling fluid and vacuum trucks to remove the released drilling mud.

Use of the open-cut crossing method would result in temporary loss or modification of aquatic habitat, increase in sedimentation and turbidity levels, and alteration of vegetative cover. The majority of fish present within the waterbody at the time of construction activities would likely be displaced to similar adjacent habitats up or down stream; however, stress, injury, or death of individual fish may occur. Increased suspended sediment and turbidity levels may cause degradation of benthic and spawning habitat and decreased dissolved oxygen levels within and downstream of the crossing location. This temporary increase in suspended solids would decrease rapidly following the completion of instream activities. The clearing of riparian vegetation during construction may reduce shade and cover until revegetation occurs, indirectly causing a temporary increase in water temperature in localized areas. Clearing would be adjacent to existing rights-of-way at the three open-cut perennial waterbody crossings along the Mainline 200-3 Loop, which would minimize changes in water temperature because much of the vegetation is already maintained in a low-growing, herbaceous state and does not provide shade over the waterbodies.

Trunkline would implement the measures outlined in our Procedures to minimize impacts on waterbodies and aquatic resources during pipeline construction. These mitigation measures include reduced workspace areas near waterbodies, establishing buffers to prevent run-off from entering waterbodies, installing erosion control devices, and completion of instream construction activities within 24 or 48 hours, depending on crossing length. Once construction is complete, streambeds and banks would be restored to their preconstruction conditions and contours to the maximum extent practicable, which would aid in preventing erosion and minimize long-term impacts on aquatic resources.

Construction of Compressor Station 203-A would require the installation of piping beneath four drainage canals using the open-cut method and permanent filling of one 660-foot-long agricultural canal. Additionally, construction of the proposed new Columbia Gulf–Egan Meter Station would require installation of station piping beneath an intermittent waterbody using the open-cut method and installation of culverts within two drainage ditches to facilitate access to the meter station site. As noted above, these surface waters provide limited value for aquatic resources; therefore impacts would not be significant.

Due to the relatively small number of crossings, limited construction workspace and duration, and implementation of the mitigation measures described above, we anticipate that the project would have minimal and localized impacts on aquatic resources.

<u>Hydrostatic Testing</u>

Prior to placing the Non-Liquefaction Facilities into service, each component would be hydrostatically tested to ensure its integrity. Hydrostatic test water would be withdrawn from both surface waterbodies and municipal sources, as described in table 4.3.2-5. The water withdrawal process could entrain fish eggs and juvenile fish located near the intake hose. Trunkline would screen intake hoses at surface water intakes to eliminate or minimize the entrainment of fingerling and small fish during water withdrawal. Trunkline would regulate the timing, rate, and volume of hydrostatic test water withdrawals to maintain ambient downstream flow in the waterbodies from which hydrostatic test water would be withdrawn.

Hydrostatic test water would contact only new pipe and Trunkline has stated that it does not plan to add chemicals to the water. After testing is completed, the hydrostatic test water would be discharged to well-vegetated uplands and/or using energy dissipation devices to regulate the discharge rate and minimize the potential for erosion, streambed scour, suspension of sediments, and excessive stream flow. Therefore, impacts on aquatic resources due to hydrostatic testing would be temporary and negligible.

Accidental Spill or Leak of Hazardous Materials

Aquatic resources could be adversely affected by an accidental spill or leak of hazardous materials into or near a waterbody. As described in section 4.3.2.2, Trunkline would implement project-specific SPAR and SPCC Plans to minimize the potential for releases to occur. Should a spill or leak occur, implementation of the response measures in the SPAR and SPCC Plans would reduce response time and ensure appropriate cleanup, thereby minimizing impacts on aquatic resources.

4.6.3 Essential Fish Habitat

4.6.3.1 Regulatory Background

The MSA (Public Law 94-265 as amended through October 11, 1996) was established, along with other goals, to promote the protection of EFH during the review of projects to be conducted under federal permits, licenses, or other authorities that affect or have the potential to affect such habitat. EFH is defined in the MSA as those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity. Federal agencies that authorize, fund, or undertake activities that may adversely impact EFH must consult with NOAA Fisheries. Although absolute criteria have not been established for conducting EFH consultations, NOAA Fisheries recommends consolidated EFH consultations with interagency coordination procedures required by other statutes, such as NEPA, the Fish and Wildlife Coordination Act, and the ESA in order to reduce duplication and improve efficiency (50 CFR 600.920(e)). Generally, the EFH consultation process includes the following steps:

1. Notification – The action agency should clearly state the process being used for EFH consultations (e.g., incorporating EFH consultation into an EIS).

2. EFH Assessment – The action agency should prepare an EFH Assessment that includes both identification of affected EFH and an assessment of impacts. Specifically, the EFH should include:

    - a description of the proposed action;

    - an analysis of the effects (including cumulative effects) of the proposed action on EFH, managed fish species, and major prey species;

    - the federal agency's views regarding the effects of the action on EFH; and

    - proposed mitigation, if applicable.

3. EFH Conservation Recommendations – After reviewing the EFH Assessment, NOAA Fisheries should provide recommendations to the action agency regarding measures that can be taken by that agency to conserve EFH.

4. Agency Response – Within 30 days of receiving the recommendations, the action agency must respond to NOAA Fisheries. The action agency may notify NOAA Fisheries that a full response to the conservation recommendations would be provided by a specified completion date agreeable to all parties. The response must include a description of measures proposed by the agency to avoid, mitigate, or offset the impact of the activity on EFH.

The FERC proposes to incorporate EFH consultation for the Lake Charles Liquefaction Project with the interagency coordination procedures required under NEPA. As such, we are requesting that NOAA Fisheries consider the EIS as our EFH Assessment.

4.6.3.2 Essential Fish Habitat within the Project Area

Between 1979 and 1987, the Gulf of Mexico Fishery Management Council (GMFMC) prepared fishery management plans (FMP) for seven marine groups within the Gulf of Mexico: reef fish, migratory pelagic fish, red drum (*Sciaenops ocellatus*), shrimp, spiny lobster (*Panulirus argus*), stone crab (*Menippe adina* and *Menippe mercenaria*), and corals. Each FMP has been amended at least several times since then. One important amendment that applied to all seven FMPs occurred in 1998 and involved the identification of EFH for each group. All estuarine systems of the Gulf (e.g., Calcasieu River estuary) are considered EFH, which is managed by the GMFMC (GMFMC, 2010).

The GMFMC (2005) designated the Calcasieu River estuary and surrounding waters as EFH for four groups of finfish and shellfish, namely red drum, shrimp, reef fish, and coastal migratory pelagics (NOAA Fisheries, 2013). The only area classified as EFH within the project area is the Industrial Canal/Turning Basin. Two categories of EFH are present within this area: mud substrates and estuarine water column.

The mud substrates in and near the Industrial Canal/Turning Basin are composed of sub-tidal unconsolidated sediments. This EFH type serves as important nursery and feeding habitat for many fish and the invertebrates they feed on (e.g., worms and mollusks living on and in the sediments). Estuarine water column habitat serves as EFH for several species and their prey at various life stages by providing suitable habitat for spawning, breeding, and foraging. The community composition of both the mud substrates and estuarine water column within the Industrial Canal/Turning Basin remain in an early successional stage due to maintenance dredging being conducted every other year, propeller wash from passing vessels, and natural sedimentation.

4.6.3.3 Impacts and Mitigation

As described in section 4.6.1.2, construction of the TCDs and berthing dock modifications would require dredging an about 22.1-acre area, which would remove the existing benthic community within the dredge footprint. Construction of the TCDs and dredging activities would also temporarily increase noise, turbidity, and suspended solids within the water column, which can adversely affect fish eggs and juvenile fish survival, benthic community diversity and health, foraging success, and suitability of spawning habitat. Additionally, sediments in the water column could be deposited on nearby substrates, burying aquatic macroinvertebrates (an important food source for many species of fish). However, due to the small volume of materials being dredged (about 26,000 cubic yards), short duration of in-water disturbance, limited deepening of the existing estuarine water column, and ongoing maintenance dredging within the Industrial Canal/Turning Basin, these impacts are expected to be localized, temporary, and minor.

As non-federal parties assisting the FERC in meeting its obligations under the MSA, Lake Charles LNG coordinated with NOAA Fisheries' Southeast Regional Office, and on March 7, 2014, requested concurrence that the project would have no effect on EFH and that further consultation under the MSA is not warranted. In a March 13, 2014 email, NOAA Fisheries concurred with the determination that the dock work and related activity in the vicinity of the Turning Basin would not result in significant adverse impact on EFH. Based on the largely temporary nature of project-related impacts and concurrence from NOAA Fisheries' Southeast Regional Office, we have determined that the project would not have a significant adverse impact on EFH.

4.7 THREATENED, ENDANGERED, AND OTHER SPECIAL STATUS SPECIES

Federal agencies are required under Section 7 of the ESA, as amended, to ensure that any actions authorized, funded, or carried out by the agency would not jeopardize the continued existence of a federally listed threatened or endangered species, or result in the destruction or adverse modification of the designated critical habitat of a federally listed species. As the lead federal agency, the FERC is required to coordinate with the FWS and NOAA Fisheries to determine whether federally listed threatened or endangered species or designated critical habitat are found in the vicinity of the project, and to determine the proposed action's potential effects on those species or critical habitats.

For actions involving major construction activities with the potential to affect listed species or designated critical habitat, the lead federal agency must prepare a BA and submit its BA to the FWS and/or NOAA Fisheries. If the action would adversely affect a listed species, the federal agency must also submit a request for formal consultation. In response, the FWS and/or NOAA Fisheries would issue a Biological Opinion as to whether or not the federal action would likely jeopardize the continued existence of a listed species, or result in the destruction or adverse modification of designated critical habitat.

As required by Section 7 of the ESA, we request that the FWS accept the information provided in this EIS as the BA for the project. Further, we request concurrence with our findings of effect for the federally listed species in table 4.7-1. As described below, we have determined that the project would have no effect on listed species under the jurisdiction of NOAA Fisheries; therefore, no formal section 7 consultation between the FERC and NOAA Fisheries is required.

Lake Charles LNG and Trunkline, acting as the FERC's non-federal representatives, initiated informal consultation with the FWS Ecological Services Field Offices in Louisiana, Arkansas, and Mississippi and with NOAA Fisheries. As part of this effort, the FWS confirmed that the proposed project activities within Trunkline's existing facilities and easements in Louisiana would be covered under Trunkline's existing Blanket Clearance (dated January 9, 2014) (FWS, 2014a; FWS, 2014b). With certain conditions, the existing Blanket Clearance authorizes Trunkline to perform minor and routine pipeline construction and maintenance activities under the FERC's jurisdiction within the State of Louisiana (FWS, 2014a).

Lake Charles LNG and Trunkline also coordinated with the LNHP regarding state-listed or other special status species or habitat within 10 miles of the project area in Louisiana, and with the Mississippi Department of Wildlife, Fisheries, and Parks and Arkansas Natural Heritage Commission regarding the project components in Mississippi and Arkansas, respectively. Federally and state-listed species, as well as species that are candidates or proposed for listing, potentially occurring in the project area are identified in table 4.7-1.

TABLE 4.7-1

Federally and State-listed Species Potentially Occurring in the Vicinity of the Lake Charles Liquefaction Project

Common Name *Scientific Name*	Federal Status[a]	State Status[a]	Parish/ County[b]	Project Components	Determination of Effect and Comments
Birds					
Bald eagle *Haliaeetus leucocephalus*	DL	E	BL	Shaw Compressor Station	*Impacts would not be significant* Nesting typically occurs in mature trees (e.g., bald cypress, sycamore, willow) in or near cypress/tupelo swamps, fresh to intermediate marshes, or open water. Suitable habitat is present within the project area adjacent to major river crossings (e.g., Lacassine and Calcasieu Rivers). No bald eagles or their nests were identified during field surveys. In the event an active bald eagle nest is identified within 660 feet of a project area prior to construction, Trunkline would notify and consult with the FWS and LDWF with respect to the National Bald Eagle Management Guidelines.
			BD	Longville Compressor Station, Transco Ragley Meter Station, US 190 Meter Station Mod., MLV 202	
			CS	Liquefaction Facilities, Mainline Connector, Mainline 200-3 Loop, 203-A Compressor Station, LCLNG Export Meter Station, Kinder Morgan–Lake Charles Meter Station, Texas Gas–Woodlawn Meter Station, Calcasieu River HDD, 100-foot Overhead Crossing	
				Gulf Crossing–Perryville Meter Station, MEP–Perryville Meter Station	
			RL		
Brown pelican *Pelecanus occidentalis*	DL	E	CA	NGPL–Lakeside Meter Station	*Impacts are not anticipated* The species is largely restricted to coastal waters for foraging and nesting. No suitable habitat is present in or adjacent to the project area.
Interior least tern *Sterna antillarum athalassos*	E	E	BL	Shaw Compressor Station	*No effect* Nesting occurs on barren or sparsely vegetated beaches, bays, estuaries, lagoons, lakes, and rivers. No suitable habitat is present in or adjacent to the project area.
			CH	Mississippi Barrel West	
			GA	Pollock Compressor Station	
			WA	Mississippi Barrel East	
Piping plover *Charadrius melodus*	T	-	CA	NGPL–Lakeside Meter Station	*No effect* Nesting occurs on wide, flat, open, sandy beaches. No suitable habitat is present in or adjacent to the project area.
			CH	Mississippi Barrel West	
Red-cockaded woodpecker *Picoides borealis*	E	E	AL	TETCO–Allen Meter Station	*Not likely to adversely affect* Species occurs in open, park-like stands of mature pine forest. Suitable habitat is present adjacent to the project area near the Pollock Compressor Station. Forested habitat within the fenced boundary of the station would not be cleared, and construction would be limited to previously disturbed areas of the site. Additionally, work in this area would be conducted in accordance with Trunkline's existing Blanket Clearance for work in existing, previously disturbed workspaces; therefore, adverse impacts on the species are not anticipated. Suitable habitat is not present elsewhere within the project area.
			BD	Longville Compressor Station, Transco Ragley Meter Station, US 190 Meter Station Mod., MLV 202	
			CS	Liquefaction Facilities, Mainline Connector, Mainline 200-3 Loop, 203-A Compressor Station, LCLNG Export Meter Station, Kinder Morgan–Lake Charles Meter Station, Texas Gas–Woodlawn Meter Station, Calcasieu River HDD, 100-foot Overhead Crossing	
				Pollock Compressor Station	
			GA		

TABLE 4.7-1 (cont'd)

Federally and State-listed Species Potentially Occurring in the Vicinity of the Lake Charles Liquefaction Project

Common Name *Scientific Name*	Federal Status[a]	State Status[a]	Parish/ County [b]	Project Components	Determination of Effect and Comments
Red knot *Calidris canutus*	P	-	CA	NGPL–Lakeside Meter Station	*Not likely to jeopardize the continued existence* The species breeds in Alaska and Canada and may overwinter on coastlines of the Gulf of Mexico. Wintering habitat occurs along seacoasts and consists of tidal flats and beaches. No suitable wintering habitat is present in or adjacent to the project area.
Sprague's pipit *Anthus spragueii*	C	-	AC	Columbia Gulf–Egan Meter Station	*Project would not contribute to a trend toward federal listing* The species breeds in native prairie of the Great Plains. Wintering habitat in southern Louisiana consists of native prairie; this community type does not occur within or adjacent to the project area.
			AL	TETCO–Allen Meter Station	
			CA	NGPL–Lakeside Meter Station	
			CS	Liquefaction Facilities, Mainline Connector, Mainline 200-3 Loop, 203-A Compressor Station, LCLNG Export Meter Station, Kinder Morgan–Lake Charles Meter Station, Texas Gas–Woodlawn Meter Station, Calcasieu River HDD, 100-foot Overhead Crossing	
			JD	Mainline Connector, Mainline 200-3 Loop, Tennessee–Kaplan Meter Station	
			RL	Gulf Crossing–Perryville Meter Station, MEP–Perryville Meter Station	
Terrestrial Mammals					
Louisiana black bear *Ursus americanus lutelous*	T, CH	-	RL	Gulf Crossing–Perryville Meter Station, MEP–Perryville Meter Station	*No effect* The species primarily inhabits large, undisturbed contiguous tracts of bottomland hardwood forest and utilizes a variety of habitat types including marshes and upland forests. Within the species' range, neither suitable habitat nor designated critical habitat are present within or adjacent to the project area. The nearest designated critical habitat to the project area is about 5.9 miles southeast of the Epps Compressor Station.
			WA	Mississippi Barrel East	
			WC	Epps Compressor Station	
Northern long-eared bat *Myotis septentrionalis*	P	-	GA	Pollock Compressor Station	*Not likely to jeopardize the continued existence* The species hibernates in caves and abandoned mines during the winter and roosts in trees during summer months. Within the species' range, suitable habitat is not present in or adjacent to the project area.
			RL	Gulf Crossing–Perryville Meter Station, MEP–Perryville Meter Station	

TABLE 4.7-1 (cont'd)

Federally and State-listed Species Potentially Occurring in the Vicinity of the Lake Charles Liquefaction Project

Common Name *Scientific Name*	Federal Status[a]	State Status[a]	Parish/ County [b]	Project Components	Determination of Effect and Comments
Terrestrial Reptiles					
Louisiana pine snake *Pituophis ruthveni*	C	C	BD	Longville Compressor Station, Transco Ragley Meter Station, US 190 Meter Station Mod., MLV 202	*Project would not contribute to a trend toward state or federal listing*
			GA	Pollock Compressor Station	The species inhabits fire-maintained, longleaf pine savannah with sandy, well-drained soils and herbaceous ground cover. This community type does not occur in the project area.
Fish					
Gulf sturgeon *Acipenser oxyrinchus desotoi*	T	T	CA	NGPL–Lakeside Meter Station	*No effect* This anadromous fish spawns in large, free-flowing freshwater rivers with hard substrates composed of sand, rock, or rubble in spring and forages in lower rivers during summer months before returning to coastal waters during the winter. No waterbodies with suitable habitat would be impacted by the project.
Pallid sturgeon *Scaphirhynchus albus*	E	E	BL	Shaw Compressor Station	*No effect*
			CH	Mississippi Barrel West	The species is restricted to main channel habitats in the Mississippi River and its large tributaries, neither of which would be impacted by the project.
			GA	Pollock Compressor Station	
			WA	Mississippi Barrel East	
Mussels					
Fat pocketbook *Potamilus capax*	E	-	BL	Shaw Compressor Station	*No effect*
			WA	Mississippi Barrel East	The species occurs in perennial rivers with sand, mud, and silt substrates. Within the species' range, suitable habitat would not be impacted by the project.
Louisiana pearlshell *Margaritifera hembeli*	T	-	GA	Pollock Compressor Station	*No effect* The species occurs in clear, moderately swift-flowing, perennial streams with stable substrate. Within the species' range, suitable habitat would not be impacted by the project.
Sheepnose Mussel *Plethobasus cyphyus*	E	-	WA	Mississippi Barrel East	*No effect* The species occurs in large streams with moderately swift currents and inhabits shallow waters with course sand and gravel substrates. Within the species' range, suitable habitat would not be impacted by the project. This species is no longer included in the FWS Information, Planning, and Conservation system Trust Resources List for Washington County.

TABLE 4.7-1 (cont'd)

Federally and State-listed Species Potentially Occurring in the Vicinity of the Lake Charles Liquefaction Project

Common Name *Scientific Name*	Federal Status[a]	State Status[a]	Parish/ County [b]	Project Components	Determination of Effect and Comments
Plants					
American chaffseed *Schwalbea americana*	E	E	AL BD	TETCO–Allen Meter Station Longville Compressor Station, Transco Ragley Meter Station, US 190 Meter Station Mod., MLV 202	*No effect* The species occurs in acidic, sandy or peaty soils within open pine flatwoods, pitch pine lowland forests, seepage bogs, palustrine pine savannahs, and other grass- and sedge-dominated plant communities. Within the species range, suitable habitat would not be impacted by the project.
Pondberry *Lindera melissifolia*	E	-	BL WA	Shaw Compressor Station Mississippi Barrel East	*No effect* The species occurs in seasonally flooded wetlands such as bottomland hardwood forests, forested swales, margins of shallow ponds, and bottoms of seasonal ponds. Within the species' range, suitable habitat is not located in or adjacent to the project area.
Marine/Aquatic Mammals					
West Indian manatee *Trichechus manatus*	E	-	CA	NGPL–Lakeside Meter Station	*No effect* Species inhabits in large, slow-moving rivers, river mouths, and shallow coastal areas such as coves and bays. No suitable habitat would be impacted by the project.
Blue whale *Balaenoptera musculus*	E	-	CA	NGPL–Lakeside Meter Station	*No effect* The species inhabits the open ocean, which would not be impacted by the project.
Finback whale *Balaenoptera physalus*	E	-	CA	NGPL–Lakeside Meter Station	*No effect* The species inhabits the open ocean, which would not be impacted by the project.
Humpback whale *Megaptera novaeangliae*	E	-	CA	NGPL–Lakeside Meter Station	*No effect* The species inhabits the open ocean, coastal waters, and sometimes inshore areas such as bays. The project would not impact the species or its habitat.
Sei whale *Balaenoptera borealis*	E	-	CA	NGPL–Lakeside Meter Station	*No effect* The species inhabits the open ocean, which would not be impacted by the project.
Sperm whale *Physeter macrocephalus*	E	-	CA	NGPL–Lakeside Meter Station	*No effect* The species inhabits the open ocean, which would not be impacted by the project.

TABLE 4.7-1 (cont'd)

Federally and State-listed Species Potentially Occurring in the Vicinity of the Lake Charles Liquefaction Project

Common Name *Scientific Name*	Federal Status[a]	State Status[a]	Parish/ County [b]	Project Components	Determination of Effect and Comments
Marine Reptiles					
Green sea turtle *Chelonia mydas*	T	-	CA	NGPL–Lakeside Meter Station	*No effect* The species is restricted to coastal areas and the open ocean, which would not be impacted by the project.
Hawksbill sea turtle *Eretmochelys imbricate*	E	-	CA	NGPL–Lakeside Meter Station	*No effect* The species is restricted to coastal areas and the open ocean, which would not be impacted by the project.
Kemp's Ridley sea turtle *Lepidochelys kempii*	E	-	CA	NGPL–Lakeside Meter Station	*No effect* The species is restricted to coastal areas and the open ocean, which would not be impacted by the project.
Leatherback sea turtle *Dermochelys coriacea*	E	-	CA	NGPL–Lakeside Meter Station	*No effect* The species is restricted to coastal areas and the open ocean, which would not be impacted by the project.
Loggerhead sea turtle *Caretta caretta*	T	-	CA	NGPL–Lakeside Meter Station	*No effect* The species is restricted to coastal areas and the open ocean, which would not be impacted by the project.

[a] Federal and state status includes: Endangered (E), Threatened (T), Proposed (P), Candidate (C), Delisted (DL), and Critical Habitat (CH).

[b] Parishes/counties include Acadia (AC), Allen (AL), Beauregard (BD), Calcasieu (CS), Cameron (CA), Grant (GA), Jefferson Davis (JD), Richland (RL), and West Carroll (WC) Parishes, Louisiana; Bolivar (BL), and Washington (WA) Counties, Mississippi; and Chicot (CH) County, Arkansas.

Based on a review of publicly available information, agency correspondence, and field surveys, a total of 28 federally and state-listed threatened and endangered, candidate, and proposed species occur in parishes and/or counties impacted by the project. In addition, critical habitat has been designated for the Louisiana black bear in Richland and West Carroll Parishes, Louisiana. We have determined that the project would have no effect on 22 of the 28 federally and/or state-listed species, is not likely to cause the jeopardy of 2 proposed species, and would not contribute to the trend toward federal listing for 2 candidate species. Table 4.7-1 summarizes the potential for the project to affect these species and the rationale for our determinations. Because the project would not affect these species, they are not discussed further in this EIS. Further discussion of one federally listed species and one state-listed species and our assessment of potential impacts are provided in sections 4.7.1 and 4.7.2.

4.7.1 Federally Listed Threatened and Endangered Species

Based on information obtained from the FWS and NOAA Fisheries, 22 federally listed threatened and endangered species, 2 species proposed for federal listing under the ESA, and 2 species that are candidates for listing under the ESA may occur within the parishes and/or counties affected by the project. Of these species, one federally listed endangered species (red-cockaded woodpecker) has the potential to be located in the vicinity of the project area and is discussed below.

The red-cockaded woodpecker is a federally listed endangered bird that inhabits open, park-like stands of mature pine forests. Although the red-cockaded woodpecker nests in excavated cavities of mature pine trees, generally 70 years or older, they may also utilize pine or pine/hardwood stands of forest, woodland, or savannah 30 years or older for foraging habitat (FWS, 2003). They feed on a variety of insects and seasonal wild fruit. The decline of the red-cockaded woodpecker has been caused by the loss of old growth pine forest due to development, shorter rotation pine management, and the encroachment of hardwood mid-story in the pine forest due to fire suppression (FWS, 2008b).

The red-cockaded woodpecker was identified as potentially occurring in Allen, Beauregard, Calcasieu, and Grant Parishes, Louisiana. Table 4.7-1 identifies the project components that could potentially impact affect this species. The LNHP (2013) indicated that suitable habitat may be present within the area and provided seven records of the red-cockaded woodpecker within 1 mile of the existing Pollock Compressor Station, which is located in Grant Parish. The closest record is located 0.1 mile southwest of the Pollock Compressor Station, within the Kisatchie National Forest. As described in section 4.6.1.3, the Pollock Compressor Station is located on land owned by Trunkline, but is surrounded by the Kisatchie National Forest.

Although construction at the existing Pollock Compressor Station would be conducted within the existing fence lines where ground has been previously disturbed, any red-cockaded woodpeckers present in adjacent areas within the Kisatchie National Forest could be temporarily disturbed during construction activities. Trunkline has stated that work at the Pollock Compressor Station would be conducted in accordance with its existing Blanket Clearance, which includes stipulations for work conducted adjacent to habitat containing cavity trees used by red-cockaded woodpeckers (FWS, 2014a).

Suitable habitat for the red-cockaded woodpecker was not identified during the field surveys in Allen, Beauregard, and Calcasieu Parishes. As part of Lake Charles LNG's and Trunkline's informal consultation with the FWS, the FWS confirmed in a November 27, 2012 email to TRC that activities at the liquefaction facility site would have *no effect* on federally listed species. In a March 31, 2014 response to a subsequent letter from TRC, the FWS provided concurrence that by adhering to the Blanket Clearance's stipulations for work at the Pollock Compressor Station, the project is not likely to adversely affect the red-cockaded woodpecker. Therefore, we have determined that the project *may affect, but is not likely to adversely affect* the red-cockaded woodpecker. However, because the Blanket Clearance only covers activities conducted in 2014, and to ensure that the stipulations do not materially change by the time the project goes to construction, **we recommend that**:

- **<u>Prior to construction</u>, Trunkline should file with the Secretary an updated Blanket Clearance regarding federally listed species under the ESA and/or, if an updated Blanket Clearance is not issued or the stipulations of the Blanket Clearance change, updated documentation from the FWS that the previous determinations of effect are still current. Trunkline should not begin construction activities <u>until</u>:**

  a. the staff completes any consultation with the FWS, if required; and

  b. Trunkline has received written notification from the Director of OEP that construction or use of mitigation may begin.

4.7.2 State-Listed and Special Status Species

Based on information obtained from the LDWF and the Arkansas Game and Fish Commission, seven state-listed threatened or endangered species and one candidate species are listed within the parishes/counties impacted by the project (LDWF, 2014b; Arkansas Natural Heritage Commission, 2010). Six of the state-listed species are also federally listed as threatened, endangered, or candidate species; these species are discussed in section 4.7.1 above. No state-listed species in Mississippi have been observed within counties that would be impacted by the project (Mississippi Museum of Natural Science, 2013). The project is expected to have no impact on one of the two non-federally listed species (brown pelican) due to the absence of suitable habitat within the project area. The remaining state-listed species, the bald eagle, is discussed below.

The bald eagle is state listed in Louisiana as endangered within several parishes crossed by the project. The bald eagle was federally delisted in 2007, but is still federally protected by the MBTA and by the BGEPA, which prohibits the "taking" of bald eagles, including their parts, nests, or eggs. The bald eagle winters and breeds throughout the United States near large waterbodies including rivers, lakes, and coastal areas. In Louisiana, bald eagles nest primarily in southeastern coastal areas but are also known to nest near large lakes in the northern and central portions of the state. Bald eagles forage on fish, waterfowl, carrion, nutria, and muskrats. Current threats to this species include loss of nesting habitat and disturbance to nesting pairs from humans during the nesting season (LDWF, 2014c).

No bald eagles or their nests were identified during field surveys conducted by Lake Charles LNG and Trunkline in September 2012 and March through May 2013. The LNHP (2013) has one record of a bald eagle within 10 miles of the project area, located about 2.5 miles southeast of MP 176.5 on the Mainline 200-3 Loop. The FWS (2013c) also indicated that floodplains associated with the Lacassine River may contain nesting bald eagles. Trunkline would utilize the HDD method to cross Lacassine Bayou and other large waterbodies, which would minimize the likelihood of project-related impacts on the bald eagle. Because no nesting sites were observed during field surveys, and the HDD method would be used to minimize potential impacts, we have determined the project would not significantly impact the bald eagle. In the event a bald eagle or its nest is identified within 660 feet of a project area prior to construction, Lake Charles LNG or Trunkline would notify the FWS and LDWF in accordance with the *National Bald Eagle Management Guidelines*.

4.8 LAND USE, RECREATION, AND VISUAL RESOURCES

4.8.1 Land Use

The Lake Charles Liquefaction Project would affect seven general land use types, including agricultural, industrial/commercial, open land, open water, forest, pine plantation, and residential. The definition of each land use type is as follows:

- Agricultural – includes active cropland, pasture, and/or hayfields;
- Industrial/Commercial – includes power or utility stations, manufacturing or industrial plants, paved areas, landfills, commercial or retail facilities, and roads;
- Open Land – includes non-forested lands, maintained utility rights-of-way (including utility corridors), and herbaceous palustrine emergent or scrub-shrub wetlands;
- Open Water – includes larger waterbody crossings such as lakes, ponds, and rivers, as well as the Industrial Canal/Turning Basin;
- Forest – includes upland or wetland forest including palustrine forested;
- Pine Plantation – includes forested lands actively used for silviculture operations; and
- Residential – includes existing developed residential areas and planned residential developments. This may include large developments or residentially zoned areas that have been developed.

Table 4.8.1-1 shows the acreage impacts associated with construction and operation of the project components by land use type. As shown in the table, construction of the project would affect a total of about 1,522.2 acres, after which about 453.5 acres of land (for new aboveground facilities and pipeline easements) would be permanently required for operation of the project (as indicated in footnote c of table 4.8.1-1, this total includes 16.6 acres of the Mainline 200-3 Loop that would overlap an existing Trunkline pipeline easement, and 1.0 acre occupied by an existing mainline valve and access road that would be within the new Compressor Station 203-A facility boundary.) Of the remaining 1,068.7 acres, about 743.5 acres would be allowed to revert to preconstruction land use type. The other 325.2 acres consists of the ACWs that would be used during construction of the proposed liquefaction facility. Lake Charles LNG would not retain this land following construction; however, in accordance with landowner agreements, they would not restore the ACWs to preconstruction condition. These areas would be cleared and slightly elevated, making them more suitable for landowners' future development plans.

TABLE 4.8.1-1

Land Use Types and Acres Affected by Construction and Operation of the Lake Charles Liquefaction Project[a,b]

	Agricultural		Residential		Industrial/ Commercial		Open Water		Open Land		Forest		Pine Plantation		Total	
Facility	Cons.	Oper.	Cons.	Oper.	Cons.	Oper.	Cons.	Oper.	Cons.	Oper.	Cons.	Oper.	Cons.	Oper.	Cons.	Oper.
LIQUEFACTION FACILITY, LNG TERMINAL, AND ACW																
Liquefaction Facility	0	0	0	0	34.2	34.2	6.3	6.3	36.4	36.4	209.0	209.0	0	0	**285.9**	**285.9**
LNG Terminal	0	0	0	0	151.8	0	22.1	0	0	0	0	0	0	0	**173.9**	**0.0**
ACW	0	0	0	0	2.3	0	0.1	0	111.6	0	211.2	0	0	0	**325.2**	**0.0**
Subtotal	**0**	**0**	**0**	**0**	**188.3**	**34.2**	**28.5**	**6.3**	**148.0**	**36.4**	**420.2**	**209.0**	**0**	**0**	**785.0**	**285.9**
NON-LIQUEFACTION FACILITIES																
Pipelines																
Mainline Connector																
Right-of-way	78.7	32.0	0.9	0.3	2.7	1.3	1.9	1.1	4.6	2.2	22.6	12.9	39.6	18.0	**150.9**	**67.8**
ATWS	32.7	0.0	0.6	0.0	2.2	0.0	0.1	0.0	0.3	0.0	3.6	0.0	3.8	0.0	**43.3**	**0.0**
Subtotal	**111.3**	**32.0**	**1.6**	**0.3**	**4.9**	**1.3**	**2.0**	**1.1**	**4.9**	**2.2**	**26.2**	**12.9**	**43.4**	**18.0**	**194.2**	**67.8**
Mainline 200-3 Loop[c]																
Right-of-way	36.9	24.8	0.0	0.0	1.3	1.0	0.5	0.4	7.9	5.7	7.1	6.6	0.7	0.7	**54.4**	**39.3**
ATWS	23.7	0.0	0.0	0.0	0.9	0.0	0.0	0.0	10.7	0.0	1.2	0.0	0.0	0.0	**36.5**	**0.0**
Subtotal	**60.6**	**24.8**	**0.0**	**0.0**	**2.2**	**1.0**	**0.5**	**0.4**	**18.6**	**5.7**	**8.3**	**6.6**	**0.7**	**0.7**	**90.9**	**39.3**
Mainline 100-3																
Mississippi East	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**2.0**	**0.0**
Mississippi West	0.0	0.0	0.0	0.0	1.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**1.6**	**0.0**
Subtotal	**0.0**	**0.0**	**0.0**	**0.0**	**3.6**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**3.6**	**0.0**
Mainline 200-1																
Calcasieu River HDD	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.4	32.3	0.2	3.4	1.9	0.0	0.0	**36.1**	**2.5**
U.S. 190 Meter	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	**1.2**	**0.0**
Subtotal	**0.0**	**0.0**	**0.0**	**0.0**	**0.2**	**0.0**	**0.4**	**0.4**	**33.3**	**0.2**	**3.4**	**1.9**	**0.0**	**0.0**	**37.3**	**2.5**

TABLE 4.8.1-1 (cont'd)

Land Use Types and Acres Affected by Construction and Operation of the Lake Charles Liquefaction Project [a,b]

	Agricultural		Residential		Industrial/ Commercial		Open Water		Open Land		Forest		Pine Plantation		Total	
Facility	Cons.	Oper.	Cons.	Oper.	Cons.	Oper.	Cons.	Oper.	Cons.	Oper.	Cons.	Oper.	Cons.	Oper.	Cons.	Oper.
Contractor Yard																
Right-of-way	**0.0**	**0.0**	**0.0**	**0.0**	**20.8**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**20.8**	**0.0**
Aboveground Facilities																
New Compressor Station																
203-A[c]	**45.6**	**45.6**	**0.0**	**0.0**	**1.0**	**1.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**46.6**	**46.6**
Modifications to Existing Compressor Stations																
Longville (existing)	0.0	0.0	0.0	0.0	44.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**44.5**	**0.0**
Pollock (existing)	0.0	0.0	0.0	0.0	78.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**78.4**	**0.0**
Epps (existing)	0.0	0.0	0.0	0.0	41.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**41.9**	**0.0**
Shaw (existing)	0.0	0.0	0.0	0.0	62.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**62.9**	**0.0**
Subtotal	**0.0**	**0.0**	**0.0**	**0.0**	**227.8**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**227.8**	**0.0**
New Meter Stations																
LCLNG Export[d]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**	**0.0**
Kinder Morgan–Lake Charles	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.4	1.5	0.0	0.0	0.0	0.0	**2.4**	**1.5**
Columbia Gulf–Egan	1.5	0.6	0.0	0.0	0.0	0.0	0.0	0.0	1.6	0.8	0.4	0.2	0.0	0.0	**3.5**	**1.6**
Gulf Crossing–Perryville	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.5	1.2	0.0	0.0	0.0	0.0	**3.0**	**1.2**
MEP–Perryville	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.4	2.1	0.0	0.0	0.0	0.0	**4.4**	**2.1**
Subtotal	**2.0**	**0.6**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**10.9**	**5.6**	**0.4**	**0.2**	**0.0**	**0.0**	**13.3**	**6.4**
Modifications to Existing Meter Stations																
NGPL–Lakeside	2.9	0.3	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**3.2**	**0.3**
TETCO–Allen	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	4.0	1.8	0.0	0.0	0.0	0.0	**4.2**	**1.8**
Texas Gas–Woodlawn	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	1.6	0.0	0.1	0.0	0.0	0.0	**1.9**	**0.0**
Tennessee–Kaplan[d]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**	**0.0**
Transco Ragley	0.0	0.0	0.0	0.0	0.7	0.0	0.0	0.0	1.3	0.0	0.0	0.0	0.0	0.0	**2.0**	**0.0**
Subtotal	**2.9**	**0.3**	**0.0**	**0.0**	**1.5**	**0.0**	**0.0**	**0.0**	**6.9**	**1.8**	**0.1**	**0.0**	**0.0**	**0.0**	**11.4**	**2.1**

TABLE 4.8.1-1 (cont'd)

Land Use Types and Acres Affected by Construction and Operation of the Lake Charles Liquefaction Project [a,b]

	Agricultural		Residential		Industrial/ Commercial		Open Water		Open Land		Forest		Pine Plantation		Total	
Facility	Cons.	Oper.	Cons.	Oper.	Cons.	Oper.	Cons.	Oper.	Cons.	Oper.	Cons.	Oper.	Cons.	Oper.	Cons.	Oper.
Total for Aboveground Facilities	**50.4**	**46.5**	**0.0**	**0.0**	**230.3**	**1.0**	**0.1**	**0.0**	**17.8**	**7.4**	**0.5**	**0.2**	**0.0**	**0.0**	**299.0**	**55.0**
Access Roads																
Mainline Connector	<0.1	0.0	0.0	0.0	49.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	**49.9**	**0.0**
Mainline 200-3 Loop	1.8	0.0	0.0	0.0	8.5	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	**10.4**	**0.0**
Mainline 200-1	0.0	0.0	0.0	0.0	20.8	0.0	<0.1	0.0	6.7	0.0	0.1	0.0	0.0	0.0	**27.6**	**<0.1**
Meter Stations	0.0	0.0	0.0	0.0	1.8	1.7	0.0	0.0	1.7	1.4	0.0	0.0	0.0	0.0	**3.5**	**3.0**
Subtotal	**1.8**	**0.0**	**0.0**	**0.0**	**80.8**	**1.7**	**0.0**	**0.0**	**8.5**	**1.4**	**0.2**	**0.0**	**0.1**	**0.0**	**91.3**	**3.1**
Total for Non-Liquefaction Facilities	**224.2**	**103.3**	**1.6**	**0.3**	**342.8**	**4.9**	**2.9**	**1.9**	**83.0**	**16.9**	**38.5**	**21.5**	**44.2**	**18.8**	**737.2**	**167.6**
PROJECT TOTALS	**224.2**	**103.3**	**1.6**	**0.3**	**531.1**	**39.1**	**31.4**	**8.2**	**231.0**	**53.3**	**458.7**	**230.5**	**44.2**	**18.8**	**1,522.2**	**453.5**

[a] The numbers in this table have been rounded for presentation purposes. As a result, the totals may not reflect the sum of the addends.

[b] Operational impacts shown for existing aboveground facilities to be modified, expanded, or affected during construction only include new operational impacts that would result from the proposed project (i.e., increases in existing operational footprint).

[c] Although included for completeness (to represent full acreage permanently encumbered by the new facilities), new operational impacts shown for the Mainline 200-3 Loop would actually be 16.6 acres less than those depicted in this table due to overlap with the existing pipeline right-of-way, and the new operation impacts shown for Compressor Station 203-A would be 1.0 acre less that those depicted because existing MLV 203-A and an associated access road would be within the new facility boundaries.

[d] Impacts for the LCLNG Export and Tennessee–Kaplan Meter Stations are included in the impacts shown for the liquefaction facility and Mainline 200-3 Loop, respectively.

4.8.1.1 Liquefaction Facility

Modifications to the existing LNG terminal would occur on industrial/commercial land within the existing 151.8-acre fenced facility. Additionally, Lake Charles LNG would dredge 22.1 acres of the Industrial Canal/Turning Basin during construction of the two TCDs (see section 4.3.2.2 for further discussion). The new liquefaction facility would be constructed on a 285.9-acre site located immediately to the north of and directly adjacent to the existing LNG terminal. The majority of the proposed liquefaction facility site (about 209.0 acres or 73 percent) is forest land, mostly classified as a wetland/upland mosaic or pimple-mound complex. The remainder of the site is mainly open land (36.4 acres or 13 percent) and industrial/commercial land (34.2 acres or 12 percent) consisting of existing office buildings and parking areas for the Alcoa-Lake Charles Facilities, and 6.3 acres (2 percent) of open water, most of which would be filled during site preparation. Lake Charles LNG would convert the entire liquefaction facility site to industrial use. About 211.2 acres (65 percent) of the ACWs required during construction is composed of forest land, followed by 111.6 acres (34 percent) of open land, 2.3 acres (about 1 percent) of industrial/commercial land, and 0.1 acre (less than 1 percent) of open water. Following construction of the liquefaction facilities, the ACWs would be stabilized as graveled or vegetated surfaces in accordance with landowner agreements.

4.8.1.2 Non-Liquefaction Facilities

Proposed New Pipelines

Land use-related impacts associated with the Mainline Connector and Mainline 200-3 Loop pipelines would include the disturbance of existing uses within the construction rights-of-way and ATWS during construction and retention of an expanded or new permanent right-of-way for operation of the pipelines.

<u>Mainline Connector</u>

The proposed 11.4-mile-long, 42-inch-diameter Mainline Connector would be constructed on newly created right-of-way. During construction of the Mainline Connector, Trunkline would generally use a 125-foot-wide construction corridor, consisting of 50 feet of permanent right-of-way for operation of the pipeline and 75 feet of temporary construction workspace. The construction right-of-way would be reduced within wetlands as discussed in section 4.4.2.2. Construction would also require the use of ATWSs at road, wetland, and waterbody crossings to provide extra space for construction activities and excavated materials storage. The predominant land use types affected by construction of the pipeline, including the construction right-of-way and ATWS, would be agricultural (111.3 acres), pine plantation (43.4 acres), and forest land (26.2 acres), followed by open and industrial/commercial land (4.9 acres each), residential land (1.6 acres), and open water (2.0 acres). Land uses within the permanent right-of-way include 32.0 acres of agricultural land, 18.0 acres of pine plantation, 12.9 acres of forest land, 2.2 acres of open land, 1.3 acres of industrial/commercial land, 1.1 acres of open water, and 0.3 acre of residential land.

<u>Mainline 200-3 Loop</u>

The entire 6.5-mile-long, 24-inch-diameter Mainline 200-3 Loop would be collocated with an existing Trunkline pipeline right-of-way. During construction of the Mainline 200-3 Loop, Trunkline would use a 75-foot-wide construction right-of-way, consisting of 50 feet of permanent right-of-way and 25 feet of temporary construction workspace, as well as ATWS at road, wetland, and waterbody crossings. Twenty-five feet of the permanent right-of-way would overlap the existing permanent easement (16.6 acres). The predominant land use types affected by construction of the pipeline, including the construction right-of-way and ATWS, would be agricultural (60.6 acres) and open land (18.6 acres), followed by forest (8.3 acres), industrial/commercial land (2.2 acres), pine plantation (0.7 acre), and open water (0.5 acre). Land uses within the permanent right-of-way include 24.8 acres of agricultural land, 6.6 acres of forest land, 5.7 acres of open land, 1.0 acre of industrial/commercial land, 0.7 acre of pine plantation, and 0.4 acre of open water.

Proposed Pipeline Modifications

Mainline 100-3

The Mainline 100-3 modifications would occur within the existing facility boundaries and require temporary disturbance of 3.6 acres of industrial/commercial land. No new permanent right-of-way would be required for operation of the modified facilities.

Mainline 200-1

Workspace for the Calcasieu River HDD would include 32.3 acres of open land, 3.4 acres of forest land, and 0.4 acre of open water, most of which would be within an existing Trunkline pipeline right-of-way. About 2.5 acres would comprise new permanent right-of-way, consisting of forest, open water, and open land. Impacts of the new permanent right-of-way between the HDD entry and exit points would be minimal, and would be limited to the cutting of a small path using non-mechanized equipment and foot traffic to lay the tracing wires during HDD construction if necessary. This area would not be maintained during operation of the pipeline.

Construction of the U.S. 190 Meter Station modifications would require a total of 1.2 acres, including the existing facility and adjacent ATWSs. Construction would affect 0.2 acre of industrial/commercial land and 1.0 acre of open land. Following construction, the ATWSs would revert to preconstruction condition and use and the modified meter station would continue to operate within the facility's existing 0.3-acre footprint.

Aboveground Facilities

Compressor Stations

Construction and operation of proposed new Compressor Station 203-A would require a total of 46.6 acres of land, including 45.6 acres of agricultural land and 1.0 acre of industrial/commercial land that includes existing MLV 203-A and an associated access road. All of the affected agricultural land would be converted to commercial/industrial land use during operation of the new facilities including the compressor station, permanent right-of-way for suction/discharge piping, and permanent access road.

Modifications to the four existing compressor stations would occur within the fenced boundaries of the existing station sites, affecting a total of 227.8 acres of industrial/commercial land. Following construction, these facilities would continue to operate within the existing facility boundaries; no additional land would be acquired or permanently maintained for these modifications.

Meter Stations

Construction activities required for the proposed modifications to the five existing meter stations, excluding the modifications to the access roads, would disturb 11.4 acres including 6.9 acres of open land, 2.9 acres of agricultural land, 1.5 acres of industrial/commercial lands, and 0.1 acre of forest land. After construction, operation of the Texas Gas–Woodlawn and Transco-Ragley Meter Stations would continue within the existing boundaries of those facilities, and the temporary workspace required for construction would revert to preconstruction condition and use. The Tennessee–Kaplan Meter Station would be operated within the Mainline 200-3 Loop right-of-way. The modifications at the NGPL–Lakeside and TETCO–Allen Meter Stations would increase those stations' permanent operational footprints by 0.3 acre (agricultural land) and 1.8 acres (open land), respectively.

The new LCLNG Export Meter Station would be located in the southeast corner of the liquefaction facility and would not require additional land for construction or operation. Construction of the new Kinder Morgan–Lake Charles, Columbia Gulf–Egan, Gulf Crossing–Perryville, and MEP–Perryville Meter Stations would affect 13.3 acres of land, including 10.9 acres of open land, 2.0 acres of agricultural land, and 0.4 acre of forest land. About 6.4 acres, including 5.6 acres of open land, 0.6 acre of agricultural land, and 0.2 acre of forest land would be permanently converted to industrial/commercial land use for operation of these new facilities. The temporary construction areas outside of the fenced facilities would be restored to preconstruction conditions in accordance with the FERC Plan and Procedures.[2]

Contractor Yard

Trunkline would use one contractor yard, consisting largely of graveled surface with some grassy areas, to support construction activities. Use of this yard would temporarily affect 20.8 acres of industrial/commercial land and Trunkline's activities would be consistent with previous uses. The yard would be allowed to revert to preconstruction condition and use after construction is complete.

Access Roads

Existing roads would be used to gain access to the proposed liquefaction facility site and the existing LNG terminal during construction and operation of the proposed liquefaction facilities; therefore, no new access roads would be required for these facilities.

A total of 29 temporary access roads, including 17 for the Mainline Connector and 12 for the Mainline 200-3 Loop, would be required to provide access to construction workspaces during construction of the pipelines. These temporary access roads would affect 60.3 acres of land, primarily within existing dirt paths (characterized in table 4.8.1-1 as industrial/commercial land) and agricultural land, followed by minor impacts on forested land and pine plantation. Depending on site-specific conditions, some or all of the existing dirt paths would require improvement in order to accommodate the movement of equipment and materials to the construction right-of-way such as widening, grading, addition of gravel, or side trimming of vegetation. Access roads would generally be no more than 30 feet wide.

Trunkline proposes to use nine temporary access roads during construction of the Calcasieu River HDD crossing (which is part of the Mainline 200-1 modifications). These access roads would affect 27.6 acres consisting predominantly of existing dirt roads or paths and existing pipeline right-of-way categorized as industrial/commercial and open land, as well as a small amount of forest land. A temporary access road would also be required for the proposed modifications at the Texas Gas–Woodlawn Meter Station, which would affect 0.3 acre of open land. Trunkline would utilize an existing access road at the Transco-Ragley Meter Station during construction of the proposed modifications at that facility, affecting 0.1 acre of industrial/commercial land.

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2 The FERC Plan and Procedures can be viewed on the FERC website at http://www.ferc.gov/industries/gas/enviro/plan.pdf and http://www.ferc.gov/industries/gas/enviro/procedures.pdf, respectively.

Construction of four new permanent access roads would be required for the Columbia Gulf–Egan, TETCO–Allen, Gulf Crossing–Perryville, and MEP–Perryville Meter Stations (see table 4.8.1-2). These permanent access roads would be constructed within industrial/commercial and open lands, permanently disturbing 3.1 acres, and would be maintained by project personnel during construction to provide continued access to the facilities. Additionally, Trunkline would require a small permanent access road, affecting less than 0.1 acre of industrial/commercial (an existing dirt path), at the U.S. 190 Meter Station. A permanent access road would also be constructed for Compressor Station 203-A; however, land use impacts for this road are included in the facility footprint.

A list of permanent access roads required for the project is provided in table 4.8.1-2. A full list of all access roads required for the project is provided in appendix I.

TABLE 4.8.1-2

New Permanent Access Roads Associated With the Lake Charles Liquefaction Project

Facility/Access Road	Proposed Modifications	Length (feet)	New Permanent Impacts (acres)	Land Use Affected
Meter Stations				
Columbia Gulf–Egan	Board road, gravel, grading, or side trimming	1,687.0	1.2	Open land
TETCO–Allen	Board road, gravel, grading, or side trimming	796.0	0.6	Existing dirt path
Gulf Crossing–Perryville	Board road, gravel, grading, or side trimming	335.0	0.2	Existing dirt path
MEP–Perryville	Board road, gravel, grading, or side trimming	1,594.0	1.1	Existing dirt path
Mainline 200-1 Modifications				
U.S. 190 Meter Station	Board road, gravel, grading, or side trimming	7.0	<0.1	Existing dirt path
TOTAL			**3.1**	

4.8.1.3 Land Use Impacts and Mitigation

Impacts on agricultural, industrial/commercial, open land, forested, pine plantation, and residential land uses are discussed below. Surface waters (open water) and wetlands are discussed in sections 4.3 and 4.4, respectively.

Agricultural

Liquefaction Facility, LNG Terminal, and Additional Construction Workspaces

No currently cultivated agricultural lands would be disturbed during construction or operation of the proposed liquefaction facility, ACWs, and existing LNG terminal modifications. However, prime farmland soils are present at the liquefaction facility and ACWs and would be permanently converted as a result of the project (see section 4.2).

Non-Liquefaction Facilities

The proposed Non-Liquefaction Facilities would cross agricultural lands currently used as pasture lands, row crops (e.g., rice and soybean), or crayfish farming. The pasture lands within the right-of-way are primarily managed for cattle. Soils classified as prime farmland would be affected by the project (see section 4.2). However, no specialty crops would be affected during construction or operation of the proposed project facilities.

Construction of the Mainline Connector and Mainline 200-3 Loop would affect 171.9 acres of agricultural land within the construction right-of-way and ATWS. Impacts on these areas would include the temporary loss of production during and shortly after construction is completed. Impacts could also include damage to existing irrigation systems and soil rutting or compaction due to construction equipment. Typical cropping and planting procedures in a given agricultural field could also be affected.

Trunkline would implement the FERC Plan (see section 2.6.3.5) to minimize impacts on agricultural lands. In agricultural lands, the pipeline would be installed via conventional trenching methods along with topsoil segregation. Prior to starting construction in agricultural areas, Trunkline would coordinate with landowners to determine the location of existing drainage structures and irrigation facilities. Trunkline would maintain the flow of water through irrigation systems throughout construction if possible and coordinate any shut off with the affected parties. During construction, Trunkline would maintain the natural surface water flow patterns of fields by providing breaks in the stockpiles of topsoil and subsoil. In addition, flow would be maintained in drainage systems to prevent ponding in adjacent undisturbed areas. For the areas alternately used for growing rice and raising crayfish, the landowner(s) would be compensated for crop loss due to construction activities.

The permanent pipeline right-of-way for the Mainline Connector and Mainline 200-3 Loop would encompass 56.8 acres of agricultural land. Following construction, Trunkline would follow the restoration and revegetation practices outlined in the FERC Plan. Any soil rutting or compaction would be repaired prior to revegetation of the disturbed areas. Agricultural lands within the permanent right-of-way would be allowed to revert to their previous use except for limited areas of the pipeline right-of-way that would be routinely maintained. The temporary workspace and ATWSs would be allowed to revert to their prior vegetated state following the completion of construction.

Construction of the new and modified aboveground facilities would affect 50.4 acres of agricultural land, resulting in impacts similar to those described above for the pipelines. Following construction, the temporary workspaces would be restored in accordance with the FERC Plan and allowed to revert to preconstruction use. A total of 46.5 acres of agricultural land would be permanently converted to industrial/commercial use for operation of the new Compressor Station 203-A and the new and expanded meter stations.

Overall, with the implementation of the FERC Plan and Procedures and the other measures identified above, we believe construction of the proposed project would have a minor, mostly temporary impact on agricultural land use. Although there would be permanent impacts on agricultural lands associated with some of the aboveground facilities, we do not believe this would represent a significant impact on agricultural uses in the area.

Industrial/Commercial

<u>Liquefaction Facility, LNG Terminal, and Additional Construction Workspaces</u>

Construction of the liquefaction facility and LNG terminal modifications, including the use of the ACWs, would affect 188.3 acres of industrial/commercial lands. The majority of this land consists of the existing 151.8-acre LNG terminal, and 34.2 acres of buildings, roads, and parking areas at the Alcoa-Lake Charles facility that would be acquired by Lake Charles LNG. The remaining 2.3 acres are within the ACWs and consist predominantly of existing roads. Construction impacts on these industrial/commercial areas during construction would include increased dust from exposed soils, construction noise, and traffic congestion. Dust and noise levels would be minimized as described in sections 4.11.1 and 4.11.2, respectively. Impacts associated with construction traffic are discussed in section 4.9.6. Following construction, the existing LNG terminal would revert to preconstruction use, and the entire 285.9-acre liquefaction facility site would be converted to industrial/commercial land use. In accordance with landowner agreements, the ACWs would not be restored to preconstruction condition, and the future land use of these areas would be determined by the landowners.

Non-Liquefaction Facilities

Construction and operation of the Mainline Connector and the Mainline 200-3 Loop would affect 7.1 and 2.3 acres of industrial/commercial land, respectively, consisting largely of roads. Construction and operation of the new Compressor Station 203-A would affect 1.0 acre of existing industrial/commercial land containing a mainline valve and associated access road. As detailed in table 4.8.1-1, construction of the proposed modifications at the existing Longville, Pollock, Epps, and Shaw Compressor Stations; the five existing meter stations; the Mainline 100-3 facilities; and the U.S. 190 Meter Station would affect a total of 233.1 acres of existing industrial/commercial land. Following construction, all of these facilities would continue to operate within their existing facility boundaries, without the need for any additional land. During construction of the project, Trunkline would also use a 20.8-acre contractor yard that is existing industrial/commercial land. Following construction, the yard would revert to preconstruction industrial/commercial land use.

Impacts on industrial/commercial land during construction of the Non-Liquefaction Facilities would be temporary and could include increased noise, dust, and impacts on traffic flow. In addition to the mitigation measures described above, Trunkline would install the pipelines using horizontal bores or HDDs to avoid impacts on several roadways and traffic. To minimize traffic congestion, Trunkline would encourage construction workers to leave their personal vehicles at the contractor yards and carpool to the construction areas, where possible. Other potential impacts on transportation and proposed mitigation measures are discussed in detail in section 4.9.6.

Based on the above discussion, we conclude that impacts of the project on industrial/commercial land would be minor.

Open Land

Liquefaction Facility, LNG Terminal, and Additional Construction Workspaces

Open land at the liquefaction facilities primarily include palustrine emergent and scrub-shrub wetland areas, non-forested upland areas, and pasture lands located in the southeastern corner of the site and within ACWs located east of Tank Farm Road. Construction and operation of the liquefaction facility would permanently convert 36.4 acres of open land within the liquefaction facility site to industrial/commercial land. Use of the ACWs during construction would affect 111.6 acres of open land. As noted previously, Lake Charles LNG would not retain the ACWs for operation of the project facilities, but as requested by the landowners, these areas would not be restored to preconstruction condition. Lake Charles LNG would stabilize the ACWs with temporary and/or permanent erosion control devices, and upon demobilization from each ACW, the land would be turned back over to the landowner.

Non-Liquefaction Facilities

Similar to the liquefaction facility, the open land associated with the Non-Liquefaction Facilities includes palustrine emergent and scrub-shrub wetland areas and non-forested upland areas. Construction of the Mainline Connector and the Mainline 200-3 Loop would affect a total of 23.5 acres of open land. Construction-related impacts on open land would include the removal of vegetation and disturbance of soils. Trunkline would minimize impacts on open land by implementing the measures in our Plan and Procedures.

Following construction, 15.6 acres of temporary workspace and ATWS would be allowed to revert to preconstruction condition. The 7.9 acres of open land that would remain within the permanent right-of-way would also be restored and allowed revert to preconstruction condition except for limited areas of the right-of-way that would be routinely maintained (i.e., mowed).

Construction of the Mainline 200-1 modifications would affect 32.3 acres of open land, most of which includes existing pipeline right-of-way Trunkline would use as temporary workspace and ATWS for the Calcasieu River HDD. Following construction, 0.2 acre of open land would be retained as permanent right-of-way. Additionally, construction of the new and modified meter stations would affect a total of 17.8 acres of open land. Following construction of these facilities, 7.4 acres of open land would be converted to industrial/commercial land for operation of the meter stations, and the remaining 10.4 acres would be restored and allowed to revert to preconstruction condition.

With the exception of the open land that would be permanently converted to industrial/commercial land for operation of the new and expanded meter stations, construction-related impacts on open land would be predominantly temporary and short term and would be minimized by implementation of the FERC's Plan and Procedures.

Forest

Liquefaction Facility, LNG Terminal, and Additional Construction Workspaces

Construction and operation of the proposed liquefaction facility would affect a total of 420.2 acres of forest land, including 209.0 acres within the liquefaction facility site and 211.2 acres within the ACWs. The existing forested areas include forested wetlands and upland wooded areas as described in detail in section 4.5.1.1. All of the forest land within the liquefaction site would be permanently converted to industrial/commercial land. Impacts on forest land within the ACWs is also considered permanent because, as discussed previously, these areas would not be restored. Trunkline would be required to conduct compensatory mitigation for forested wetlands in compliance with COE requirements as discussed in section 4.4.4.

Non-Liquefaction Facilities

Forested land affected by construction and operation of the Non-Liquefaction Facilities include forested wetlands and upland forests of mixed hardwoods and conifers as described in detail in section 4.5.1.1.

Construction of the Mainline Connector and the Mainline 200-3 Loop would involve clearing of 34.5 acres of forest land, including 19.5 acres within the permanent right-of-way and 15.0 acres within temporary workspace and ATWS. Following construction, the majority of the forest land within the permanent right-of-way would be converted to open land as a result of maintenance activities. Although the temporary workspace and ATWS would be allowed to revert to preconstruction condition, the impact on forest land in these areas would be long term due to the long regeneration period for this type of vegetation.

Construction and operation of the Calcasieu River HDD would affect an additional 3.4 and 1.9 acres of forest land, respectively. Construction of the new and modified meter stations would affect 0.5 and 0.2 acre, respectively. Impacts would be similar to those described above for the new pipelines; the forest land within the permanent meter station boundaries would be permanently converted to industrial/commercial land.

Trunkline would minimize impacts on forest land by implementing the measures in our Plan and Procedures, and by avoiding clearing between the HDD entrance and exit points at the Calcasieu River HDD. Moreover, Trunkline would be required to conduct compensatory mitigation for forested wetlands in compliance with COE requirements as discussed in section 4.4.4.

Pine Plantation

Liquefaction Facility, LNG Terminal, and Additional Construction Workspaces

No pine plantations would be affected during construction or operation of the proposed liquefaction facility.

Non-Liquefaction Facilities

Pine plantations are located along the Mainline Connector route and, to a lesser extent, the Mainline 200-3 Loop route. The pine plantations in these areas are dominated by varying age stands of loblolly pine and are used exclusively for timber production. Construction of the two pipelines would affect a total of 43.4 acres of pine plantation.

The impacts on pine plantations would be similar to those described for forest land. No special construction techniques would be used within pine plantations unless requested by the landowners. The landowners would be allowed to replant the temporary construction right-of-way and ATWS (25.4 acres); however, this would be a long-term impact due to the relatively long growth period required for marketable timber. Timber production would be prohibited within the permanent right-of-way, resulting in permanent removal of 18.7 acres of land from timber production. Trunkline would compensate the landowners for the loss of timber production in accordance with the terms of individual easement agreements.

Residential

Liquefaction Facility, LNG Terminal, and Additional Construction Workspaces

Residential areas in the vicinity of the liquefaction facility are characterized as rural residential but occur at a denser rate than those near the other project components. A single residence within the proposed liquefaction facility site on the west side of Big Lake Road has been purchased by Lake Charles LNG. No other residential land uses are located within or immediately adjacent to any of the other project facilities, and no residential lands would be affected during construction or operation of the proposed liquefaction facility.

Non-Liquefaction Facilities

The residential areas identified in the general vicinity of the Non-Liquefaction Facilities are low intensity rural residential land use characterized by widely spaced homes on large parcels. No residential structures or buildings are located within 50 feet of any of the Non-Liquefaction Facilities. The Mainline Connector pipeline route would cross one parcel identified as residential land just south of Gordon Dennison Road near MP 2.9. The closest construction workspace on this parcel would be about 320 feet from the residence. The majority of the right-of-way and workspaces on this parcel would be in fields used for hay production, but one ATWS would cross a private road leading to the residence and farm structures (i.e., barns). Access to the residence and other structures would remain open during construction. Following construction, land within the temporary right-of-way and ATWS would be allowed to revert to preconstruction conditions. Although certain activities (e.g., tree planting or construction of permanent structures) would not be allowed, land within the permanent right-of-way would also revert to preconstruction conditions and use. Therefore, impacts on this residential land would be temporary and short term.

4.8.2 Landowner and Easement Requirements

4.8.2.1 Liquefaction Facility

Lake Charles LNG currently leases 46 acres within the proposed liquefaction facility site. The property, owned by the Lake Charles Port Authority (also known as the Lake Charles Harbor and Terminal District), is adjacent to and north of the railroad that separates the existing LNG Terminal from the proposed liquefaction facility and the Alcoa property at Granger Road west to Big Lake Road. Current use of the land is the liquids metering facility in the southwest portion of the property and undeveloped mosaic. Lake Charles LNG plans to acquire 80 acres of land within the proposed liquefaction facility site from Alcoa. The remainder of the land required for the liquefaction facility and ACWs would be leased from the Lake Charles Port Authority. All work at the existing LNG terminal would occur within the existing facility. Aside from the Lake Charles Port Authority properties, no federal, state, or local agency owned or managed lands would be affected by the liquefaction facility.

4.8.2.2 Non-Liquefaction Facilities

The lands necessary for construction and operation of the Non-Liquefaction Facilities would be composed of both land currently owned or leased by Lake Charles LNG or Trunkline and other private land. For privately owned lands along the pipeline routes, Trunkline would need to secure easements that convey temporary and permanent rights-of-way.

An easement agreement between a company and a landowner typically specifies compensation for losses resulting from construction, including losses of non-renewable and other resources, damages to property during construction, and restrictions on existing uses that would not be permitted on the permanent right-of-way. Compensation would be fully determined through negotiations between Trunkline and the landowner.

If an easement cannot be negotiated with a landowner and the project has been certified by the FERC, Trunkline could use its right to eminent domain under section 7(h) of the NGA and the procedure set forth under the Federal Rules of Civil Procedure (Rule 71A) to obtain the right-of-way and ATWS areas. Trunkline would still be required to compensate the landowner for the right-of-way and any damages incurred during construction; however, the level of compensation would be determined by a court according to state or federal law.

4.8.3 Planned Developments

There are no planned residential or commercial developments within 0.25 mile of the project. However, four commercial/industrial facilities are planned within 1 mile of the proposed liquefaction facility, including the proposed Magnolia LNG Project and associated Kinder Morgan Louisiana Pipeline LLC Lake Charles Expansion Project; the G2X Energy natural gas-to-gasoline facility; and the Louisiana Marine Fisheries Enhancement, Research, and Science Center. Certain non-jurisdictional facilities are also planned to provide utilities (i.e., electric power, water) to the Lake Charles Liquefaction and Magnolia LNG Projects. Each of these projects, as well as other planned residential and commercial/industrial development projects in the broader project area, are discussed in the cumulative impact analysis provided in section 4.13.1.

4.8.4 Recreation and Special Interest Areas

4.8.4.1 Liquefaction Facility

Construction and operation of the liquefaction facility would not directly affect designated recreational areas. However, portions of two NWRs (the Sabine NWR and the East Cove Unit of the Cameron Prairie NWR) are in the vicinity of the Calcasieu Ship Channel and offer a variety of recreational activities and recreational boating and fishing occurs in the project area. There are also two golf courses located nearby. Potential impacts on these areas are discussed below.

Ship traffic accesses the existing terminal via the Gulf Intracoastal Waterway and Calcasieu Ship Channel. During construction, barges would deliver equipment and materials to the existing LNG terminal. Barge traffic during construction would consist of an average of five barge deliveries per day, and each barge would occupy the Calcasieu Ship Channel for about 15 minutes before turning at Devil's Elbow (the turn off point for the Industrial Canal/Turning Basin).

The Sabine NWR is 8 miles south of Hackberry, Louisiana, and extends to the ship channel between river miles 9 and 12 (for reference, the Industrial Canal is at about river mile 23). Users of the Sabine NWR adjacent to the ship channel may observe an increase in barge traffic during the construction period. Users may also observe LNG carrier traffic through the channel during operation of the liquefaction facility; however, Lake Charles LNG has not requested a change to the currently authorized size, number, or transit route of the LNG carriers calling on the terminal. The East Cove Unit of the Cameron Prairie NWR extends along a portion of the southeastern shore of Calcasieu Lake. The Cameron Prairie NWR is about 1.4 miles from the Calcasieu Ship Channel at the nearest point, and there is land east of the ship channel that would blocks views from the refuge. As a result, we do not believe that East Cove Unit users would likely be affected by marine traffic a construction and operation of the project.

Recreational boating and fishing occurring in the project area could be affected by construction activities. Calcasieu Landing, a public boat launch, is located on the south side of the Industrial Canal at the entrance to the canal from the Intracoastal Waterway. Additionally, recreational boat traffic uses the Calcasieu Ship Channel in transit to Calcasieu Lake. We believe the impacts of construction-related barge traffic within the Intracoastal Waterway and the ship channel on recreational boats would be minor because the ship channel is specifically maintained to provide deep draft access to the Port of Lake Charles and is routinely used for both recreational and industrial traffic. Similarly, the impacts of barge traffic on fishing in the channel would be minor. Restrictions on fishing in the immediate vicinity of the proposed TCDs and berth modifications would exist during construction of the facilities and when the facilities are in use, but there is extensive similar habitat in the Industrial Canal and the general project area. During operation, the potential impacts on recreational boating and fishing would not increase above the impacts addressed in the previous authorizations for the existing LNG terminal because Lake Charles LNG has not requested an increase in LNG carriers calling on the terminal. Overall, construction and operation of the project would result in minor, temporary impacts on recreational boating and fishing. Additional discussion of project-related impacts on marine traffic is provided in section 4.9.6.

Construction of the liquefaction facilities could temporarily affect two nearby golf courses. The Lake Charles Country Club Golf Course, a private country club on Prien Lake with an 18-hole golf course, is located 2.4 miles from ACW Area A. The Gray Plantation Golf Course, an 18-hole golf course and sports club, is located 0.3 mile from ACW A. Construction could generate dust and noise, which could be a nuisance to the recreational users. Construction could also interfere with or diminish the quality of the recreational experience by affecting public access during peak season due to construction-related increases in traffic. In general, impacts on the golf courses would be temporary and would be limited to the period of active construction. Dust and noise levels would be minimized as described in sections 4.11.1 and 4.11.2, respectively. To minimize impacts on traffic, we are recommending that Lake Charles LNG prepare and file a traffic management plan as discussed in section 4.9.6.1. With implementation of these measures, we do not believe that any significant impacts on the golf courses would occur during construction. Operation of the liquefaction facility is not expected to affect recreational activities at the nearby golf courses.

4.8.4.2 Non-Liquefaction Facilities

Construction and operation of the Non-Liquefaction Facilities would not directly affect designated special interest areas. However, several areas are located within 2.5 miles of the project.

The Lacassine NWR is located 0.4 mile south of the existing NGPL–Lakeside Meter Station facility. The Lacassine NWR is part of the Southwest Louisiana NWR Complex, which consists of three other federal wildlife refuges in southwest Louisiana: Cameron Prairie, Sabine, and Shell Keys. Lacassine NWR, located in Cameron and Evangeline Parishes, encompasses nearly 35,000 acres and serves as a refuge and breeding ground for migratory birds and other wildlife. The refuge is bisected by the Gulf Intracoastal Waterway and Bayou Lacassine and is bordered on the east by the Mermentau River and on the west by the Bell City Drainage Ditch. The southern border of the refuge is formed by Lake Misere, Bayou Misere, Mud Lake, and Grand Lake. The dominant feature of the refuge is the Lacassine Pool, where sport fishing is permitted at a level compatible for the environment. Hunting and bird watching are also popular recreational activities within the NWR. A nature drive, foot trails, and observation towers are available year-round (FWS, 2014c). The closest construction activities to the refuge would be the modifications at the NGPL–Lakeside Meter Station, which would occur within the existing facility and in adjacent agricultural areas. Due to the distance between the meter station and the NWR (0.4 mile), any impacts on recreational users within the Lacassine NWR would be limited to minor, short-term increases in noise and dust during construction activities and would not be significant. Operation of the modified facility would not affect the NWR.

The Kisatchie National Forest in Grant Parish surrounds the areas immediately adjacent to the Pollock Compressor Station. However, the Pollock Compressor Station is completely owned by Trunkline and all work to be performed at the Pollock Compressor Station would occur within Trunkline's existing fence line. Because the construction activities proposed at the Pollock Compressor Station would be minor and within an existing industrial facility, we believe that visitors to this area of the national forest would not be adversely affected.

The Calcasieu River is classified as a Louisiana Natural and Scenic River. The approximately 200-mile-long river drains a largely rural area of forests and bayou country in Vernon Parish and then meanders southward through the Kisatchie National Forest, passing the towns of Oakdale and Lake Charles to enter Calcasieu Lake (or Big Lake), an estuary on the Gulf of Mexico. Trunkline proposes to replace an existing Calcasieu River crossing with a 2,867-foot-long segment of new pipeline via the HDD method to connect the Mainline 200-1 pipeline to Trunkline's existing 200-3 Line. The HDD method, as described further in section 2.6.3.3, is a trenchless crossing method that can avoid direct surface impacts on sensitive resources like the Calcasieu River and its riparian area. By using the HDD method, Trunkline would eliminate the need for both clearing of the riparian area where the pipeline crosses the river, and for in-water work and any resultant disruption of boating. Additionally, Trunkline would implement the measures in the FERC Procedures and its HDD Contingency Plan (see appendix D) to further minimize the extent and duration of construction disturbance on this waterbody. With implementation of these measures, we do not believe the natural and scenic characteristics of the river would be affected by the project (see section 4.8.6).

4.8.5 Hazardous Waste Sites

Based on a review of several federal, state, and local government environmental databases, no listed NPL or "Superfund" sites were identified within 8 miles of any proposed project sites (EPA, 2013d). Information on contaminated soil or groundwater near the proposed facilities is provided in sections 4.2 and 4.3, respectively.

Alcoa is currently working with the LDEQ regarding impacts on soil and sediment from historical uses of PCBs and other materials at the Alcoa facility east of the proposed liquefaction facility. Lake Charles LNG is working closely with Alcoa to determine what contaminants may be encountered during construction of the liquefaction facility. Lake Charles LNG would manage and dispose of impacted media in accordance with applicable regulations and in coordination with Alcoa and the LDEQ.

Should contaminated soils, sediments, or groundwater be encountered unexpectedly during construction, Lake Charles LNG would implement their *Plan for Unanticipated Discovery of Contaminated Soils or Groundwater* (see section 4.2.2). If contamination is encountered, work would be stopped, appropriate containment and cleanup measures would be employed, and applicable regulatory agencies would be consulted if warranted to develop a site-specific plan for removal, disposal, and treatment of the contaminated area. Identification/characterization, handling, labeling, storage, manifesting, transportation, record keeping, and disposal of potentially contaminated materials would be conducted in accordance with applicable federal, state, and local regulations and guidance. In addition, Lake Charles LNG and Trunkline would implement their SPAR and SPCC Plans to minimize potential contamination of soil and water resources from spills or releases of fuel, other mechanical fluids, or other hazardous materials.

4.8.6 Visual Resources

"Visual resources" refers to the composite of basic terrain features, geologic features, hydrologic features, vegetation patterns, and anthropogenic features that influence the visual appeal of an area for residents or visitors. In general, impacts on visual resources may occur during construction when large equipment, excavation activities, spoil piles, and construction materials are visible to local residents and visitors and during operation to the extent facilities or portions of facilities and their lighting are visible to residents and visitors. The degree of visual impact resulting from the proposed project facilities is highly variable among individuals, and is typically determined by the general character of the existing landscape and the visually prominent features of the proposed facilities.

4.8.6.1 Liquefaction Facility

The primary existing structures in the viewshed of the proposed new liquefaction facility include the existing Trunkline LNG Terminal, East Moss Lake Oil and Gas Field, Alcoa-Lake Charles facilities, and other industrial properties. The viewshed also includes the Industrial Canal and Calcasieu Ship Channel to the south and southwest, forest and wetlands to the north, and a mix of open and vegetated areas to the east. Because the topography of the surrounding area is fairly level, visibility would extend outward from the site except where buffered by vegetation or existing structures.

Construction activities, particularly at ACW A, might be visible from residences along Jacob's Way Road, Ford Road, Wilder Road, and north of Haymark Road; however, most of these residences would be visually shielded from the construction activity by forest land. Visual impacts would be more significant for the residences east of Big Lake Road where there is more open land and fewer forested buffers. Clearing and construction activities at ACW D would result in visual impacts on residences north of the ACW along West Lincoln Road. Visual impacts on residential areas south of the Industrial

Canal along Airhart Road would be negligible due to distance and the presence of vegetation. There are no nearby residences west of the liquefaction facility site or the existing LNG terminal, but activities may be visible to recreationists using the Calcasieu Ship Channel.

Construction of the liquefaction facility would also increase traffic on West Tank Farm Road (to the north of the site) and Big Lake Road (to the east of the site), which could impact motorists using those roads, who could observe increased equipment, vehicles, workers, and structures on the proposed site. However, the overall duration of views for passers-by would be short.

The impact on visual resources during construction would be temporary due to the presence of workers and equipment for the approximately 5-year construction period, but the impacts resulting from operation of the facilities would be permanent.

The permanent changes to the visual character of the area would include the clearing of forested vegetation within ACWs A and D, and within the liquefaction facility site. Additionally, the LNG terminal modifications and proposed new liquefaction facility would include many aboveground structures that could result in visual resource impacts. These include but are not necessarily limited to three liquefaction trains, flare structures, mooring and breasting dolphins, and two TCDs. The new facilities would also require lighting for operations, safety, and to comply with Federal Aviation Administration (FAA) requirements. Lake Charles LNG has determined that it would not be feasible to leave a visual buffer along the liquefaction plant boundaries along Tank Farm Road or Big Lake Road for security and safety reasons. However, Lake Charles LNG is considering retaining a forested buffer along the east edge of ACW A along Big Lake Road, which could provide a visual screen between the facilities and the nearest residences to the east. Lake Charles LNG has not indicated whether it also considered a forested buffer along the north side of ACW D to reduce visual impacts on residences north of West Lincoln Road. **To ensure that impacts on the surrounding visual landscape are minimized, we recommend that:**

- **<u>Prior to construction</u>, Lake Charles LNG should file with the Secretary, for review and written approval of the Director of OEP, visual screening plans for ACWs A and D. At a minimum, each plan should include the retention of a forested buffer of sufficient width to provide an effective visual screen between the liquefaction facilities or ACW and the nearest residences located to the east (for ACW A) and to the north (for ACW D).**

Another potential source of visual impacts is the flare system that would be constructed as part of the project, which would include seven flares on three derrick structures. Two of the derricks would be located within the liquefaction facility, one of which would support a single startup flare, and the other of which would support 4 emergency flares and a spare. Another derrick near the dock area would support a marine flare. Lake Charles LNG anticipates that the flare heights would range from 201 to 351 feet, with estimated diameters from 16 to 48 inches. When in use, the flares would be visible from varying distances. To the east of the proposed site, where trees do not offer vegetative screening, flares may be visible to neighborhoods along Big Lake Road and in the vicinity of Elliott Road. Neighborhoods to the south along Airhart Road would have limited visibility due to the distance from the site and the existing vegetative buffers. The upper parts of the flares might be visible at neighborhoods along Haymark Road and from varying points within the Gray Plantation Golf Club. However, flares would only operate on a limited basis. The startup flare would be in use throughout the initial start-up period prior to beginning operation of each liquefaction train. The duration of the flaring associated with the start-up period would depend on the specific commissioning schedule, but is expected to be up to 1 month for each train. The other flares would be used only on an emergency basis. Therefore, visual impacts resulting from the flares during operation of the facility would be temporary and infrequent.

Impacts on the visual landscape associated with the modified and new facilities at the LNG terminal and proposed liquefaction facility would be permanent, but because the liquefaction facility would be constructed immediately adjacent to the existing terminal, views of the facility would be consistent with the existing industrial area. Additionally, implementation of a visual screening plan as recommended above would minimize impacts. Overall, we believe that visual impacts of the proposed liquefaction facility and LNG terminal modifications would be minor and generally in character with the existing landscape.

4.8.6.2 Non-Liquefaction Facilities

Pipelines

During construction of the pipelines, visual impacts would result from the presence of personnel, large construction equipment, and vehicles, all of which could be visible in areas accessible to the public, such as roadways crossed by the route and nearby residences. However, no residences are located within 50 feet of the construction right-of-way and the pipeline routes do not cross densely populated areas. Visual impacts due to the presence of construction equipment and personnel would be temporary and short term; therefore, we believe those visual impacts would not be significant.

The primary impact on visual resources during construction and operation of the Mainline Connector and Mainline 200-3 Loop would result from vegetation clearing in the construction rights-of-way and ATWS. Clearing of forest land within the construction right-of-way, and maintenance of the permanent right-of-way in an herbaceous or scrub-shrub state, would change the viewscape for viewers in the area. Trunkline would allow forest land in ATWSs to revert to preconstruction conditions, although it could take up to 50 years for forest vegetation to reach a mature stage, resulting in long-term visual impacts in those areas. The permanent visual impact would be most noticeable for the Mainline Connector, which would result in the creation of a new right-of-way. Operational impacts along the Mainline 200-3 Loop, where the new right-of-way would overlap an existing pipeline right-of-way, would be less evident. Once the disturbed areas are restored and revegetated in accordance with the FERC Plan and Procedures, operation of the pipeline would result in negligible impacts in open areas, where the permanent right-of-way would largely revert to preconstruction condition and use.

As noted above, the proposed Mainline 200-1 modifications would include installation of a new pipeline segment by HDD across the Calcasieu River, a Louisiana Natural and Scenic River. Drilling equipment and construction activities may be visible to passers-by at some locations along the river, but there are few residences in the area, with the closest about 0.5 mile away. Overall, visual impacts associated with the HDD operations would be minor and short term. Moreover, use of the HDD method would minimize visual impacts associated with operation of the new pipeline segment because it would eliminate the need to remove vegetation at the river banks, and Trunkline has indicated that it would not conduct maintenance clearing between the HDD entrance and exit points. Therefore, no additional visual impacts would occur during operation.

Compressor Stations

Construction at the existing compressor stations would result in negligible visual impacts. These would include the presence of equipment and workers, and short-term, localized disturbance of vegetation and soils within the fence line of these industrial facilities. After restoration, there would be no visual impacts associated with operation of the modified piping.

Construction of Compressor Station 203-A would occur within a rural area of Calcasieu Parish off of Dennison Road and south of Billy Corbello Road, both of which are low-density, two-lane roads.

Construction related impacts including the presence of equipment and workers would be temporary and limited to the construction period. The areas that would be cleared and graded predominantly consist of agricultural land, which would be converted to industrial/commercial land. During both construction and operation, Compressor Station 203-A would be visible to motorists passing through the immediate rural area of Calcasieu Parish. Construction and operation of Compressor Station 203-A would not affect any designated visual resources; however, the station would be visible to the few nearby residences, the closest of which are about 790 feet east, 1,200 feet southwest, and 1,330 feet northwest of the station perimeter. Therefore, **we recommend that:**

- **<u>Prior to the end of the draft EIS comment period</u>, Trunkline should file with the Secretary a plan to minimize visual impacts of Compressor Station 203-A on nearby residences.**

Meter Stations

Construction activities at the new and modified meter stations would result in short-term, localized visual impacts similar to those described above. There would be no permanent visual impacts at the existing meter stations that would not be expanded. The new and expanded meter stations would result in new, permanent impacts on visual resources. A fence would be erected around each of the new meter stations and the existing fencelines would be expanded at the existing stations where necessary to encompass the new facilities. However, the new meter and expanded meter stations would be in rural areas and would not affect any designated visual resources. Therefore, we believe the proposed new and modified meter stations would have a minimal impact on visual resources.

Contractor Yard

The contractor yard that would be used for the temporary storage of trailers, vehicles, pipe, and other construction-related material during construction consists of previously disturbed, graveled areas and some grassy areas. Minimal ground disturbance is anticipated during use of the yard for the project. There would be no permanent impacts on visual resources associated with the use of the yard. The only impacts at the yard would be temporary during construction. Moreover, the yard has been used for similar purposes in the past.

Access Roads

Trunkline proposes to use 39 temporary access roads (in addition to permanent access roads at existing facilities) during construction of the Non-Liquefaction Facilities. Some of these roads would require minor improvements that would not have a significant impact on visual resources. After construction, the roads used for temporary access would be returned to preconstruction conditions unless another arrangement is mutually agreed upon with the landowner.

The permanent access roads to the new meter stations would be constructed on existing dirt paths or open land. Use of these roads by construction equipment and project personnel would result in temporary impacts on visual resources during construction. Overall, we believe the permanent access roads to these new aboveground facilities would result in minor impacts on the viewshed during both construction and operation.

4.8.7 Coastal Zone Management

The CZMA calls for the "effective management, beneficial use, protection, and development" of the nation's coastal zone and promotes active state involvement in achieving those goals. As a means to reach those goals, the CZMA requires participating states to develop management programs that demonstrate how those states will meet their obligations and responsibilities in managing their coastal areas. In Louisiana, the LDNR's Office of Coastal Management administers the CZMP. The LDNR evaluates activities or development affecting land within Louisiana's coastal zone for compliance with the CZMA through a process called "federal consistency."

The Gulf Intracoastal Waterway marks the inland extent of the coastal zone boundary. Project facilities that fall within this boundary include the proposed new Kinder Morgan–Lake Charles Meter Station and the modifications and expansion at the NGPL–Lakeside Meter Station. No other components of the project are located within the Coastal Zone.

Trunkline initiated consultation with the LDNR for the NGPL–Lakeside and Kinder Morgan–Lake Charles Meter Stations on March 7, 2014 requesting confirmation that the project would be consistent with the Louisiana Coastal Resources Program and clarification as to whether a CUP would be required for these facilities. In an August 27, 2014 letter, the LDNR Office of Coastal Management stated that the proposed work at the NGPL–Lakeside Meter Station would have no direct and significant impact on coastal waters and that the Kinder Morgan–Lake Charles Meter Station is exempt; therefore, neither facility would require a CUP.

4.9 SOCIOECONOMICS

Construction of the project could impact socioeconomic conditions, either adversely or positively, in the general vicinity of the project. These potential impacts include alteration of population levels or local demographics, increased employment opportunities, increased demand for housing and public services, transportation impacts, and an increase in government revenue associated with sales and payroll taxes. The potential socioeconomic impacts of project operation include employment opportunities, ongoing local expenditures by the operator, an increased tax base, and an increased demand for public services.

The socioeconomic analysis is limited to Calcasieu, Jefferson Davis, and Beauregard Parishes in Louisiana because they encompass the larger project components: the existing LNG terminal, proposed liquefaction facility, the Mainline Connector and the Mainline Loop 200-3, Compressor Station 203-A, and upgrades at the Longville Compressor Station. For the purposes of our socioeconomic analysis, these three parishes are defined as the "project area."

4.9.1 Population

Table 4.9.1-1 provides a summary of selected population and demographic information for the project area.

TABLE 4.9.1-1

Existing Socioeconomic Conditions in the Project Area for the Lake Charles Liquefaction Project

State/Parish	Square Miles[a]	Population 2010[a]	Population 2012 (est.)[a]	Population Density (per square mile) 2010[a]	Population Density (per square mile) 2012	Per Capita Income 2012[a]	Civilian Labor Force 2012[b]	Unemploy-ment Rate 2012[b]	Top Two Major Industries 2013[c]
Louisiana	43,203.90	4,533,372	4,602,134	104.9	106.5	$24,264	2,083,710	6.4	1. Educational, health, and social services 2. Manufacturing
Calcasieu Parish	1,063.66	192,768	194,323	181.2	182.7	$24,255	92,084	5.9	1. Educational, health, and social services 2. Manufacturing
Jefferson Davis Parish	651.33	31,594	31,439	48.5	48.3	$21,142	14,587	5.3	1. Educational, health, and social services 2. Retail trade
Beauregard Parish	1,157.34	35,654	36,240	30.8	31.3	$22,428	14,403	7.0	1. Educational, health, and social services 2. Manufacturing

[a] U.S. Census Bureau, 2014a
[b] Louisiana Workforce Commission, 2013
[c] City-Data, 2013

4.9.1.1 Liquefaction Facility

The U.S. Census Bureau (U.S. Census Bureau, 2014a) reported that in 2012, the population of Calcasieu Parish was 194,323, with a population density of 182.7 persons per square mile. The average population density for Louisiana in 2012 was 106.5 persons per square mile.

Construction of the liquefaction facility is expected to begin in 2015 and be completed with full service anticipated by 2020. Lake Charles LNG estimates a peak construction workforce of about 5,600 workers, with an average workforce of about 2,100 workers over 5 years. Lake Charles LNG anticipates that about 20 percent of these workers would be hired locally; the peak number of non-resident workers hired during construction is estimated to be 4,480. Should non-resident workers be accompanied by family members, and based on an average household size of 2.55 persons in Calcasieu Parish, up to 11,424 non-local persons could potentially move to the project area during peak construction (U.S. Census Bureau, 2014a). Although it is not likely that all workers would bring families, this addition would constitute a 5.9 percent increase over the current Calcasieu Parish population of 194,323. The peak construction workforce would be required for less than 9 months.

Lake Charles LNG anticipates hiring up to 176 additional permanent employees to operate the liquefaction facility. This workforce and their families would represent a minor but permanent population increase in the vicinity of the liquefaction facility.

4.9.1.2 Non-Liquefaction Facilities

The major Non-liquefaction Facilities would be constructed in three Parishes: Calcasieu, Jefferson Davis, and Beauregard. Calcasieu Parish is described above. The estimated 2012 population densities, an indication of the extent of development, for Jefferson Davis and Beauregard parishes were 48.3 and 31.3 persons per square mile, respectively. The total population of Jefferson Davis Parish is 31,439 and the total population of Beauregard Parish is 36,240 (U.S. Census Bureau, 2014a).

The construction workforce for the Non-liquefaction Facilities would consist of about 90 workers for the compressor stations and 260 workers for the pipelines. Based on previous construction experience in the project area, Trunkline estimates that about 20 percent of the workforce would reside in the project area, while 80 percent would commute to the work sites daily. Given that almost all the workforce is anticipated to live within daily commuting distance of the project areas, the construction workers associated with the Non-liquefaction Facilities would likely have a negligible effect on population in the project areas.

Trunkline anticipates hiring eight new permanent employees to operate the Non-liquefaction Facilities. This would represent a negligible increase in the local population in the vicinity of the project area.

4.9.2 Economy and Employment

Table 4.9.1-1 provides selected employment and income statistics for the project area. The main employment sectors in Calcasieu and Beauregard Parishes are education, health, and social services, and manufacturing. In Jefferson Davis Parish, the main employment sectors are education, health, and social services, and retail trade (City-Data, 2013).

4.9.2.1 Liquefaction Facility

The civilian labor force is defined as the sum of employed persons and those searching for work. The civilian labor force in Calcasieu Parish is 92,084 persons and per capita income is $24,255. Calcasieu Parish has an unemployment rate of 5.9 percent, and 16.8 percent of the population is below the poverty line. The parish has a lower unemployment rate than the State of Louisiana, which has an unemployment rate of 6.4 percent. In addition, Calcasieu Parish has a smaller percentage of the population that is below the poverty level compared to Louisiana’s 18.7 percent.

Expenditures in the liquefaction facility project area are estimated to be $1.68 billion for various goods and services throughout construction. Total wages during the entire construction period are expected to equal about $2.72 billion. Construction of the liquefaction facility would increase economic activity within the area in several ways:

- a direct effect – hiring of local construction workers and purchases of goods and services from local businesses;
- an indirect effect – the additional demand for goods and services, such as replacing inventory from the firms that sell goods and services directly to the project or to workers and their families; and
- an induced effect – the spending of disposable income by the construction workers at local businesses, which in turn order new inventory from their suppliers.

The increase in economic activity resulting from the sum of these three effects would result in a temporary positive economic impact in the vicinity of the liquefaction facility.

Anticipated operational expenditures would include $65 million in annual regional taxable expenditures on goods and services, about $21 million per year in salaries, and an un-estimated amount in indirect and induced expenditures as these dollars are spent and re-spent throughout the economy. We conclude that the expenditures and permanent workforce associated with operation of the liquefaction facility would result in positive permanent impact on the local economy.

4.9.2.2 Non-Liquefaction Facilities

Employment and income information for Calcasieu Parish is described above. The civilian labor force numbered 14,587 in Jefferson Davis Parish and 14,403 in Beauregard Parish. Per capita income is roughly the same in both parishes ($21,142 in Jefferson Davis Parish and $22,428 in Beauregard Parish), and both are below the state's average per capita income of $24,264.

Jefferson Davis has an unemployment rate of 5.3 percent, with 18.1 percent of the population below the poverty line. Beauregard Parish has an unemployment rate of 7.0 percent, with 14.8 percent of the population below the poverty line. Both parishes have a smaller percentage of their population below the poverty line than Louisiana, but only Jefferson Davis has a lower unemployment rate as well.

Expenditures during construction of the non-liquefaction facilities are estimated to be about $161.7 million for various goods and services. Total wages during the entire construction period are expected to equal about $137.2 million. As with the liquefaction facility, in addition to the direct employment and payroll impacts generated by the Non-liquefaction Facilities, dollars spent on goods and services would have positive direct, indirect, and induced economic impacts on the project area during the construction period.

Operation of the Non-Liquefaction Facilities would result in $1.6 million in annual regional expenditures on goods and service and about $1.3 million per year in salaries. These expenditures would result in a negligible positive impact on the local economy.

4.9.3 Local Taxes and Government Revenue

4.9.3.1 Liquefaction Facility

Lake Charles LNG estimates spending $325 million on construction materials and supplies in the liquefaction facility area during construction. This would generate increased local, state, and federal sales tax revenue in the project area. The expenditures on goods and services by the construction workforce and the families of the workers would also generate increased tax revenues. In addition, local, state, and federal governments would tax the $2.7 billion in total workforce payroll. This increase in tax revenue would be a temporary, positive impact on the tax revenue in the liquefaction facility area.

After construction, Lake Charles LNG would pay parish property taxes on its liquefaction facility and equipment. Lake Charles LNG estimates that the total property tax paid in Calcasieu Parish for the initial year following completion of construction would be $5.8 million. There also would be long-term increases in sales tax revenue from expenditures on materials, goods, and services by Lake Charles LNG and the operational workforce.

4.9.3.2 Non-Liquefaction Facilities

Trunkline estimates that the total construction payroll for the Non-Liquefaction Facilities would be about $137.2 million. It is also likely that some portion of construction materials and supplies (estimated at about $24.5 million) would be purchased locally. Additionally, expenditures by Trunkline, workers, and the families of workers during construction would increase tax revenues in the region. The project would have a temporary, positive impact on the tax revenue in the project area.

Operation of the Non-liquefaction Facilities would also have a positive effect on local property tax revenue. Table 4.9.3-1 summarizes the anticipated property taxes by parish/county to be paid in the initial year after project completion.

TABLE 4.9.3-1	
Estimated Property Taxes (Year 1 In-Service) for the Lake Charles Liquefaction Project	
Parish, State	Estimated Property Taxes
Calcasieu Parish, LA	$5,852,061
Jefferson Davis Parish, LA	$1,272,084
Beauregard Parish, LA	$1,289,212
Total	**$8,413,357**

4.9.4 Housing

Table 4.9.4-1 provides data on the local rental and other temporary housing options in the project area.

TABLE 4.9.4-1

Housing Characteristics in the Project Area for the Lake Charles Liquefaction Project

State/Parish	Housing Units[a]	Vacant Housing Units[a]	Vacant Housing Units for Rent[a]	For Seasonal, Recreational, or Occasional Use[a]	Rental Vacancy Rate (percent)[a]	Number of Hotels and Motels[b]
Louisiana	1,964,981	236,621	66,857	42,253	10.5	538
Calcasieu Parish	82,058	8,062	3,015	724	11.8	120
Jefferson Davis Parish	13,306	1,535	320	260	9.9	78
Beauregard Parish	15,040	1,881	251	513	8.0	115

[a] U.S. Census Bureau, 2014b

[b] Yellowbook, 2013 (number of "Hotels and Motels" as advertised on www.yellowbook.com). Some of these hotels and motels may be located in adjacent parishes.

The number of housing units (permanent and temporary) varies across the project area, largely based on the parish population and presence or absence of a major city. In 2010, the fewest housing units were in Jefferson Davis Parish (13,306), which also had the lowest population for those parishes/counties evaluated, while the most housing units were in Calcasieu Parish (82,058), which had the highest population of the parishes and counties in the project area. Rental vacancy rates in the project area ranged from a low of 8.0 percent in Jefferson Davis Parish to a high of 11.8 percent in Calcasieu Parish.

According to the U.S. Census Bureau, vacant housing units in Calcasieu Parish in 2010 totaled 8,062 units; of these, 3,015 units were rentals and 724 were for seasonal, recreational, or occasional use. Vacant housing units in Jefferson Davis Parish totaled 1,535 units; of these, 320 units were rentals and 260 were for seasonal, recreational, or occasional use. In Beauregard Parish, vacant housing units totaled 1,881 units, with 251 rentals and 513 units for seasonal, recreational, or occasional use. There are about 313 hotels/motels across the three parishes that could be used by the short-term workforce. The project area also offers other temporary housing options such as campgrounds and RV parks. The Pelican Lodge industrial housing facility at the Port of Lake Charles (Southwestern Louisiana Economic Development Alliance, 2014) is under development; this facility will have the initial capacity to house 4,000 construction personnel when complete.

4.9.4.1 Liquefaction Facility

As stated previously, Lake Charles LNG anticipates local residents would comprise a portion of the workers hired for construction of the liquefaction facility. Calcasieu Parish has the most vacant transient housing units that would be available to the workforce, including vacant units for rent and those for seasonal, recreational, and occasional use (3,739 units) as well as rooms at 120 hotels and motels (see section 4.9.5). The currently available transient housing in Calcasieu Parish may not be sufficient to accommodate the maximum peak non-resident workforce; therefore, during the 9-month period that the peak workforce may be present, workers might need to find housing outside the local area and commute from further away, and/or make use of the Pelican Lodge housing facility if available. Outside of the time when the workforce peaks, sufficient housing is expected to be available to accommodate the average workforce required for the construction of the liquefaction facility. Overall, we believe construction of the proposed liquefaction facility would have a temporary impact on housing in the project area. However, as discussed in section 4.13.2.9, housing constraints would be more significant if several of the other planned projects in the area are constructed in the same timeframe. Lake Charles LNG and Trunkline have stated that the bid documents for the project would require prospective contractors to address this issue and to provide a plan worker housing in their proposals.

We believe the addition of 176 permanent staff required to operate the liquefaction facility would have a minor permanent impact on local housing markets.

One residence and one business would be displaced as a result of construction of the liquefaction facility. The residence was located near the northeast corner of the proposed liquefaction facility site and has already been purchased by Lake Charles LNG and the occupants have relocated. An office building and a parking area located in the southwest corner of the proposed liquefaction facility site has also been purchased, and would be vacated prior to construction.

4.9.4.2 Non-Liquefaction Facilities

Trunkline anticipates local hires would comprise almost all of the peak 690 workers for construction of the Non-Liquefaction Facilities. Those workers would commute daily from their homes to the construction right-of-way or the compressor station sites. Based on the number of available rental housing units and hotels/motels in the three parishes as discussed above, adequate housing exists to accommodate non-resident workers and their families. Overall, construction of the proposed Non-Liquefaction Facilities would not result in significant impacts on transient housing in the area.

Operation of the Non-Liquefaction Facilities would require eight new permanent employees who would relocate to the project area. These new employees would represent a negligible decrease in available permanent housing.

It is not anticipated that any residences or businesses would be displaced during the construction or operational phases of the Non-Liquefaction Facilities. Trunkline would minimize the impact on residential properties by locating the pipelines and compressor station in areas removed from residential uses, to the extent practicable.

4.9.5 Public Services

Table 4.9.5-1 summarizes local community public services in the project area.

TABLE 4.9.5-1 **Public Services in the Project Area for the Lake Charles Liquefaction Project**					
Parish, State	Number of Public Schools[a]	Number of Sheriff's Departments[b]	Number of Police Departments[b]	Number of Fire and Rescue Departments[c]	Number of Hospitals[d]
Calcasieu Parish, LA	56	1	6	5	5
Jefferson Davis Parish, LA	10	1	5	4	1
Beauregard Parish, LA	8	1	2	1	1

[a] Public Schools K12, 2014
[b] USA Cops, 2013
[c] USA Fire & Rescue, 2013
[d] Hospitals Center, 2013

4.9.5.1 Liquefaction Facility

Calcasieu Parish has 56 public schools with an enrollment of 31,657 students in 2009 to 2010 (Public Schools K12, 2014). There are five hospitals, one sheriff's department, six police departments, and five fire departments within the parish.

The peak number of 5,600 workers is anticipated to last less than 9 months. Lake Charles LNG estimates local workers would account for about 20 percent of the workforce based on construction of the existing LNG terminal. If all of the about 4,500 non-resident workers relocate to Calcasieu Parish with two children each, local school system enrollment would increase by 9,000 students, or an increase of 28.4 percent. However, Lake Charles LNG would not employ many of the workers for the full duration of construction, and it is unlikely that those workers would relocate with their children. For the average workforce of 2,100 and assuming two children per worker, school enrollment could increase by 4,400 students, or 13.9 percent. We believe this represents the worst-case scenario, resulting in moderate, temporary impacts on the schools. However, many construction workers do not have families or would not relocate their families while they work at the liquefaction facility. As a result, the impacts on schools in the project area would likely be much less than estimated.

During operation of the liquefaction facility, the additional 176 permanent workers would not likely cause any adverse impact on local schools. If all 176 permanent workers have 2 children, this would result in 352 additional children in local parish school systems. This addition would represent a 1.1 percent increase in total enrollment, with students spread out over many grade levels. As a result, we believe no adverse impacts from operation of the liquefaction facility would occur on the parish's school systems.

Construction of the liquefaction facility would result in little or no short-term impact on the availability of local community facilities and services such as police, fire, and medical because the non-local workforces would be small relative to the current population. The proposed liquefaction facility would not materially change the emergency response requirements from those associated with operations at the existing LNG terminal. The local fire department is part of a regional mutual aid organization that provides emergency services to numerous petro-chemical facilities and is an experienced responder to industrial incidents. The LNG terminal has its own first responder group that supports the local services on an as needed basis. The local communities have adequate infrastructure and community services to meet the needs of the workers that would be required for construction and operation of the facility. Therefore, we believe impacts on public services during construction of the liquefaction facility would be temporary and minor.

4.9.5.2 Non-Liquefaction Facilities

We believe Trunkline's construction workers would not likely bring family members to the area due to the relatively short construction period required for the Non-Liquefaction Facilities. Further, the temporary increase in population due to construction would be negligible compared to the current population in the project areas. As a result, we believe the Non-Liquefaction Facilities would minimally impact schools in the project area. Although it is likely that there would be some need for increased police, fire, and medical services during construction, those public services would experience only minor impacts during construction.

The eight new permanent positions would represent a negligible increase in the local population. Therefore, we believe local public services would not be impacted.

4.9.6 Transportation

4.9.6.1 Liquefaction Facility

Roadway Traffic

Access for transporting equipment, materials, and personnel to the liquefaction facility site would largely be provided by existing roads and barge traffic. The construction entrance to the liquefaction facility would be located on West Tank Farm Road, which intersects with Big Lake Road (LA 384). West Tank Farm Road is a two-lane asphalt roadway with 6-foot shoulders and a posted speed limit of 55 miles per hour. Traffic count data provided by the Calcasieu Metropolitan Planning Organization indicated that LA 384, adjacent to the proposed site, currently experiences about 4,374 vehicles per day.

Traffic would increase substantially during construction in the vicinity of the proposed liquefaction facility due to the presence of worker vehicles, construction vehicles, and trucks taking materials and equipment to and from the site. During the peak of construction, about 5,600 employees would travel to the worksite. This would result in up to 4,308 commuter vehicles entering or exiting the site per shift. Lake Charles LNG may consider bussing the construction workers to and from the site using a remote location(s) to mitigate traffic impacts.

Truck deliveries would not typically occur during the peak traffic periods and would not affect existing traffic. A majority of the large deliveries for rock fill materials are anticipated to be delivered by barge to the site. Barges would deliver large equipment and materials, such as soil and rock fill, to the work dock during construction. This would reduce the number of truck trips to and from the liquefaction facility as well as the potential for damage to local roadways and traffic congestion. Material deliveries by truck would peak at about 7,000 per month with an average of 350 per day. Lake Charles LNG would attempt to schedule deliveries outside of peak traffic hours, when possible, to reduce congestion.

Lake Charles LNG commissioned a traffic assessment study to evaluate potential impacts of the project on traffic in the project area. The study conducted concluded that traffic generated by the construction and operation of the proposed project is not expected to impact the existing roadway network in terms of roadway capacity once a planned road improvement project, the Ham Reid Road Extension, is completed. The Ham Reid Road Extension would provide a connection between Elliot and Big Lake Roads, relieving current capacity deficiencies on Country Club Road. By itself, the project would not significantly impact the existing roadway network; however, the traffic study indicated that the cumulative impact of the proposed project and other anticipated or recently completed developments in the vicinity of the liquefaction facility may create roadway capacity deficiencies (Fenstermaker, 2014).

The traffic study described a number of mitigation strategies to decrease or eliminate the potential traffic impact. **Therefore, we recommend that:**

- **<u>Prior to construction</u>, Lake Charles LNG should file with the Secretary, for review and written approval by the Director of OEP, a traffic management plan that details specific measures that would be implemented to minimize impacts on traffic. The traffic management plan should identify off-site vehicle parking areas, alternative worker transportation methods, traffic control measures, infrastructure improvement, traffic control personnel, and construction and delivery areas.**

Operation of the liquefaction facility would require a permanent workforce of 250 employees (74 current and 176 new) who would commute to the site on a daily basis. Based on Lake Charles LNG's 2014 traffic impact study (Fenstermaker, 2014), we believe this would not result in a significant impact on the existing traffic conditions in the vicinity of the project. Additionally, operation of the liquefaction facility would increase truck traffic; however, it is not likely that the increase in traffic would be substantial. We believe there would be a minor impact on local roads for the life of the project.

Marine Traffic

During construction of the liquefaction facility, marine traffic would consist of bulk carriers, which would deliver aggregate from the Gulf of Mexico to a dump site near Devil's Elbow (the point of the turn off for the Industrial Canal and Turning Basin), and barges would then deliver aggregate from the dump site to the liquefaction facility. Based on a marine traffic study conducted for the project (Ausenco, 2013), existing vessel traffic in Calcasieu Channel is 18.8 vessels per week, or 2.7 vessels daily. Bulk carrier traffic would be less than one vessel per week, and the bulk carriers would not block other traffic in the channel during unloading. Barge traffic during construction would consist of an average of five barge deliveries per day, and each barge would occupy the main channel for about 15 minutes before turning at Devil's Elbow. The marine traffic study (Ausenco, 2013) found that there was sufficient capacity in the channel for the increase in bulk carrier and barge traffic due to construction of the liquefaction facility, and the construction traffic would not impact existing users of Calcasieu Channel.

Lake Charles LNG has not requested an increase in the currently authorized number of LNG carriers that would call on the existing LNG terminal during operation of the liquefaction facility.

4.9.6.2 Non-Liquefaction Facilities

Trunkline would install the pipelines using horizontal bores or HDDs to prevent impacts on roadways and traffic. Trunkline proposes to open-cut dirt and gravel roads and would attempt to schedule construction activities to minimize traffic flow interruptions. If an open-cut would require extensive construction time, steel plates would be used across the trench and/or provisions would be made for temporary detours or other measures to allow safe traffic flow during construction.

The movement of construction equipment and materials and the daily commuting of employees to and from the construction work areas may also slightly increase traffic volumes. Construction work is typically scheduled to take advantage of daylight hours, 6 days per week; therefore, most workers would commute to and from the construction areas and contractor yards during off-peak hours. Along the pipeline routes, construction would move sequentially; therefore, traffic flow impacts that do arise would be temporary on any given section of roadway. To minimize traffic congestion, Trunkline would encourage construction workers to leave their personal vehicles at the contractor yards and carpool to the construction areas, where possible. As necessary, contractors may provide buses to move workers from common parking areas to the construction work areas. Therefore, we expect construction of the Non-

Liquefaction Facilities to result in minor, temporary impacts on traffic flow by the construction workforce.

Operation of the Non-liquefaction Facilities would not result in any significant impacts on traffic or roadways within the project area.

4.9.7 Property Values

4.9.7.1 Liquefaction Facility

The proposed location for the liquefaction facility is adjacent to the existing LNG terminal and other industrial facilities in an area zoned for these types of uses. It is located in a sparsely populated rural residential area where some residences have existed during the operational period of the existing LNG terminal and some have been constructed since the terminal has been in operation. Therefore, it is unlikely that there would be any adverse effects on property values of nearby residences.

Further, some long-term construction workers would likely purchase residences in the vicinity of the liquefaction facility. These housing purchases would have a net positive effect on property values in the vicinity of the project.

4.9.7.2 Non-Liquefaction Facilities

Currently available information does not support any firm conclusion with respect to project impacts on property values (INGAA, 2001). The impact the Non-Liquefaction Facilities may have on the value of a tract of land depends on many factors, including size, the values of adjacent properties, presence of other pipelines, the current value of the land, and the extent of development and other aspects of current land use. A potential purchaser will make an offer to purchase based on his or her own values, which might or might not take the project's presence into account. Data are insufficient to conclude that any significant impacts on property values would occur as a result of the project.

The effect that an easement may have on property values is an issue that is negotiated between Trunkline and the landowners during the easement acquisition process. The easement acquisition process is designed to provide fair compensation to the landowner for the right to use the property for project construction and operation.

Trunkline would compensate landowners as appropriate for damage(s) to their property, including damage to crops, pasture, and timber. In the event that a landowner observes damage after restoration is complete, Trunkline would work with the landowner to correct the deficiency.

Property taxes are generally based on the actual use of the land. Construction of the pipelines would not typically change the general use of the land, but it would preclude the construction of aboveground structures within the permanent right-of-way. If a landowner feels that the presence of a pipeline easement reduces the value of his or her land, resulting in excessive property taxes, he/she may appeal the issue of the assessment and subsequent property taxation to the local property taxation agency. In any event, Trunkline would compensate landowners for negative impacts on their properties.

4.9.8 Environmental Justice

Executive Order 12898 on environmental justice recognizes the importance of using the NEPA process to identify and address, as appropriate, any disproportionately high and adverse health or environmental effects of federal programs, policies, or activities on minority populations and low-income groups. The provisions of Executive Order 12898 apply equally to Native American programs. Consistent with Executive Order 12898, the CEQ has called on federal agencies to actively scrutinize the following issues with respect to environmental justice (CEQ, 1997):

- the racial and economic composition of affected communities;
- health-related issues that may amplify project effects to minority or low-income individuals; and
- public participation strategies, including community or tribal participation in the NEPA process.

The EPA provides guidance on determining whether there is a minority or low-income community to be addressed in a NEPA analysis. According to this guidance, minority population issues must be addressed when they comprise over 50 percent of an affected area or when the minority population percentage of the affected area is substantially greater than the minority percentage in the larger area of the general population. Low-income populations are those that fall within the annual statistical poverty thresholds from the U.S. Department of Commerce, Bureau of the Census Population Reports, Series P-60 on Income and Poverty.

In accordance with these guidelines, we prepared an environmental justice analysis for the project. Table 4.9.8-1 shows the racial composition and economic status of Calcasieu, Jefferson Davis, and Beauregard Parishes as well as the State of Louisiana.

TABLE 4.9.8-1

Demographics in the Lake Charles Liquefaction Project Area[a]

State/Parish	Racial Composition of Population (percent): White alone, not Hispanic or Latino	Black or African American Alone	Hispanic or Latino	Other	Median Household Income (2008 to 2012)	Persons Below Poverty (percent)
Louisiana	59.9	32.4	4.5	3.2	$44,673	18.7
Calcasieu Parish	69.2	25.1	2.8	2.9	$44.247	16.8
Jefferson Davis Parish	78.6	17.2	1.8	2.4	$41,777	18.1
Beauregard Parish	79.8	13.5	3.2	3.5	$46,762	14.8

a U.S. Census Bureau, 2014a

The liquefaction facility would be located adjacent to the existing LNG terminal site and would not be located near any low-income or minority population areas. Therefore, there would not be any disproportionately high or adverse environmental and human health impacts on low-income and minority populations.

Trunkline would collocate new pipeline facilities with existing linear and facility infrastructure where possible. The remaining pipeline routes would cross mostly rural areas and were developed to avoid a disproportionate effect on any population (minority, low-income, or otherwise). The new compressor station would be located in a rural agricultural area proximate to existing natural gas transmission infrastructure. There would not be any disproportionately high or adverse environmental and human health impacts on low-income and minority populations from construction or operation of the Non-liquefaction Facilities.

4.10 CULTURAL RESOURCES

Section 106 of the NHPA, as amended, requires the FERC to take into account the effect of its undertakings on properties listed, or eligible for listing, on the NRHP and to afford the ACHP an opportunity to comment on the undertaking. Lake Charles LNG and Trunkline, as non-federal parties, are assisting the FERC in meeting our obligations under section 106 and the implementing regulations in 36 CFR 800 by preparing the necessary information, analyses, and recommendations, as authorized by 36 CFR 800.2(a)(3).

Construction and operation of the Lake Charles Liquefaction Project could have the potential to affect historic properties (that is, cultural resources listed or eligible for listing on the NRHP). Historic properties include prehistoric or historic archaeological sites, districts, buildings, structures, and objects, as well as locations with traditional value to Native Americans or other groups. Historic properties generally must possess integrity of location, design, setting, materials, workmanship, feeling, and association, and must meet one or more of the criteria specified in 36 CFR 60.4.

4.10.1 Liquefaction Facility

4.10.1.1 Cultural Resources Survey

Lake Charles LNG completed a records review and Phase I cultural resources surveys of the proposed liquefaction facility and associated ACW. The investigations covered both archaeological and architectural resources. A Phase I report for the liquefaction facility (Grunden et al., 2013) and an Addendum Phase I report for the associated ACW (Laird, 2014a) were provided to the FERC and the Louisiana SHPO. Lake Charles LNG did not conduct cultural resources survey within the existing LNG terminal, providing a May 2014 agreement with the Louisiana SHPO that stated no consultation with the SHPO was necessary for construction or maintenance projects within existing rights-of-way, fenced aboveground facilities, or for use of existing access roads.

The records review identified two known resources (archaeological site 16CU37 and cemetery Cem-Cu-43-01) within the survey area for the liquefaction facility. Site 16CU37 consisted of the ruins of a mid-twentieth century structure originally recorded in 2005. Cem-Cu-43-01, the historic Black Bayou Cemetery, was originally recorded in 2003. Site 16CU37 had previously been recommended as not eligible for the NRHP, and the eligibility of Cem-Cu-43-01 for the NRHP had not been previously assessed. No known historic architectural resources were identified within or near the proposed liquefaction facility.

The Phase I cultural resources surveys examined a 739-acre area for the liquefaction facility and associated ACW. The survey consisted of pedestrian surface inspection of areas with greater than 25 percent surface visibility, and systematic subsurface shovel testing of areas that were not inundated, composed of hydric soil, or covered with gravel or other obvious fill. A total of 1,479 shovel tests were excavated. A single new archaeological site, a house ruin (16CU79), was identified at the liquefaction facility and recommended as not eligible for the NRHP. The previously recorded Black Bayou Cemetery was relocated and not assessed; however, Lake Charles LNG plans to avoid the cemetery during construction and operation of the facility. To prevent inadvertent impacts during construction, Lake Charles LNG would install safety fencing around the cemetery and assign an inspector to oversee earth moving activities in proximity to the cemetery. During operation, the liquefaction facility vapor fence would be adjacent to the existing cemetery fence line. Previously recorded archaeological site 16CU37 was not relocated and Lake Charles LNG recommended no additional investigation of the site's recorded location.

Lake Charles LNG also examined surrounding areas within line-of-sight (estimated to be 0.25 mile) of proposed construction for historic architectural resources. No historic architectural resources were identified.

In letters dated May 21, 2013, March 17, 2014, and June 12, 2014, the Louisiana SHPO commented on the Phase I and Addendum Phase I reports and concurred that site 16CU79 was not eligible for the NRHP, and that no historic properties would be affected by construction of the liquefaction facility. We concur also.

4.10.1.2 Compliance with the National Historic Preservation Act

Cultural resources surveys have been completed for the liquefaction facility and ACW. The Louisiana SHPO and FERC agree that no historic properties would be affected by these project components. Therefore, the process of complying with Section 106 of the NHPA has been completed for the liquefaction facility and ACW.

4.10.2 Non-Liquefaction Facilities

4.10.2.1 Cultural Resources Survey

Louisiana

Trunkline completed a records review and Phase I cultural resources surveys of most of the proposed Non-Liquefaction Facilities. The investigations covered both archaeological and architectural resources. Phase I reports for the Mainline 200-3 Loop (Laird et al., 2013a), Mainline Connector (Laird et al., 2013b), aboveground facilities (including Compressor Station 203-A, the LCLNG Export, Kinder Morgan-Lake Charles, Columbia Gulf–Egan, MEP–Perryville, Gulf Crossing–Perryville, TETCO–Allen, a portion of Transco Ragley, NGPL–Lakeside, Tennessee–Kaplan Meter Stations, and a 20.8-acre contractor storage yard) (Laird et al., 2013c), and an Addendum Phase I report for the Texas Gas–Woodlawn Meter Station (Laird, 2014b),were provided to the FERC and the Louisiana SHPO. Cultural resources surveys were not conducted for the existing Pollock, Longville, and Epps Compressor Stations, the US 190 Meter Station, and several access roads because they were exempt from survey in accordance with Trunkline's May 2014 agreement with the Louisiana SHPO (see above).

The records review did not identify any known archaeological resources within the survey areas or any known historic architectural resources within or near the proposed Non-Liquefaction Facilities.

The Phase I cultural resources surveys included examination of a 200- to 400-foot-wide corridor encompassing the proposed pipeline rights-of-way and associated ATWSs, 50-foot-wide corridors along the proposed access roads, as well as examination of parcels for the compressor station, contractor storage yard, and the new and modified meter stations. In total, about 1,011 acres were surveyed. The cultural resources survey consisted of pedestrian surface inspection of areas with greater than 25 percent surface visibility, and systematic subsurface shovel testing of areas that were not inundated or obviously disturbed past the depth of potential archaeological deposits. A total of 2,321 shovel tests were excavated.

Trunkline did not identify any archaeological resources within the surveyed areas. Trunkline also examined the areas surrounding the pipelines, compressor station, new meter stations, meter station modifications, access roads, and contractor storage yard for architectural resources that could be visually impacted by those facilities. Trunkline defined the area of potential visual impact as the surrounding areas within the line of sight of each proposed facility. Trunkline did not identify any architectural resources within those areas.

In three separate letters (one for each Phase I report reviewed) dated September 4, 2013, as well as an additional letter dated March 17, 2014 (for the Addendum Phase I report), the Louisiana SHPO concurred that no historic properties would be affected by construction of the Mainline 200-3 Loop, Mainline Connector, aboveground facilities, and the Texas Gas–Woodlawn Meter Station. We concur also.

Subsequently, Trunkline contacted the Louisiana SHPO regarding an additional 0.13-acre work area for the Transco Ragley Meter Station, and the proposed route of the HDD crossing of the Calcasieu River. On March 27, 2014, the Louisiana SHPO indicated that "no known historic properties will be affected" by Trunkline's use of the additional Transco Ragley Meter Station work area or by Trunkline's proposed route of the HDD crossing of the Calcasieu River. We concur also.

Mississippi

Trunkline contacted the Mississippi SHPO regarding the activities at the existing Shaw Compressor Station. In a letter dated May 16, 2013, the SHPO concluded that the proposed modifications at the Shaw Compressor Station would have no effect on cultural resources. We concur.

Subsequently, Trunkline contacted the Mississippi SHPO regarding the proposed modifications to the existing launcher barrel facility situated on the east bank of the Mississippi River. In a letter dated April 14, 2014, the SHPO indicated that "no cultural resources are likely to be affected" by the modifications to this facility. We concur.

Arkansas

Trunkline contacted the Arkansas SHPO regarding the proposed installation of a new bi-directional barrel at the existing facility situated on the west bank of the Mississippi River. On March 31, 2014, the SHPO indicated that "no known historic properties will be affected" by the installation of this facility. We concur.

4.10.2.2 Compliance with the National Historic Preservation Act

Cultural resources surveys have been completed for the Non-Liquefaction Facilities. The Louisiana, Mississippi, and Arkansas SHPOs, as well the FERC, agree that no historic properties would be affected by these facilities. Therefore, the process of complying with Section 106 of the NHPA has been completed for the Non-Liquefaction Facilities.

4.10.3 Unanticipated Discovery Plan

Lake Charles LNG and Trunkline prepared an Unanticipated Discovery Plan that they would implement in the event that cultural resources or human remains are encountered during construction of the proposed project components in Louisiana. We requested minor revisions to the plan, and Lake Charles LNG and Trunkline provided a revised plan that we find acceptable. Lake Charles LNG and Trunkline subsequently provided a copy of the plan to the Louisiana SHPO; on April 2, 2014, the Louisiana SHPO responded that it had reviewed and accepted the plan.

Trunkline prepared Unanticipated Discovery Plans for the Non-Liquefaction Facilities in Mississippi and Arkansas that it would implement in the event that cultural resources or human remains are encountered during construction of project components in those states. We requested minor revisions to the plans, and Trunkline provided revised plans that we find acceptable.

Trunkline subsequently provided copies of the Mississippi and Arkansas Unanticipated Discovery Plans to the Mississippi and Arkansas SHPOs, respectively. The Mississippi SHPO responded that it found the plan to be acceptable, but suggested that the Oklahoma Band of Choctaw Indians Tribal Historic Preservation Officer be added to the list of tribes to be notified if an unanticipated discovery of prehistoric material is made during project construction. The Arkansas SHPO made several recommendations for revisions to the Arkansas plan. Trunkline submitted revised plans addressing the Mississippi and Arkansas SHPOs' comments**.** We find the revised plans acceptable.

4.10.4 Native American Consultation

We sent our NOI and supplemental NOI to the following federally recognized Native American tribes: the Caddo Nation; Chitimacha Tribe of Louisiana; Jena Band of Choctaw Indians; the Coushatta Tribe of Louisiana; the Mississippi Band of Choctaw Indians; the Choctaw Nation of Oklahoma; the Tunica-Biloxi Tribe of Louisiana; and the Alabama Coushatta Tribe of Texas. The NOI requested comments on the proposed project and encouraged attendance at the FERC's public scoping meeting. We received a response to the initial NOI from the Choctaw Nation of Oklahoma requesting copies of correspondence received from the Mississippi SHPO, as well as copies of the cultural resources survey reports. The Choctaw Nation of Oklahoma reiterated this request in an April 9, 2013 letter to the FERC acknowledging receipt of the supplemental NOI. We directed Lake Charles LNG and Trunkline to provide copies of the requested information to the Choctaw Nation of Oklahoma, which they provided on May 12, 2014. In a June 20, 2014 response, the Choctaw Nation of Oklahoma indicated they were unaware of any cultural or sacred sites within the immediate project area and that work should proceed as planned, but requested to be contacted in the event that Native American cultural objects or human remains were encountered during construction. The Unanticipated Discovery Plans provide for notification of Native American tribes in the event of a discovery. We did not receive responses to the NOI or supplemental NOI from any of the other tribes.

We sent a follow-up letter to each of the tribes on September 28, 2012. The letters requested comments from the tribes and assistance in identifying properties of traditional, religious, or cultural importance that may be affected by the proposed project. We received a letter from the Jena Band of Choctaw Indians deferring to the Coushatta Tribe of Louisiana. To date, we have received no other responses.

Lake Charles LNG and Trunkline sent three letters (for the liquefaction facility, the Non-Liquefaction Facilities, and an update on all project facilities) to the Caddo Nation, Chitimacha Tribe of Louisiana, Jena Band of Choctaw Indians, the Coushatta Tribe of Louisiana, the Tunica-Biloxi Tribe of Louisiana, and the Alabama Coushatta Tribe of Texas on August 13, 2012; February 5, 2013; and March 3, 2014. The letters requested the tribes communicate any concerns about potential impacts the proposed project may have on archaeological sites, burials, or traditional cultural properties. In an April 8, 2013 response, the Jena Band of Choctaw Indians requested that Lake Charles LNG and Trunkline provide additional information and the cultural resource survey reports for review. The Jena Band of Choctaw Indians reiterated these requests in an email to Lake Charles LNG and Trunkline dated March 13, 2014. Lake Charles LNG and Trunkline provided the reports and other requested information to the tribe on May 9, 2014. To date, no comments have been received from the tribe.

In a letter dated April 2, 2014, the Coushatta Tribe of Louisiana concurred with Lake Charles LNG's and Trunkline's recommendations that no historic properties would be affected by the proposed project. The tribe requested that they be notified if cultural resources or human remains are discovered during construction activities. The Unanticipated Discovery Plans provide for notification of Native American tribes in the event of a discovery. In a response dated April 4, 2014, the Chitimacha Tribe of Louisiana noted that they had no concerns or comments regarding the project. No other responses have been received to date to the letters sent by Lake Charles LNG and Trunkline.

4.11 AIR QUALITY AND NOISE

4.11.1 Air Quality

4.11.1.1 Regional Climate

Due to its location near the Gulf of Mexico, the Lake Charles Liquefaction Project area has a subtropical climate which is generally categorized as warm and wet, with mild and humid winters (EPA, 2014a). A semi-permanent high-pressure system, known as the Bermuda High, is typically situated off of the Atlantic Coast. Depending on its position, it commonly draws moisture northward or westward from the Atlantic and Gulf of Mexico, especially during the warm season. As a result, summers in the project area are characteristically warm and moist with frequent thundershower activity in the afternoon and early evening hours. Day-to-day and week-to-week variations in the positions of the Bermuda High can have a strong influence on precipitation patterns. When the Bermuda High builds west over the region, hot and dry weather occurs, although humidity often remains relatively high. This pattern can cause heat waves and poor air quality (NOAA, 2013).

The Lake Charles area receives an annual average of 57.19 inches of rain. February is typically the driest month of the year with an annual mean of 3.28 inches, whereas June tends to be the wettest month with an annual mean of 6.07 inches. Snow events are rare with an annual mean of 0.3 inches of snow which is only likely to occur in January or February. Temperatures range from an average of 60.6 degrees Fahrenheit in February to an average of 91.3 degrees Fahrenheit in August (NOAA, 2004).

Wind direction in the Lake Charles area is primarily either north or south depending on the time of year. Spring and summer months experience winds coming from the south whereas wind direction is typically from the north or northeast during the fall and winter months. On average, wind speed varies between 6 and 10 miles per hour (NOAA, 1998).

4.11.1.2 Existing Air Quality

Ambient Air Quality Standards

Criteria Pollutants

The EPA, as required by the CAA, has established National Ambient Air Quality Standards (NAAQS) to protect public health (primary standards) and public welfare (secondary standards). Standards have been set for six principal pollutants that are called “criteria pollutants.” These criteria pollutants are ground-level ozone, carbon monoxide (CO), oxides of nitrogen (NO_X), sulfur dioxide (SO_2), respirable and fine particulate matter (inhalable particulate matter with an aerodynamic diameter less than or equal 10 microns [PM_{10}] and less than or equal to 2.5 microns [$PM_{2.5}$]), and airborne lead (Pb). Ozone is not directly emitted into the atmosphere from an emissions source. Ozone develops as a result of a chemical reaction between NO_X and volatile organic compounds (VOC) in the presence of sunlight. Therefore, NO_X and VOCs are often referred to as ozone precursors. Table 4.11.1-1 lists the NAAQS for the six criteria pollutants. Louisiana, Arkansas, and Mississippi have adopted the NAAQS.

TABLE 4.11.1-1

National Ambient Air Quality Standards

Criteria Pollutant	Primary/ Secondary	Averaging Time	Level	Form
CO	Primary	8-hour	9 ppm (10,000 μg/m^3)	Not to be exceeded more than once per year
		1-hour	35 ppm (40.000 μg/m^3)	
Pb	Primary and secondary	Rolling 3-month average	0.15 μg/m^3 [a]	Not to be exceeded
Nitrogen dioxide (NO_2)	Primary	1-hour	100 ppb (189 μg/m^3)	98th percentile, averaged over 3 years
	Primary and secondary	Annual	53 ppb[b] (100 μg/m^3)	Annual mean
Ozone	Primary and secondary	8-hour (2008)	0.075 ppm[c] (150 μg/m^3)	Annual fourth-highest daily maximum 8-hr concentration, averaged over 3 years
	Primary and secondary	8-hour (1997)	0.08 ppm (157 μg/m^3)	
	Primary and secondary	1-Hour	0.12 ppm (235 μg/m^3)	
Particle pollution				
$PM_{2.5}$	Primary	Annual	12 μg/m^3	Annual mean, averaged over 3 years
	Secondary	Annual	15 μg/m^3	
	Primary and secondary	24-hour	35 μg/m^3	98th percentile, averaged over 3 years
PM_{10}	Primary and secondary	24-hour	150 μg/m^3	Not to be exceeded more than once per year on average over 3 years
SO_2	Primary	1-hour	75 ppb (195 μg/$m^{3)}$[d]	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years
	Secondary	3-hour	0.5 ppm (1,300 μg/m^3)	Not to be exceeded more than once per year

[a] Final rule signed October 15, 2008. The 1978 lead standard (1.5 μg/m^3 as a quarterly average) remains in effect until 1 year after an area is designated for the 2008 standard, except that in areas designated nonattainment for the 1978, the 1978 standard remains in effect until implementation plans to attain or maintain the 2008 standard are approved.

[b] The official level of the annual NO_2 standard is 0.053 ppm, equal to 53 ppb, which is shown here for the purpose of clearer comparison to the 1-hour standard.

[c] Final rule signed March 12, 2008. The 1997 ozone standard (0.08 ppm, annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years) and related implementation rules remain in place. In 1997, EPA revoked the 1-hour ozone standard (0.12 ppm, not to be exceeded more than once per year) in all areas, although some areas have continued obligations under that standard (“anti-backsliding”). The 1-hour ozone standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is less than or equal to 1.

[d] Final rule signed June 2, 2010. The 1971 annual and 24-hour SO_2 standards were revoked in that same rulemaking. However, these standards remain in effect until 1 year after an area is designated for the 2010 standard, except in areas designated nonattainment for the 1971 standards, where the 1971 standards remain in effect until implementation plans to attain or maintain the 2010 standard are approved.

Notes: ppm = parts per million; μg/m^3 = microgram per cubic meter; ppb = parts per billion

Source: EPA, 2014b

Greenhouse Gases

In April 2007 the Supreme Court ruled that greenhouse gases (GHG) fell within the CAA's definition of "air pollutant," and required the EPA to conduct an endangerment finding for GHGs. On December 7, 2009 the EPA issued findings that current and projected concentrations of six key well-mixed GHGs in the atmosphere threaten the public health and welfare of current and future generations (EPA, 2014c). The six key GHGs are:

- carbon dioxide (CO_2);
- methane (CH_4);
- nitrous oxide (N_2O);
- hydrofluorocarbons (HFC);
- perfluorocarbons (PFC); and
- sulfur hexafluoride (SF_6).

These findings were based on emissions associated with new motor vehicles; however, regulation of GHGs has expanded to include major stationary sources of air pollutants. There are no NAAQS for GHGs.

GHGs are often represented by an aggregate number expressed in units of carbon dioxide equivalent (CO_2e). A global warming potential (GWP) factor has been determined by the EPA for each GHG, which is a relative measure of a GHG's ability to absorb solar radiation and its residence time in the atmosphere in comparison to that of CO_2. For example, CO_2 has a GWP of 1, whereas CH_4 has a GWP of 25 and N_2O has a GWP of 298.

Air Quality Control Regions and Attainment Status

An air quality control region (AQCR) is defined under 42 USC §7407(c) as "...any interstate area or major intrastate area which [the Administrator of the EPA] deems necessary or appropriate for the attainment and maintenance of ambient air quality standards." Each AQCR, or portion(s) of an AQCR, is classified as either attainment, non-attainment, or maintenance with respect to the NAAQS.

Areas where ambient air concentrations of the criteria pollutants are below the levels listed in the NAAQS are considered in attainment; if ambient air concentrations of criteria pollutants are above the NAAQS levels then the area is considered to be non-attainment. Areas that have been designated nonattainment but have since demonstrated compliance with the NAAQS are designated maintenance for that pollutant. Maintenance areas are treated similar to attainment areas for the permitting of stationary sources; however, specific provisions may be incorporated through the state's approved maintenance plan to ensure that the air quality would remain in compliance with the NAAQS for that pollutant. Maintenance areas retain the classification for 20 years before being re-classified as attainment areas. Areas where air quality data is not available are considered to be unclassifiable and are treated as attainment areas. The entire Lake Charles Liquefaction Project area is classified as in attainment for all criteria pollutant standards.

Air Quality Monitoring and Background Concentrations

Ambient air monitoring operations in Louisiana are the responsibility of the LDEQ Air Quality Assessment Division, which has developed a statewide network of stationary monitoring stations to collect direct measurements of air pollutant concentrations. Data from these air monitoring sites is available through the EPA's AIRDATA database which collects air monitoring data from all over the country. The majority of work associated with the Lake Charles Liquefaction Project would be in the Calcasieu Parish, Louisiana area. The nearest or most representative monitors for ambient air concentrations of $PM_{2.5}$, SO_2, nitrogen dioxide (NO_2), and ozone are in Lake Charles, Calcasieu Parish, Louisiana. The nearest and most representative monitors for ambient air concentrations of PM_{10}, CO, and Pb are in Galveston, Jefferson, and Harris Counties, Texas, respectively.

Ambient air quality monitoring data from the 3-year period 2011 to 2013 are summarized in table 4.11.1-2 for those monitors that were nearest or most representative of the Lake Charles Liquefaction Project area. For each monitor, table 4.11.1-2 lists the applicable concentrations such as annual mean concentration in each year and/or a near maximum short-term concentration. Second-high short-term concentrations are listed for most pollutants, but table 4.11.1-2 includes the fourth highest 8-hour concentration for ozone, the 98th percentile 24-hour concentration for $PM_{2.5}$, the 98th percentile 1-hour concentration for NO_2, and the 99th percentile 1-hour concentration for SO_2.

The concentrations listed in table 4.11.1-2 are maximum or near maximum values for the identified monitors. As such, they are not necessarily representative of current actual air quality in the immediate vicinity of the project.

TABLE 4.11.1-2

Ambient Air Quality Concentrations for Areas Near the Lake Charles Liquefaction Project

Pollutant	Averaging Period	Rank	Location	2013	2012	2011	Units	Monitor(s)
CO	1-hour	2nd high	Jefferson County, TX	0.7	0.7	0.9	ppm	A
	8-hour	2nd high	Jefferson County, TX	0.6	0.5	0.5	ppm	A
NO_2	Annual	Mean	Calcasieu Parish, LA	N/A	N/A	6	ppb	B
	1-hour	98th percentile	Calcasieu Parish, LA	30	27	32	ppb	B
Ozone	8-hour	4th high	Calcasieu Parish, LA	0.07	0.075	0.069	ppm	B
$PM_{2.5}$	24-hour	98th percentile	Calcasieu Parish, LA	17	20	20	$\mu g/m^3$	E
	Annual	Mean	Calcasieu Parish, LA	N/A	N/A	8.9	$\mu g/m^3$	E
PM_{10}	24-hour	2nd high	Galveston County, TX	46	54	51	$\mu g/m^3$	C
SO_2	1-hour	99th percentile	Calcasieu Parish, LA	31	42	37	ppb	B
	3-hour	2nd high	Calcasieu Parish, LA	N/A	N/A	N/A	ppb	B
Lead	Quarterly	Maximum	Harris County, TX	N/A	N/A	N/A	$\mu g/m^3$	D

Monitor Key:
A = Seattle Street, Nederland, Jefferson County, Texas(monitor # 482451035)
B = 2646 John Stine Rd, Lake Charles, Calcasieu Parish, Louisiana (monitor # 220190008)
C = 2516 Texas Avenue, Texas City, Galveston County, Texas (monitor # 481670004)
D = 1262 ½ Mae Drive, Houston, Harris County, Texas (monitor #482011034)
E = Common & E. McNeese, Lake Charles, Calcasieu Parish, Louisiana (monitor # 220190010)
Notes:
$\mu g/m^3$ = micrograms per cubic meter
ppm = parts per million
ppb = parts per billion
N/A = data not yet available
Source: epa.gov/airdata

4.11.1.3 Regulatory Requirements for Air Quality

The LDEQ is the lead air permitting authority for the Lake Charles Liquefaction Project facilities in Louisiana. The LDEQ's air quality regulations are codified in Title 33 of the Louisiana Administrative Code (LAC) Part III Chapters 1 through 59. The regulations incorporate the federal program requirements listed in 40 CFR Parts 50-99 and establish permit review procedures for all facilities that can emit pollutants to the ambient air. New facilities are required to obtain an air quality permit prior to initiating construction. Facilities can trigger additional review by the EPA if the facility triggers PSD permitting requirements.

The Mississippi Department of Environmental Quality (MDEQ) Air Division is the air permitting authority for the project facilities in Mississippi. The MDEQ's air quality regulations are codified in Title 11 of the Mississippi Administrative Code, Part 2, Chapters 1-10.

The project components proposed to be constructed in Arkansas would not result in significant emissions and would not be subject to air quality regulations in that state.

Federal Regulatory Requirements

<u>New Source Review – Prevention of Significant Deterioration</u>

Congress established the New Source Review (NSR) preconstruction permitting program as part of the 1977 CAA Amendments. Federal preconstruction review under NSR is conducted under separate procedures for sources in attainment areas and sources in nonattainment areas. Nonattainment New Source Review applies to sources in nonattainment areas. Since the project is not located in any nonattainment areas, this process does not apply and is not discussed further. PSD applies to new major sources or major modifications at existing sources located in attainment areas or in areas that are unclassifiable. PSD is intended to keep new air emission sources from causing the existing air quality to deteriorate beyond acceptable levels. Under PSD, any new major source or major modification of an existing source of air pollutants is required to obtain an air quality permit before beginning construction. The definition of a PSD major source of air pollutants as applicable to the project is any stationary source which emits, or has the potential to emit, 250 tons per year (tpy) of a regulated criteria pollutant (40 CFR Part §51.166(b)(1)(i)(b)).

PSD can also apply to an existing major source when physical modifications are made to the source that result in increased emissions above the "major modification" or significant emission rate (SER) for the respective pollutant. The SERs for the pollutants applicable to the Lake Charles Liquefaction Project are listed in table 4.11.1-3.

TABLE 4.11.1-3

Major Stationary Source/Major Modification Emission Thresholds

Pollutant	Major Stationary Source Threshold Level (tpy)	Major Modification Significant Net Increase (tpy)
Ozone /VOC/NO_X	250	40
CO	250	100
SO_2	250	40
PM	250	25
PM_{10}	250	15
$PM_{2.5}$	250	10
Pb	250	0.6
GHG	N/A	N/A

GHG Reporting Rule

In September 2009, the EPA issued the final Mandatory Reporting of Greenhouse Gases Rule, requiring reporting of GHG emissions from suppliers of fossil fuels and facilities that emit greater than or equal to 25,000 metric tpy of GHG (reported as CO_2). In November 2010, the EPA signed a rule finalizing GHG reporting requirements for the petroleum and natural gas industry in 40 CFR Part 98 Subpart W. The industry separates LNG storage facilities from LNG import and export equipment because the former are considered part of the source category regulated by Subpart W. The rule does not apply to construction emissions.

The new liquefaction facilities would potentially be subject to the GHG Mandatory Reporting Rule. The rule establishes reporting requirements based on actual emissions; however, it does not require emission controls. Lake Charles LNG would monitor emissions in accordance with the reporting rule. If actual emissions exceed the 25,000 tpy CO_2e reporting threshold, Lake Charles LNG would be required to report its GHG emissions to the EPA.

GHG Tailoring Rule

On May 13, 2010, the EPA issued a PSD GHG Tailoring Rule. The rule tailored specific applicability thresholds for GHG stationary sources. However, on June 23, 2014, the Supreme Court ruled that the EPA cannot require PSD permitting based solely on GHG emissions, striking down a portion of the rule.

The GHG Tailoring Rule specified that as of July 1, 2011, new sources would become subject to PSD with regard to GHGs if the source emits or has the potential to emit greater than 100,000 tpy of CO_2e. An existing Title V facility was subject to a 75,000 tpy CO_2e significance threshold for any modifications. However, based on the Supreme Court ruling, in order for PSD permitting requirements to apply, the new or modified source must be subject to PSD for a criteria pollutant in order to be considered a major PSD source for GHGs, and for such sources only Best Available Control Technology (BACT) would apply to the sources of GHG emissions.

PSD Requirements

Once a facility is subject to PSD, the following requirements apply:

- installation of BACT;
- air quality monitoring and modeling analyses to ensure that a project's incremental increase of emissions will not cause or contribute to a violation of any NAAQS;
- notification to the federal land manager of nearby Class I areas and modeling if applicable;
- a growth, soil and vegetation, and visibility analysis; and
- public comment on the permit.

BACT is an emissions limitation which is based on the maximum degree of control that can be achieved. It is a case-by-case decision that considers energy, environmental, and economic impact. BACT can be add-on control equipment or modification of the production processes or methods. This includes fuel cleaning or treatment and innovative fuel combustion techniques. BACT may be a design, equipment, work practice, or operational standard if imposition of an emissions standard is infeasible (EPA, 2014d).

The air quality monitoring and modeling analysis involves an assessment of existing air quality, which may include ambient monitoring data and air quality dispersion modeling results, and predictions, using dispersion modeling, of ambient concentrations that will result from the proposed project and future growth associated with the project (EPA, 2014d).

Federal Class I areas are areas of special national or regional natural, scenic, recreational, or historic value for which the PSD regulations provide special protection. There are 156 Class I areas in the United States. If a new source or major modification of an existing source is subject to the PSD program requirements and is within 62 miles (100 kilometers) of a Class I area, the facility is required to notify the appropriate federal officials and assess the impacts of the proposed project on the Class I area.

The proposed liquefaction facility would be subject to PSD permitting requirements as discussed in more detail below. Although the Longville Compressor Station is an existing major source, the expected increase in emissions due to the proposed modifications would not exceed the SERs listed in table 4.11.1-3; therefore, it would not be subject to PSD permitting requirements. Compressor Station 203-A also would not be subject to the major source PSD requirements because it would not emit 250 tons or more of any criteria pollutant, and it is not listed as belonging to one of 28 specifically listed industrial source categories under 40 CFR 52.21 (b) (1) which have a 100 tpy applicability threshold. All other facilities associated with the Lake Charles Liquefaction Project are not expected to exceed the emission thresholds that would trigger PSD requirements.

The results of the PSD applicability analysis for the liquefaction facility are summarized in table 4.11.1-4. The proposed liquefaction facility would be permitted as a separate, stand-alone stationary source. However, as the liquefaction facility would be adjacent to the existing LNG terminal and both emission sources would be under common operational control, Lake Charles LNG anticipates that the two facilities would be addressed as a single source for PSD applicability and subject to the net emission increase thresholds shown above. The PSD applicability analysis for the liquefaction facility indicates that operational emission increases would exceed the significant net emission increase thresholds listed in table 4.11.1-4 for PM_{10}, $PM_{2.5}$, NO_X, CO, and VOC.

TABLE 4.11.1-4

Prevention of Significant Deterioration Applicability Analysis for the Liquefaction Facility at the Existing LNG Terminal

Pollutant	Significant Emission Rate (tpy)	Proposed New LNG Liquefaction Facility Emissions (tpy)	Creditable Contemporaneous Emission Change (tpy)	Net Emission Increase (tpy)	Significant Net Emission Increase (Yes/No)
PM_{10}	15	202.47	0	202.47	Yes
$PM_{2.5}$	10	202.47	0	202.47	Yes
NO_X	40	750.41	0	750.41	Yes
SO_2	40	39.89	0	39.89	No
CO	100	1,878.83	0	1,878.83	Yes
Total VOC	40	58.18	0	58.18	Yes
CO_2e	N/A	4,513,540	0	4,513,540	N/A

N/A = Not applicable.

Note: Ozone is assessed through two precursors: NO_X and VOC, and is not specifically listed in the table.

Lake Charles LNG conducted a BACT analysis for the liquefaction facility as required for its PSD permit application. The analysis uses a "top-down" approach developed by the EPA for determining the best type of control technology for the liquefaction facility. The approach includes five basic steps: 1) identification of all available control options for the emission unit in question; 2) evaluation of the technical feasibility of the control options identified in step one; 3) ranking of remaining control technologies from step two based on control effectiveness for the pollutant under review; 4) consideration of the energy, environmental, and economic impacts of available and technically feasible control technology options; and 5) selection of the most effective control alternative not eliminated in step four and establishment of a corresponding emission limit.

Tables 4.11.1-5 and 4.11.1-6 summarize the findings of the BACT analysis for the liquefaction facility with respect to criteria and GHG pollutants, respectively.

In accordance with 40 CFR Part 52.21, a demonstration of compliance with the NAAQS and PSD Increment standards is required for the construction of any new major stationary source or any project at an existing major stationary source in an area designated as attainment or unclassifiable under the CAA. The ambient air quality in Calcasieu Parish is designated as attainment for all criteria pollutants. Based on the PSD analysis for the proposed liquefaction facility, Lake Charles LNG conducted dispersion modeling for CO, NO_2, PM_{10}, and $PM_{2.5}$. The procedures, assumptions, and results of the air dispersion analysis are documented in a detailed modeling report that was submitted to the LDEQ in September 2014 (Trinity Consultants, 2014a).

Lake Charles LNG's analysis included:

- a description of all assumptions made for modeling purposes;
- feasible "worst-case" operating scenarios (those that would produce the highest concentration of air emissions);
- evaluation of the emissions from all of the stationary sources at the proposed liquefaction facility;
- emissions from a marine flare and two emergency generators that would be installed at the existing LNG terminal as part of the proposed liquefaction facility (the emissions from these three sources are included in the liquefaction facility air permit application, as well as being included in the air dispersion modeling analysis for the liquefaction facility); and
- a PSD Screening Analysis, NAAQS Analysis, and PSD Increment Analysis

The results of this modeling analysis were compared to the significant impact levels, as well as added to the background levels and compared to the NAAQS. The results of this modeling analysis are detailed in section 4.11.1.5, Operational Air Emissions Impacts and Mitigation.

PSD requirements also include an analysis of the impacts from the proposed project on Class I areas, growth, soil and vegetation, and visibility. The following is a summary of the analyses performed for these impacts.

Class I Area Analysis: There are no Class I areas within 300 kilometers of the facility. Therefore, no Class I modeling analysis was necessary.

TABLE 4.11.1-5

Best Available Control Technology Analysis Summary for Criteria Pollutants for the Lake Charles Liquefaction Project Liquefaction Facility

Source	Pollutant	Proposed Emission Controls	Proposed Emission Limits
Gas Turbines	NO_X	Selective catalytic reduction (90 percent control efficiency) and low No_x burners	5 ppm (volumetric dry) corrected to 15 percent O_2 on a 3-hour average.
	CO	Post combustion catalytic oxidation CO Turndown (COTD)	10 ppm (volumetric dry) corrected to 15 percent O_2 on a 3-hour average. Performance test will be used to demonstrate compliance.
	VOC	Good combustion practices Post combustion catalytic oxidation	Work practice standards
	PM	Low PM-emitting gaseous fuels only, good combustion and maintenance practices	Work practice standards
Thermal Oxidizers	NO_X	Low NO_X burners and good combustion practices	Work practice standards
	CO	Good combustion practices	Work practice standards
	PM	Low PM-emitting gaseous fuels only, good combustion and maintenance practices	Work practice standards
AGRU Process Vents	VOC	Thermal Oxidizer	99.9 percent efficiency; Minimum firebox temperature for ongoing compliance and leakless components
Flares	NO_X	40 CFR Part 60.18 and good combustion practices	Minimum heating value (British thermal units per standard cubic foot) and maximum tip velocity based on 40 CFR 60.18
	CO	40 CFR Part 60.18 and good combustion practices	NSPS standards
Hot Oil Heater	NO_X	Low NO_X burners and good combustion practices	Work practice standards
	CO	Good combustion practices	Work practice standards
	VOC	Good combustion practices	Work practice standards
	PM	Good combustion practices	Work practice standards
Fugitives	VOC	Leak detection & repair program	Monitoring on a monthly basis with a leak detection threshold of 500 parts per million by volume (ppmv)
Standby Generator Diesel Engines	VOC, NO_X, CO, PM	Good combustion practices	Non-emergency maintenance and testing limited to 100 hours per year
Firewater Pump Diesel Engines		Good combustion practices	Non-emergency maintenance and testing limited to 100 hours per year
Condensate Storage Tank		Internal floating roof with liquid mounted primary and rim mounted secondary seals	Monitoring on a monthly basis with a leak detection threshold of 500 ppmv

TABLE 4.11.1-6

Best Available Control Technology Analysis Summary for Greenhouse Gas Pollutants for the Lake Charles Liquefaction Project Liquefaction Facility

Source	Pollutant	Proposed Emission Controls	Proposed Emission Limits
Gas Turbines	CO_2	Low carbon fuels, design and operational energy efficiency including:	Monthly calibration, check filters, etc.
		Excess O_2 analyzer	Quarterly maintenance
		Preventative Maintenance	Tune ups and calibration performed quarterly
		Tuning /Calibration	Classify as environmentally critical instruments and thus receive an increased priority for preventative maintenance and repairs
		Fuel Gas Flow Meter	
		Oxygen control	Control O_2based on O_2 analyzer output to assure high efficiency combustion
Thermal Oxidizers		Design and operational energy efficiency including:	Monthly calibration, check filters, etc.
		Excess O_2 analyzer	Quarterly maintenance
		Preventative Maintenance	Tune ups and calibration performed quarterly
		Tuning /Calibration	Classify as environmentally critical instruments and thus receive an increased priority for preventative maintenance and repairs
		Fuel Gas Flow Meter	
		Oxygen control	Control O_2based on O_2 analyzer output to assure high efficiency combustion
		Firebox temperature	Monitor Chamber exit temperature
Flares		Design and operated in accordance with 40 CFR Part 60.18 including:	Minimum heating value (British thermal units per standard cubic foot) and maximum tip velocity based on 40 CFR Part 60.18
		Compliance with an annual CO_2e emission limit	Demonstrated on a rolling 12 month basis
		Compliance with 40 CFR Part 98 Subpart W	Calculations performed monthly based upon fuel flow and heating value
Standby Generator Diesel Engines		Good combustion practice	Non-emergency maintenance and testing limited to 100 hours per year
Firewater pump engines		Good combustion practice	Non-emergency maintenance and testing limited to 100 hours per year
Fugitives		Leak detection & repair program	Monitoring on a monthly basis with a leak detection threshold of 500 parts per million by volume (ppmv)
Gas Turbines	CH_4	Low carbon fuels, design and operational energy efficiency including:	Monthly calibration, check filters, etc.
		Excess O_2 analyzer	Quarterly maintenance
		Preventative Maintenance	Tune ups and calibration performed quarterly
		Tuning /Calibration	Classify as environmentally critical instruments and thus receive an increased priority for preventative maintenance and repairs
		Fuel Gas Flow Meter	
		Oxygen control	Control O_2based on O_2 analyzer output to assure high efficiency combustion
Thermal Oxidizers		Low carbon fuels, design and operational energy efficiency including:	Monthly calibration, check filters, etc.
		Excess O_2 analyzer	Quarterly maintenance
		Preventative Maintenance	Tune ups and calibration performed quarterly
		Tuning /Calibration	Classify as environmentally critical instruments and thus receive an increased priority for preventative maintenance and repairs
		Fuel Gas Flow Meter	
		Oxygen control	Control O_2based on O_2 analyzer output to assure high efficiency combustion
Flares		Design and operated in accordance with 40 CFR Part 60.18 including:	Minimum heating value (British thermal units per standard cubic foot) and maximum tip velocity based on 40 CFR Part 60.18
		Compliance with an annual CO_2e emission limit	Demonstrated on a rolling 12 month basis
		Compliance with 40 CFR Part 98 Subpart W	Calculations performed monthly based upon fuel flow and heating value

TABLE 4.11.1-6 (cont'd)

Best Available Control Technology Analysis Summary for Greenhouse Gas Pollutants for the Lake Charles Liquefaction Project Liquefaction Facility

Source	Pollutant	Proposed Emission Controls	Proposed Emission Limits
Standby generator diesel engines		Good combustion practice	Non-emergency maintenance and testing limited to 100 hours per year
Firewater pump engines		Good combustion practice	Non-emergency maintenance and testing limited to 100 hours per year
Fugitives		Leak detection & repair program	Monitoring on a monthly basis with a leak detection threshold of 10,000 ppmv for CH_4
Gas Turbines	N_2O	Design and operational energy efficiency including: Excess O_2 analyzer Preventative Maintenance Tuning /Calibration Fuel Gas Flow Meter Oxygen control	Monthly calibration, check filters, etc. Quarterly maintenance Tune ups and calibration performed quarterly Classify as environmentally critical instruments and thus receive an increased priority for preventative maintenance and repairs Control O_2based on O_2 analyzer output to assure high efficiency combustion
Thermal Oxidizers		Design and operational energy efficiency	Work practice standards
Flares		Design and operational energy efficiency	Design and operational energy efficiency
Standby generator diesel engines		Good combustion practice	Non-emergency maintenance and testing limited to 100 hours per year
Firewater pump engines		Good combustion practice	Non-emergency maintenance and testing limited to 100 hours per year

Growth Impact Analysis: The elements of the growth analysis include a projection of the associated industrial, commercial, and residential growth that would occur in the area of impact (AOI) due to the proposed project, including the potential impact on ambient air due to this growth. Lake Charles LNG anticipates that about 250 new employees would be hired as a result of the proposed project, and that all of these new employees would be existing residents of Calcasieu Parish and/or nearby parishes. Lake Charles LNG does not anticipate any associated industrial or commercial growth due to the proposed project. Therefore, negligible growth-related ambient air impacts are expected.

Soil and Vegetation Impact Analysis: For most types of soil and vegetation, ambient concentrations of criteria pollutants below the secondary NAAQS will not result in harmful effects (EPA, 1990). Lake Charles LNG's modeling analysis demonstrates compliance with the NAAQS standards. Therefore it is presumed that emissions from the proposed project would not result in harmful effects on either soil or vegetation.

Visibility Analysis: Based on a conservative Level 1 visibility analysis (Trinity Consultants, 2014a), visibility impacts from the proposed project would not be above the critical screening criteria; thus, an additional refined analysis is not necessary. As such, significant visibility or regional haze impacts from the project are not expected.

New Source Performance Standards

Section 111 of the CAA authorized the EPA to develop technology-based standards which apply to specific categories of stationary sources. These standards, referred to as New Source Performance Standards (NSPS), are found in 40 CFR Part 60. The NSPS apply to new, modified, and reconstructed affected facilities in specific source categories.

We have determined that the following NSPS would be applicable to one or more project components.

Subpart A – General Provisions

The general provisions listed in Subpart A include broader definitions of applicability and various methods for maintaining compliance with requirements listed in subsequent subparts of 40 CFR Part 60. Subpart A also specifies the state agencies to which the EPA has delegated authority to implement and enforce standards of performance. The LDEQ has been delegated authority for all 40 CFR Part 60 standards promulgated by the EPA, except for Subpart AAA – Standards of Performance for New Residential Wood Heaters, which is not applicable to the Lake Charles Liquefaction Project [40 CFR Part 60.4(e)(2)]. Equipment at the LNG Terminal, the liquefaction facility, Compressor Station 203-A, the Longville Compressor Station, and the meter stations subject to any of the NSPS subparts listed below would all be subject to Subpart A. Lake Charles LNG and Trunkline have outlined the methods and measures by which they would comply with the specific requirements of each applicable NSPS subpart listed below in section 22 of the Approval of Emissions (AAE) form included in their respective permit applications submitted to the LDEQ (Trinity Consultants, 2014b, c, and d).

Subpart Kb – Standards of Performance for Volatile Organic Liquid Storage Vessels (Including Petroleum Liquid Storage Vessels) for Which Construction, Reconstruction, or Modification Commenced After July 23, 1984

This subpart regulates emissions of VOCs from various forms of volatile organic liquid storage tanks with a capacity greater than or equal to 75 m^3 for which construction, reconstruction, or modification is commenced after July 23, 1984. In addition to standards for reducing emissions of VOCs, this subpart also requires testing of emission control devices as well as monitoring, recordkeeping, and reporting requirements. One fixed-roof storage tank (Condensate Storage Tank EPN 8101F) that would be located at the proposed liquefaction facility would be subject to NSPS Subpart Kb. The condensate tank would comply with the emission limitations of NSPS Subpart Kb through the installation and maintenance of an internal floating roof in accordance with 40 CFR Part 60.112b(a)(1). The remaining liquefaction facility storage tanks would not be subject to NSPS Subpart Kb because the tanks would not meet the applicability criteria for minimum storage capacity (gallons) and/or for minimum true vapor pressure for the stored volatile organic liquid. The 10,000-gallon storage tank proposed to be installed at the Shaw Compressor Station would be exempt from this subpart because its storage capacity would be below the applicability criteria.

Subpart IIII – Standards of Performance for Stationary Compression Ignition Internal Combustion Engines

Subpart IIII applies to owners and operators of stationary compression ignition internal combustion engines (CI ICE) that commence construction after July 11, 2005 where the stationary CI ICE are: 1) manufactured after April 1, 2006 and are not fire pump engines, or 2) are manufactured as a certified NFPA fire pump engine after July 1, 2006.

Subpart IIII specifies emission standards, fuel requirements, compliance requirements, and testing requirements for CI ICE, some of which vary by model year, engine power, and displacement, and also specifies notification, reporting, and recordkeeping requirements for owners and operators of CI ICE subject to this subpart. CI ICEs located at the liquefaction facility, Compressor Station 203-A, the Longville Compressor Station, and the emergency generators located at the meter stations would be subject to Subpart IIII.

In accordance with 40 CFR Part 60.4205(b), Lake Charles LNG and Trunkline would comply with the emission limitation requirements by installing emergency CI ICE that are certified by the engine manufacturer to meet the required emission limits. In addition, Lake Charles LNG and Trunkline would maintain and operate the emergency CI ICE in accordance with the engine manufacturer's specifications. Emergency engines would not be operated in excess of 100 hours per calendar year for any combination of purposes or in excess of 50 hours per years in non-emergency situations. In order to ensure compliance with hours of operation limits, Lake Charles LNG and Trunkline would install a non-resettable hour meter prior to startup of each of the engines.

Subpart KKKK – Standards of Performance for Stationary Combustion Turbines

Subpart KKKK applies to owners and operators of stationary combustion turbines with a heat input peak load equal to or greater than 10.7 gigajoules (10 million British thermal units, MMBtu) per hour that commenced construction, modification, or reconstruction after February 18, 2005. Subpart KKKK regulates emissions of NO_X and SO_2. Subject turbines must meet the applicable emission limits and operational requirements as well as recordkeeping and reporting requirements of this subpart.

All of the compressor turbines at the liquefaction facility and the Solar Mars turbines to be installed at Compressor Station 203-A and the Longville Compressor Station would be subject to NSPS Subpart KKKK. The turbines would meet the less than 25 ppm NO_x emission limit specified in 40 CFR Part 60.4320(a). Additionally, for the compressor turbines at the liquefaction facility, Lake Charles LNG would implement Selective Catalytic Reduction control technology to reduce NO_x emissions to less than 25 ppm. Lake Charles LNG and Trunkline would perform annual NO_x testing to demonstrate compliance with the NO_x emission limit in accordance with 40 CFR Part 60.4340(a).

Subpart JJJJ, Standards of Performance for Stationary Spark Ignition Internal Combustion Engines

Subpart JJJJ applies to stationary spark ignition internal combustion engines (SI ICE) with a maximum engine power greater than or equal to 75 kW (100 hp). The five natural gas-fired compressor engines proposed to be installed at Compressor Station 203-A would be subject to this subpart. Trunkline would comply with the engine operations and maintenance requirements, recordkeeping and reporting, and performance testing as outlined in 40 CFR Parts 60.4243 and 4245.

National Emission Standards for Hazardous Air Pollutants

The National Emissions Standards for Hazardous Air Pollutants (NESHAP), codified in 40 CFR Parts 61 and 63, regulate the emissions of Hazardous Air Pollutants (HAP) from new and existing sources. Part 61, promulgated before the 1990 CAA Amendments, regulates eight hazardous substances: asbestos, benzene, beryllium, coke oven emissions, inorganic arsenic, mercury, radionuclides, and vinyl chloride.

The 1990 CAA Amendments established a list of 189 HAPs, resulting in the promulgation of Part 63, also known as the Maximum Achievable Control Technology (MACT) standards. Part 63 regulates HAPs from major sources of HAPs and specific source categories emitting HAPs. Some NESHAPs may apply to non-major sources (area sources) of HAPs. Major source thresholds for NESHAPs are 10 tpy of any single HAP or 25 tpy of total HAPs.

The proposed liquefaction facility would be a major source of HAPs due to a single HAP (formaldehyde from combustion emissions) being greater than 10 tpy. Compressor Station 203-A would not be a major source for HAPS. The existing Longville Compressor Station is a major source of HAPS due to a single HAP (formaldehyde from combustion emissions) being greater than 10 tpy. The proposed modifications at this facility would not alter this status.

Subpart A – General Provisions

The general provisions listed in Subpart A include broader definitions of applicability and various methods for maintaining compliance with requirements listed in subsequent subparts of 40 CFR Part 63. This subpart also addresses the delegation of NESHAP authority to the states. Though not all NESHAPs have been delegated to the state in Louisiana, the specific NESHAPs that are applicable to the Lake Charles Liquefaction Project have been delegated to LDEQ. Lake Charles LNG and Trunkline have outlined the methods and measures by which they would comply with the specific requirements of each applicable NESHAP subpart listed below in section 22 of the AAE forms included in their respective permit applications submitted to the LDEQ (Trinity Consultants, 2014b, c, and d).

Subpart YYYY – NESHAP for Stationary Combustion Turbines

Subpart YYYY establishes national emission limitations and operating limitations for emissions of HAPs from stationary combustion turbines located at major sources of HAP emissions, and requirements to demonstrate initial and continuous compliance with the emission and operating limitations. The compressor turbines and combustion turbines proposed to be installed at the liquefaction facility, Compressor Station 203-A, and the Longville Compressor Station would qualify as new stationary turbines under this subpart. However, the EPA has not taken final action to require compliance. Therefore, the proposed new gas-fired turbines are not required to meet compliance requirements, except for submission of the initial notification requirements under 40 CFR Part 63.6645(f).

Subpart DDDDD – NESHAP for Industrial, Commercial, and Institutional Boilers and Process Heaters

Subpart DDDDD applies to industrial, commercial, or institutional boiler or process heater that is located at, or is part of, a major source of HAPs. The new liquefaction facility would be a major source of HAPs, and the proposed hot oil fired heater at this facility would be subject to this subpart. To comply with this subpart, Lake Charles LNG would be required to operate and maintain the hot oil fired heater in a manner consistent with safety and good air pollution control combustion practices as specified by 40 CFR 63.6.

Subpart ZZZZ – NESHAP for Stationary Reciprocating Internal Combustion Engines

Subpart ZZZZ applies to the new emergency internal combustion engines that would be located at area sources of HAPs. Subpart ZZZZ applies to the new CI ICEs proposed to be installed at the new liquefaction facility, Compressor Station 203-A, the Longville Compressor Station, and the emergency CI ICE at the meter stations. All of the NESHAP Subpart ZZZZ compliance requirements would be met through compliance with the corresponding NSPS, 40 CFR Part 60, Subpart IIII in accordance with 40 CFR Parts 63.6590(c) and (c)(1).

Title V Operating Permits

The Part 70 Operating Permit program, as described in 40 CFR Part 70, requires major stationary sources of air emissions to submit an operating permit application prior to initial facility startup. Part 70 operating permits are more commonly referred to as "Title V" permits. In Louisiana, the EPA has delegated the authority to issue Title V permits to the LDEQ, which has incorporated the program in LAC 33:III.507. The threshold levels for determining the applicability for a Title V permit are:

- 100 tpy of any criteria air pollutant;
- 10 tpy of any individual HAP; or
- 25 tpy of any combination of HAPs.

The proposed liquefaction facility would be considered a part of the same stationary source as the existing LNG terminal; however, operations and emissions sources at the LNG terminal would remain authorized under the current Title V permit (No. 0520-00098-V8), while the operations and emissions sources at the liquefaction facility would be authorized under a new and separate Title V permit. Lake Charles LNG submitted their Title V permit application for the liquefaction facility to the LDEQ in December 2013, and submitted a revised Title V permit application to the LDEQ in July 2014. In September 2014, Lake Charles LNG submitted their air quality dispersion modeling report as an addendum to the application. As previously discussed, emissions from a marine flare and two emergency generators that would be installed at the existing LNG terminal as part of the proposed liquefaction facility are included in this liquefaction facility air permit application.

Emissions associated with Compressor Station 203-A would surpass the Title V permitting thresholds for NO_X, and CO. Therefore, Trunkline would be required to obtain a Title V permit for this facility. Trunkline submitted its Title V permit application for proposed Compressor Station 203-A to LDEQ in December 2014.

The Longville Compressor Station is an existing Title V facility and would be required to make a minor modification to its Title V permit as estimated emissions resulting from the proposed modifications would be below the SER thresholds. Trunkline submitted a Title V modification application for the Longville Compressor Station to the LDEQ in December 2014.

The Shaw Compressor Station has an existing Title V Operating Permit issued by the MDEQ. The estimated emissions for the proposed modifications at this facility are less than 5 tpy of VOC. Based on its review of Section 502(b)(10) of the CAA and the general conditions of its permit, Trunkline determined that it is authorized to make the proposed modifications at the Shaw Compressor Station without obtaining a Title V Operating permit revision, and that only a Section 502(b)(10) notification letter to the MDEQ will be required at least 7 days before the proposed change occurs.

General Conformity

A General Conformity applicability analysis is required for any part of the project occurring in nonattainment or maintenance areas for criteria pollutants. Section 176(c) of the CAA requires federal agencies to ensure that federally approved or funded projects conform to the applicable approved State Implementation Plan (SIP). Such activities must not:

1. cause or contribute to any new violation of any standard in any area;
2. increase the frequency or severity of any existing violation of any standard in any area; or
3. delay timely attainment of any standard or any required interim emission reductions or other milestones in any area.

The entire Lake Charles Liquefaction Project area is classified as in attainment for all criteria pollutant standards; therefore, General Conformity requirements would not apply.

Greenhouse Gas Reporting Rule

On November 8, 2010, the EPA signed a rule that finalizes reporting requirements for the petroleum and natural gas industry under 40 CFR Part 98. Subpart W of 40 CFR Part 98 requires petroleum and natural gas facilities that emit 25,000 metric tons or more of CO_2e per year to report annual emissions of specified GHGs from various processes within the facility. LNG storage and LNG import and export equipment are considered part of the source category regulated by Subpart W. The proposed liquefaction facility, the Longville Compressor Station, and Compressor Station 203-A are estimated to exceed the 25,000 metric ton threshold of CO_2e emissions; therefore, Lake Charles LNG and Trunkline would be required to comply with all applicable requirements of the rule.

Chemical Accident Prevention Provisions

40 CFR Part 68, Chemical Accident Prevention Provisions, is a federal regulation designed to prevent the release of hazardous materials in the event of an accident and to minimize impacts when releases do occur. The regulation contains a list of substances and threshold quantities for determining applicability of the rule to a facility. If a facility stores, handles, or processes one or more substances on this list and at a quantity equal to or greater than that specified in the regulation, the facility must prepare and submit a risk management plan. Lake Charles LNG does not propose to store acutely hazardous materials at a quantity equal to or greater than that specified. Therefore 40 CFR Part 68 requirements would not be applicable to the proposed facilities.

Louisiana State Regulatory Requirements

LAC Title 33, Part III details the air quality regulations for emission sources in Louisiana. In addition, LAC Title 33, Chapter 1, delegates authority to the LDEQ to maintain air quality resources in Louisiana and enforce LDEQ air quality regulations. The following Louisiana state air quality requirements would be applicable to emission sources proposed as part of the Lake Charles Liquefaction Project.

- Chapter 9 – General Regulations on Control of Emissions and Emission Standards
- Chapter 11 – Control of Air Pollution from Smoke
- Chapter 13 – Emission Standards for Particulate Matter
- Chapter 15 – Emission Standards for Sulfur Dioxide
- Chapter 21 – Control of Emission of Organic Compounds

Lake Charles LNG and Trunkline have outlined the methods and measures by which they would comply with the requirements of each applicable LDEQ air quality regulation in section 22 of the AAE form included in their permit applications (Trinity Consultants, 2014b, c, and d). It is expected that the LDEQ would include permit conditions in the respective permits to ensure compliance with these regulations.

4.11.1.4 Construction Air Emissions Impacts and Mitigation

Air pollutant emissions during construction of the Lake Charles Liquefaction Project would result from the operation of construction vehicles, marine traffic, vehicles driven by construction workers commuting to and from project work sites, and the generation of fugitive dust during construction activities. Particulate emissions would result from fugitive dust generated by construction-related activities and from open burning for land clearance. The quantity of fugitive dust would depend on several factors, including the size of area disturbed; the nature and intensity of construction activity; surface properties (such as the silt and moisture content of the soil); the wind speed; and the speed, weight, and volume of vehicular traffic.

Liquefaction Facility and Existing LNG Terminal

Construction of the liquefaction facility is expected to occur over a period of about 5 years. Construction emission estimates for the liquefaction facility, excluding those associated with marine traffic, are summarized in table 4.11.1-7.

TABLE 4.11.1-7												
Liquefaction Facility Construction Emissions												
Construction Activity	NO_X (tons)	SO_2 (tons)	CO (tons)	PM_{10} (tons)	$PM_{2.5}$ (tons)	TSP (tons)	THC (tons)	VOC (tons)	CO_2 (tons)	CH_4 (tons)	N_2O (tons)	CO_2e (tons)
Worker commuting[a]	22.07	11.87	188.68	0.22	0.22	-	-	15.58	5,290	1.9	0.2	5,401.9
Fugitive dust[b]				2,831.40	424.71	6,482.30	-	-	-	-	-	-
Construction dirt work	794	18	371	65	65	-		75	51,388	3	1	51,735.92
Construction plant work	3,515	130	1,437	295	295	-	-	333	225,184	18	4	226,970
Open burning	1.2	-	42.3	-	-	5.1	5.7	-	-	-	-	-

a Emissions from worker commuting are based on an estimated 44-month construction period, assuming an average of 1,500 workers commute to the project site 30 days per month.

b TSP emissions include construction of liquefaction facility and ACWS A, B, C, and D.

Notes:

TSP: Total suspended particulates

THC: Total Hydrocarbons

Estimated emissions from the barges and bulk carriers that would deliver materials to the liquefaction facility site during construction were not yet available during preparation of the draft EIS. Therefore, in order to provide for a more accurate analysis of construction emissions, **we recommend that**:

- **<u>Prior to the end of the draft EIS comment period</u>, Lake Charles LNG should file with the Secretary the estimated emissions from the barges and bulk carriers that would deliver materials to the liquefaction facility site during construction.**

Non-Liquefaction Facilities

<u>Compressor Stations</u>

Construction emissions anticipated to occur for Compressor Station 203-A and the Longville Compressor Station are summarized in tables 4.11.1-8 and 4.11.1-9, respectively. Emissions shown for pipeline construction and dirt work include tailpipe emissions from construction equipment anticipated to operate over the course of the construction period. Emissions from workers commuting to and from the compressor stations sites would be minimal. Additionally, since work at the Longville Compressor Station would occur within the existing facility, emissions from fugitive dust or open burning would also be minimal.

TABLE 4.11.1-8								
Compressor Station 203-A Construction Emissions (2017–2018)								
Construction Activity	NO_X (tons)	SO_2 (tons)	CO (tons)	PM_{10} (tons)	$PM_{2.5}$ (tons)	TSP (tons)	THC (tons)	VOC (tons)
Construction Plant and Dirt Work	119.13	1.24	61.15	9.03	9.03	-	-	7.68
Open Burning	0.09	-	3.21	-	-	5.1	0.39	-
Fugitive Dust	-	-	-	-	-	34.6	-	-

TABLE 4.11.1-9								
Longville Station Construction Emissions (2017–2018)								
Construction Activity	NO_X (tons)	SO_2 (tons)	CO (tons)	PM_{10} (tons)	$PM_{2.5}$ (tons)	TSP (tons)	THC (tons)	VOC (tons)
Construction Plant and Dirt Work	119.13	1.24	61.15	9.03	9.03	-	-	12.53

The only construction activity associated with the Shaw compressor station is the installation of a 10,000-gallon storage tank and connection piping. Therefore, the construction emissions are expected to be insignificant.

Pipelines

Construction emissions for the Mainline Connector pipeline and the Mainline 200-3 Loop are summarized in tables 4.11.1-10 and 4.11.1-11, respectively. Emissions shown for pipeline construction and dirt work include tailpipe emissions from construction equipment anticipated to operate over the course of the construction period.

TABLE 4.11.1-10								
Mainline Connector Pipeline Construction Emissions (2017–2018)								
Construction Activity	NO_X (tons)	SO_2 (tons)	CO (tons)	PM_{10} (tons)	$PM_{2.5}$ (tons)	TSP (tons)	THC (tons)	VOC (tons)
Pipeline Construction and Dirt Work	319.13	3.98	614.92	21.79	21.72	-	-	45.41
Open Burning (Calcasieu Parish, LA)	0.05	-	1.63	-	-	0.20	0.22	-
Open Burning (Jefferson Davis Parish, LA)	0.40	-	13.83	-	-	1.68	1.88	-
Fugitive Dust (Calcasieu Parish, LA)	-	-	-	-	-	7.8	-	-
Fugitive Dust (Jefferson Davis Parish, LA)	-	-	-	-	-	66.4	-	-

TABLE 4.11.1-11								
Mainline 200-3 Loop Pipeline Construction Emissions (2017–2018)								
Construction Activity	NO_X (tons)	SO_2 (tons)	CO (tons)	PM_{10} (tons)	$PM_{2.5}$ (tons)	TSP (tons)	THC (tons)	VOC (tons)
Pipeline Construction and Dirt Work	137.41	1.72	264.44	9.38	9.38	-	-	19.59
Open Burning (Calcasieu Parish, LA)	0.05	-	1.70	-	-	0.21	0.23	-
Open Burning (Jefferson Davis Parish, LA)	0.14	-	4.74	-	-	0.58	0.64	-
Fugitive Dust (Calcasieu Parish, LA)	-	-	-	-	-	5.1	-	-
Fugitive Dust (Jefferson Davis Parish, LA)	-	-	-	-	-	14.2	-	-

Meter Stations, Mainline 100-3 and 200-1 Modifications

Construction emissions associated with the proposed new and modified meter stations, Mainline 100-3 modifications, and Mainline 200-1 modifications would be minimal, localized to the construction area, and relatively short term. All of these facilities would be located in sparsely populated areas. Construction at each site would require a small workforce ranging from an average of 25 workers to an estimated peak workforce of 45 workers.

Mitigation Measures

Lake Charles LNG and Trunkline would minimize vehicular exhaust and crankcase emissions from gasoline and diesel engines by complying with applicable EPA mobile source emission performance standards and by using equipment manufactured to meet these standards. Fugitive dust emissions would be limited or mitigated, if necessary, by spraying water to dampen dry work surfaces and/or by the application of calcium chloride or other dust suppressants.

Fugitive dust and construction emissions would occur during the construction period and would subside once construction activities for any given project component are complete. Additionally, construction emissions be primarily limited to the construction area and would represent a small portion of the parishes' and counties' yearly emissions inventories. Construction emissions associated with pipeline construction would typically be intermittent and short term at any one location because pipeline construction moves though individual areas relatively quickly. In conclusion, we find that construction-related impacts on local air quality would not be significant.

4.11.1.5 Operational Air Emissions Impacts and Mitigation

Liquefaction Facility

Emissions from the operation of the liquefaction facility are expected from the various combustion sources and storage tanks located on site. A summary of emissions for stationary sources at the liquefaction facility is provided in table 4.11.1-12; a detailed emission summary is included in Appendix B of Lake Charles LNG's revised Title V/PSD permit application submitted to the LDEQ for the liquefaction facility (Trinity Consultants, 2014b). The estimated emissions reflect any applicable vendor guarantees and BACT limits.

TABLE 4.11.1-12

Liquefaction Facility Summary of Emissions

NO_X (tpy)	SO_2 (tpy)	CO (tpy)	PM_{10} (tpy)	$PM_{2.5}$ (tpy)	VOC (tpy)	H_2S (tpy)	NH_3 (tpy)	CO_2 (tpy)	CH_4 (tpy)	N_2O (tpy)	HAPs (tpy)
750.41	39.89	1,878.83	202.47	202.47	58.18	0.02	402.66	4,484,169	244.0	78.19	18.68

As discussed in the PSD applicability section in section 4.11.1.3, Lake Charles LNG's analysis included a PSD Screening Analysis, NAAQS Analysis, and PSD Increment Analysis for stationary sources at the liquefaction facility (Trinity Consultants, September 2014a). The PSD Screening Analysis included a Significance Analysis, the AOI Analysis, and the Preconstruction Monitoring Analysis. The significance analysis considers the emissions associated only with the proposed project to determine if it would have a significant impact on the surrounding area. The modeled ground-level concentrations are compared to the corresponding significant impact levels (SIL), also known as modeling significance levels, to determine if any predicted concentrations at any receptor locations are "significant." If the significance analysis reveals that modeled ground-level concentrations for a particular pollutant and averaging period are greater than the applicable SIL, a full impact analysis, which considers emissions from regional sources within the AOI, is performed at the significant receptors. If predicted significance analysis impacts for a particular pollutant are below the applicable SIL(s), then no further analyses (e.g., NAAQS and PSD increment analyses) are required for that pollutant. Results from the significance analysis also dictate if preconstruction ambient monitoring is required. Table 4.11.1-13 lists the applicable standards for the pollutants involved.

TABLE 4.11.1-13 **Applicable PSD Increment and NAAQS Air Quality Levels**					
Pollutant	Averaging Period	SIL ($\mu g/m^3$)	Monitoring de Minimis Concentration ($\mu g/m^3$)	PSD Class II Increment ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)
CO	8-hour	500	575	N/A	10,000
	1-hour	2,000	N/A	N/A	40,000
NO_2	1-hour	7.5[a]	N/A	Not established	188[b]
	Annual	1	14	25	100
$PM_{2.5}$	24-hour	1.2[c]	4[c]	9	35
	Annual	0.3	N/A	4	12
PM_{10}	24-hour	5	10	30	150

[a] Based on U.S. EPA Memorandum from Stephen D. Page to Regional Air Division Directors titled "Guidance Concerning the Implementation of the 1-hour NO_2 NAAQS for the Prevention of Significant Deterioration Program." June 29, 2010.

[b] Based on the currently applicable 1-hour NO_2 standard of 100 ppb.

[c] The monitoring *de minimis* concentration and the SIL for $PM_{2.5}$ 24-hour averaging period were vacated in a court decision dated January 22, 2013.

In accordance with the modeling requirements outlined above, Lake Charles LNG performed significance analyses for CO, NO_2, PM_{10}, and $PM_{2.5}$. The results of these analyses are summarized in table 4.11.1-14.

TABLE 4.11.1-14 **Significance Modeling Analysis Results**				
Pollutant	Averaging Period	Maximum Modeled Concentration ($\mu g/m^3$)	Significant Impact Level ($\mu g/m^3$)	Monitoring de Minimis Level ($\mu g/m^3$)
CO	1-hour	133.5	2,000	N/A
CO	8-hour	70.4	500	575
PM_{10}	24-hour	4.5	5	10
$PM_{2.5}$	24-hour	3.6	1.2	4
$PM_{2.5}$	Annual	0.27	0.3	N/A
NO_2	1-hour	18.4	7.5	N/A
NO_2	Annual	0.76	1	14

Note: Meteorological data years: 5-year max.

CO, PM_{10} Significance Analysis Impacts: This analysis showed that SILs and the monitoring *de minimis* concentration for CO or PM_{10} were not exceeded by impacts from the proposed project. Since the modeled impacts do not exceed the SILs for CO and PM_{10}, the project would not cause or significantly contribute to an exceedance of either the CO or PM_{10} NAAQS, and a full impact analysis is not required for either CO or $PM_{10.}$ Additionally, since the monitoring *de minimis* concentration for either CO or PM_{10} were not shown to be exceeded, pre-construction monitoring is not required.

$PM_{2.5}$ Significance Analysis Impacts: This analysis showed that the $PM_{2.5}$ 24-hour SIL was exceeded by impacts from the proposed project. Since the 24-hour SIL was exceeded, a NAAQS and PSD Increment analysis was required to be performed for the $PM_{2.5}$ 24-hour averaging period. The 24-hour monitoring *de minimis* concentration and the Annual SIL were not exceeded by impacts from the proposed project. Therefore, pre-construction monitoring and cumulative impacts for annual $PM_{2.5}$ are not required.

NO_2 Significance Analysis Impacts: This analysis showed that the NO_2 1-hour SIL was exceeded by impacts from the proposed project. Since the 1-hour SIL was exceeded, a NAAQS analysis was required to be performed for the NO_2 1-hour averaging period. However, since the PSD Increment standard has not been established for NO_2 1-hour, a PSD Increment analysis was not performed. The NO_2 annual monitoring *de minimis* concentration and SIL were not exceeded by impacts from the proposed project. Therefore, pre-construction monitoring and cumulative impacts for annual NO_2 are not required.

A NAAQS analysis is required for all criteria pollutants with modeled concentrations in excess of their respective SILs. As discussed above, $PM_{2.5}$ and NO_2 modeled concentrations exceeded their 24-hour and 1-hour SILs, respectively. Therefore, a NAAQS analysis was required for both of these pollutants and averaging periods. A source is not considered to have caused or contributed to the violation if its own impact from the modeling significance analysis is not significant (e.g., modeled impact is less than the SIL) at the violating receptor at the time of the predicted violation. If no simultaneous exceedance of the SIL and the NAAQS is found in this process, the modeling analysis demonstrates that the proposed project would not cause or contribute to the potential NAAQS exceedance. If this is the case, no further analysis is required. If a simultaneous exceedance is found at any receptor and the receptor is located on another facility's property, the other facility's contribution to the potential exceedance has been subtracted. If the revised concentration is less than the NAAQS standard, compliance is demonstrated and no further analysis is required. For any remaining potential NAAQS exceedance, a file review to update any emission sources that contribute to potential NAAQS exceedance(s) has been performed.

The results of the NAAQS modeling analyses are summarized in table 4.11.1-15.

$PM_{2.5}$ and NO_2 NAAQS Analysis Results: Although the modeled results in table 4.11.1-15 show exceedances of the NAAQS for both the $PM_{2.5}$ 24-hour and the NO_2 1-hour standard, a culpability analysis for the project's $PM_{2.5}$ and NO_2 emissions impacts demonstrate that none of the significance analysis contributions are significant at the same time and location of a NAAQS exceedance. Therefore, the $PM_{2.5}$ 24-hour and NO_2 model results demonstrated compliance with NAAQS modeling requirements based on the fact that the facility would not cause or contribute to the violation.

TABLE 4.11.1-15

NAAQS Modeling Analysis Results

Pollutant	Averaging Period	NAAQS (µg/m³)	Background Concentration (µg/m³)	NAAQS Minus Background Concentration (µg/m³)	Modeled NAAQS Concentration (µg/m³)	Modeled SIL Contribution (µg/m³)	Pass Culpability?
$PM_{2.5}$	24-hour	35	19	16	2314.08[a]	0.24	Yes
$PM_{2.5}$	24-hour	35	19	16	36.57	1.19[b]	Yes
NO_2	1-hour	188	30	158	1303.32[a]	1.3E-04	Yes
NO_2	1-hour	188	30	158	446.38	5.4[b]	Yes

[a] Receptor chosen to demonstrate maximum modeled NAAQS concentration.

Notes:

Utilized the MAXCONDT function in AERMOD

Note: Meteorological data years: 5-year max.

For pollutants with a modeled concentration greater than the corresponding SIL, PSD regulations require a PSD Increment Analysis. The PSD Increment analysis demonstrates that the proposed project would neither cause nor contribute to an exceedance of federal ordinances on industrial expansion. As discussed above, the $PM_{2.5}$ and NO_2 modeled concentrations exceeded their 24-hour and 1-hour SILs, respectively. A PSD Increment analysis was performed for $PM_{2.5}$ 24-hour standard, but no PSD Increment analysis was performed for NO_2 1-hour standard since a PSD Increment has not yet been established.

The PSD Increment analysis for $PM_{2.5}$ 24-hour standard implemented the same AOI and receptors as the NAAQS analysis. The inventory for the $PM_{2.5}$ 24-hour PSD Increment was determined using the major and minor baseline years for $PM_{2.5}$. Through coordination with the LDEQ, Lake Charles LNG used May 2, 2013 as the minor baseline year date, as well as AOI plus 50 kilometers as the inventory radius. Lake Charles LNG gathered the actual, reported inventory for 2013 from the LDEQ. Those emissions represented the baseline emissions for the model. The potential $PM_{2.5}$ emissions of the proposed project and the increment inventory emissions described above were modeled together for comparison to the $PM_{2.5}$ 24-hour PSD Increment.

Table 4.11.1-16 summarizes the results of the PSD Increment analysis for the $PM_{2.5}$ 24-hour standard.

TABLE 4.11.1-16

$PM_{2.5}$ 24-hour PSD Increment Analysis Results

Meteorological Data Year	$PM_{2.5}$ 24-hour PSD Increment (µg/m ^{3})	UTM East (NAD 83) (m)	UTM North (NAD 83) (m)	Modeled PSD Increment Concentration (µg/m ^{3})	Modeled SIL Contribution (µg/m ^{3})	Pass Culpability?
2009	9	472,500	3,333,200	6.5	N/A	N/A
2010	9	472,900	3,332,400	9.7	0.48	Yes
2011	9	472,600	3,333,200	7.0	N/A	N/A
2012	9	471,000	3,333,400	8.6	N/A	N/A
2013	9	471,000	3,332,900	9.1	0.15	Yes

Table 4.11.1-16 shows the yearly results for the $PM_{2.5}$ 24-hour PSD Increment models. The years 2009, 2011, and 2012 did not exceed the PSD Increment, therefore not requiring a culpability analysis. The years 2010 and 2013 had concentrations that exceeded the PSD Increment, therefore requiring a culpability analysis. The modeled SIL contributions to the 2010 and 2013 PSD Increment exceedances were under the $PM_{2.5}$ 24-hour SIL threshold. The culpability analysis showed that the proposed project would not cause or contribute to the potential PSD Increment exceedance.

In addition to emissions from the stationary sources included in the PSD modeling analysis, Lake Charles LNG provided emissions for mobiles sources during operation of the liquefaction facility, including LNG carriers and tugboats. However, Lake Charles LNG is not proposing to increase the currently authorized number or size of LNG carriers that would potentially call on the proposed export facility. Therefore, emissions from these sources could occur independent of the proposed project and are not discussed here. Emissions from mobile sources are considered in section 4.13.2.11, Cumulative Impacts.

Lake Charles LNG would minimize potential impacts on air quality due to the operation of liquefaction facility by adhering to applicable federal and state regulations and installing BACT to minimize emissions. Section 4.11.1.3 describes measures for BACT as required for NO_x, CO, VOC, PM_{10}, $PM_{2.5}$, and GHG emissions for the proposed equipment to be installed at the liquefaction facility.

Non-Liquefaction Facilities

Compressor Station 203-A

Emissions from Compressor Station 203-A are expected from various combustion sources and storage tanks. Trunkline would install five Caterpillar 3616 engines, five Mars 100 turbines, two emergency generators, and a condensate storage tank at the station. Additionally, truck loading activities and fugitive emissions from components are expected to cause emissions of VOCs. A summary of the estimated emissions for the operation of Compressor Station 203-A is provided in table 4.11.1-17.

TABLE 4.11.1-17							
Compressor Station 203-A Operational Emissions Summary for the Lake Charles Liquefaction Project							
NO_X (tpy)	SO_2 (tpy)	CO (tpy)	$PM_{10/2.5}$ (tpy)	VOC (tpy)	CH_2O (tpy)	Total HAPS (tpy)	CO_2e (tpy)
249.09	1.98	208.08	23.33	149.66	5.91	14.26	364,265

CH_2O = Formaldehyde

As noted above, Compressor Station 203-A is not subject to PSD permitting requirements (major source permitting, modeling, or application of BACT requirements). However, to assist us in preparing this EIS, Trunkline performed an air dispersion screening analysis using the AERSCREEN model to assess the impact of the proposed Compressor Station 203-A on the NAAQS. The results of this analysis are summarized in table 4.11.1-18.

TABLE 4.11.1-18					
Compressor Station 203-A AERSCREEN Modeling Results					
Pollutant	Averaging Period	Maximum Combined Model Concentration (μg/m^3)	Ambient Background (μg/m^3)	Total Concentration (μg/m^3)	NAAQS (μg/m^3)
CO	1-Hour	22.62	798	820.62	40,000
CO	8-Hour	20.36	570	590.36	10,000
NO_2	1-Hour	21.67	56.40	78.07	188
NO_2	Annual	2.17	9.40	11.57	100
$PM_{2.5}$	24-Hour	1.52	19	20.52	35
$PM_{2.5}$	Annual	0.25	8.4	8.65	12
PM_{10}	24-Hour	1.52	72	73.52	150
SO_2	1-Hour	0.22	96.57	96.79	196

The AERSCREEN model results shown in table 4.11.1-18 demonstrate that the emissions from the proposed new Compressor Station 203-A would not significantly impact the air quality in the surrounding area.

Trunkline would minimize potential impacts on air quality due to the operation of Compressor Station 203-A by adhering to applicable federal and state regulations as discussed in section 4.11.1.3 and in section 22 of the AAE form included in its air permit application.

Longville Compressor Station

Modifications to the Longville Compressor Station would include the installation of one Mars turbine, the retirement of the single existing natural gas-fired turbine compressor, and the installation of one new diesel-fired emergency internal combustion engine generator. A summary of the existing facility emission totals as well as estimated emissions from the proposed new facility sources is provided in table 4.11.1-19. The proposed modifications to the Longville Compressor Station would not result in the exceedance of any criteria pollutant SER. Therefore, the proposed modifications at the Longville Compressor Station would not be subject to PSD permitting, modeling, or application of BACT requirements. However, to assist us in preparing this EIS, Trunkline performed an air dispersion screening analysis using the AERSCREEN model to assess the impact of the proposed modifications at the Longville Compressor Station on the NAAQS. The results of this analysis are summarized in table 4.11.1-20.

TABLE 4.11.1-19							
Longville Compressor Station Operational Emissions Summary for the Lake Charles Liquefaction Project							
Facility	NO_X (tpy)	SO_2 (tpy)	CO (tpy)	$PM_{10/2.5}$ (tpy)	VOC (tpy)	CH_2O (tpy)	CO_2e (tpy)
Existing Facility Emissions	3,982.65	3.57	384.67	20.23	190.42	40.29	102,575.07
Proposed Facility Sources	-10.28	-0.10	20.52	2.51	17.53	0.27	55,824
New Facility Total	3,972.37	3.47	405.19	22.74	207.95	40.56	158,398.67

CH_2O = Formaldehyde

TABLE 4.11.1-20					
Longville Compressor Station Modifications AERSCREEN Modeling Results					
Pollutant	Averaging Period	Maximum Combined Model Concentration (μg/m^3)	Ambient Background (μg/m^3)	Total Concentration (μg/m^3)	NAAQS (μg/m^3)
CO	1-Hour	3.17	798	801.17	40,000
CO	8-Hour	2.85	570	572.85	10,000
NO_2	1-Hour	2.51	56.40	58.91	188
NO_2	Annual	0.25	9.40	9.65	100
$PM_{2.5}$	24-Hour	0.21	19	19.21	35
$PM_{2.5}$	Annual	0.03	8.4	8.43	12
PM_{10}	24-Hour	0.21	72	72.21	150
SO_2	1-Hour	0.03	96.57	96.60	196

The AERSCREEN model results shown in table 4.11.1-20 demonstrate that the proposed modifications to the Longville Compressor Station would not significantly impact the air quality in the surrounding area.

Trunkline would minimize potential impacts on air quality due to the operation of the Longville Compressor Stations by adhering to applicable federal and state regulations as discussed in section 4.11.1.3 and in section 22 of the AAE form included in its air permit application. However, Trunkline's AERSCREEN analysis only included the proposed modifications, and not the existing facilities. Therefore, **we recommend that:**

- **<u>Prior to construction</u>, Trunkline should file with the Secretary an AERSCREEN modeling analysis for the *existing and proposed units* at the Longville Compressor Station demonstrating that the emissions of criteria pollutants from the full facility would not result in local exceedance of the NAAQS; state ambient air quality standards; or cause or contribute to violations of the NAAQS.**

<u>Shaw Compressor Station (Mississippi)</u>

The Shaw Compressor Station operates under an existing Title V permit from the MDEQ. The only new equipment expected to be added to this facility is a 10,000-gallon storage tank for pipeline distillates, water, and compressor oils. VOC emissions from this tank are expected to be less than 5 tpy. The proposed piping modifications to make this station bi-directional would not be emission sources.

Meter Stations

Trunkline proposes to install a 50 hp emergency generator engine at each metering station. The emissions from a single emergency engine are estimated at: 3.4 tpy NO_x, 15.5 tpy CO, less than 1 tpy VOC, and 9,225 tpy GHG.

Mainline 100-3 and 200-1 Modifications

Based on the gas composition, the volumes of the respective launchers/receivers, and the assumption that pigs will be run one time per year, Trunkline estimates that fugitive emissions for the pig launchers and receivers to be installed/replaced on the Mainline 100-3 and the Mainline 200-1 facilities would be 0.92 pounds of VOC for the 36-inch barrel and 0.41 pounds of VOC for the 24-inch barrel. The annual emissions for these two facilities would be *de minimis*.

4.11.2 Noise

Sound is a sequence of waves of pressure that propagates through compressible media such as air or water. When sound becomes excessive, annoying, or unwanted, it is referred to as noise. The Lake Charles Liquefaction Project would affect noise levels in the vicinity of project components during construction and operation of the proposed facilities. Construction and operation of the project may affect overall noise levels in the immediate area. The ambient sound level of a region is defined by the total noise generated within the specific environment and usually comprises natural and man-made sounds. At any location, both the magnitude and frequency of environmental noise may vary considerably over the course of a day and throughout the week. This variation is caused in part by changing weather conditions and the effect of seasonal vegetative cover.

Two measurements used by some federal agencies to relate the time-varying quality of environmental noise to its known effects on people are the equivalent sound level (L_{eq}) and the day-night sound level (L_{dn}). The L_{eq} is a sound level over a specific time period corresponding to the same sound energy as measured for an instantaneous sound level assuming it is a constant noise source. Sound levels, measured in decibels (dB), are perceived differently, depending on length of exposure and time of day. The L_{dn} takes into account the duration and time the noise is encountered. Specifically, in the calculation of the L_{dn}, late night and early morning (10:00 p.m. to 7:00 a.m.) noise exposures are increased by 10 decibels to account for people’s greater sensitivity to sound during nighttime hours. To account for the human ear’s sensitivity to low-level noises, decibel levels are corrected using the A-weighted scale (dBA). The A-weighted scale is used because human hearing is less sensitive to low and high frequencies than mid-range frequencies.

Table 4.11.2-1 demonstrates the relative dBA noise levels of common sounds measured in the environment and industry. A 3 dB change of sound level is considered to be barely perceivable by the human ear. A 5 or 6 dB change of sound level is considered noticeable, and a 10 dB increase is perceived as if the sound intensity has doubled.

TABLE 4.11.2-1

Sound Levels (dBA) and Relative Loudness

Description of Sound	Sound Level (dBA)
Threshold of pain	140
Jet taking off (200-foot distance)	130
Operating heavy equipment	120
Night club with music	110
Construction site	100
Boiler room	90
Freight train (100-foot distance)	80
Classroom chatter	70
Conversation (3-foot distance)	60
Urban residence	50
Soft whisper (5-foot distance)	40
North rim of Grand Canyon	30
Silent study room	20
Threshold of hearing (1,000 hertz)	0

Adapted from OSHA Technical Manual, 1999

4.11.2.1 Noise Regulations

Federal Regulations

In 1974, the EPA published *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety* (EPA, 1974). This publication evaluated the effects of environmental noise with respect to health and safety. The document provides information for state and local governments to use in developing their own ambient noise standards. The EPA has determined that in order to protect the public from activity interference and annoyance outdoors in residential areas, noise levels should not exceed an L_{dn} of 55 dBA. We have adopted this criterion (18 CFR 157.206(b)(5)) for new compression and associated pipeline facilities, and it is used here to evaluate the potential noise effects from operation of the proposed liquefaction facility, Compressor Station 203-A, the Longville Compressor Station, and HDD activities. An L_{dn} of 55 dBA is equivalent to a continuous noise level of 48.6 dBA for facilities that operate at a constant level of noise.

State and Local Regulations

The State of Louisiana has no regulations that would limit noise generated from the construction and operation of the Lake Charles Liquefaction Project.

Calcasieu Parish has adopted a noise ordinance (Code of Ordinances, Chapter 18, Article VIII – Disturbing the Peace) that does not set specific sound level limits, but restricts excessive noise as follows: "No person shall make, continue, or cause to be made or continued any loud, unnecessary or excessive noise which unreasonably interferes with the comfort and repose of others within the jurisdiction of the parish."

Applicable exemptions include:

- Sec 18–99, paragraph (3) “Noises made by persons having obtained a permit”;
- Sec 18–99, paragraph (4) “Any noise resulting from activities of temporary duration, for which a permit has been granted pursuant to this article, and which conforms to the conditions and limits stated thereon”; and
- Sec 18–100, paragraph (4) “Construction and demolition. The operating of any equipment used in construction work within 165 feet of any residential or noise sensitive-area (NSA) between sunset and sunrise on weekdays and Saturdays, and 9:00 p.m. and 8:00 a.m. on Sundays and holidays, except for emergency work.”

No other Louisiana parishes in which the project is located have noise ordinances.

There are no state or local regulations pertaining to the areas in Mississippi and Arkansas in which the proposed project facilities would be located.

4.11.2.2 Existing Sound Levels and Noise-Sensitive Areas

Liquefaction Facility

Lake Charles LNG and Trunkline’s noise consultant (Hoover & Keith, Inc. (H&K)) measured ambient noise levels on June 26, 2013, at four NSAs representing the boundary of the nearest existing residential development within the vicinity of the proposed liquefaction facility (see figure 4.11.2-1). Measurements were not taken at a fifth NSA at which ambient noise was assumed to be equivalent to that at another NSA. The results of the ambient noise survey as well as the distance and direction of each identified NSA from the liquefaction facility are provided in table 4.11.2-2.

TABLE 4.11.2-2

Ambient Noise Study Results for the Lake Charles Liquefaction Facility

Location ID	Distance (feet)	Direction	Existing Ambient L_{dn} (dBA) June 2013
NSA 1	4,200	North-northeast	54.8
NSA 2	5,100	East	50.9
NSA 3	5,600	West	45.1
NSA 4	7,100	Northwest	48.5
NSA 5	5,500[a]	Northwest	48.5[b]

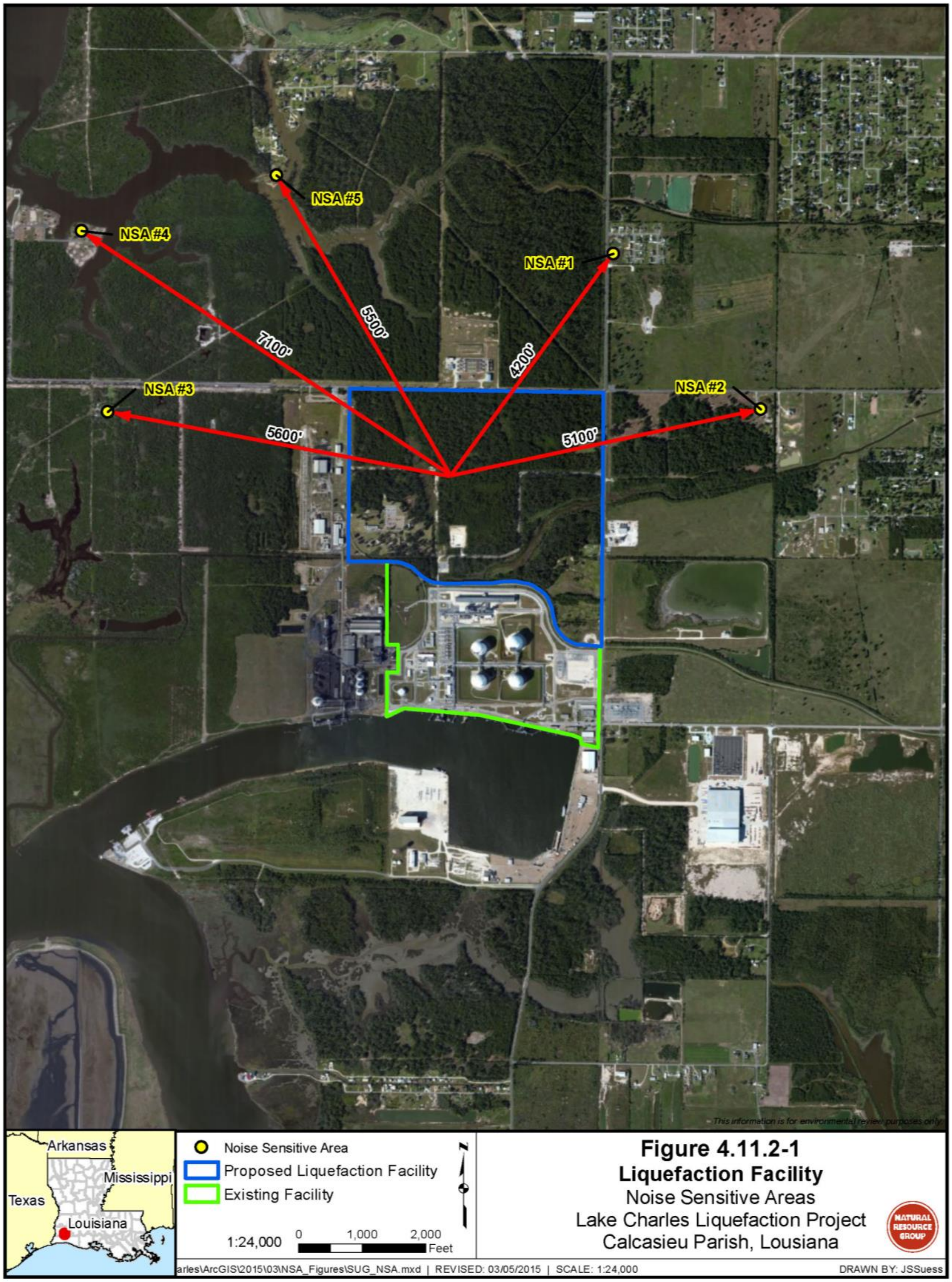
[a] The distance shown for NSA 5 has been corrected from that shown in Trunkline’s noise analysis; however, the noise level is not affected.

[b] Measurements were not conducted near this NSA; it is assumed to be equivalent to NSA 4.

Non-Liquefaction Facilities

<u>Compressor Station 203-A</u>

H&K recorded ambient noise level measurements on June 27, 2013, at four NSAs in the vicinity of proposed Compressor Station 203-A (see figure 4.11.2-2). A fifth NSA was identified after the preconstruction noise survey had been completed. The results of the ambient noise survey as well as the distance and direction of each identified NSA are provided in table 4.11.2-3.



NSA #5
NSA #4
NSA #1
5500'
7100'
4200'
NSA #3
NSA #2
5600'
5100'
Arkansas
Mississippi
Texas
Louisiana
Noise Sensitive Area
Proposed Liquefaction Facility
Existing Facility
1:24,000
0
1,000
2,000
Feet
Figure 4.11.2-1
Liquefaction Facility
Noise Sensitive Areas
Lake Charles Liquefaction Project
Calcasieu Parish, Lousiana
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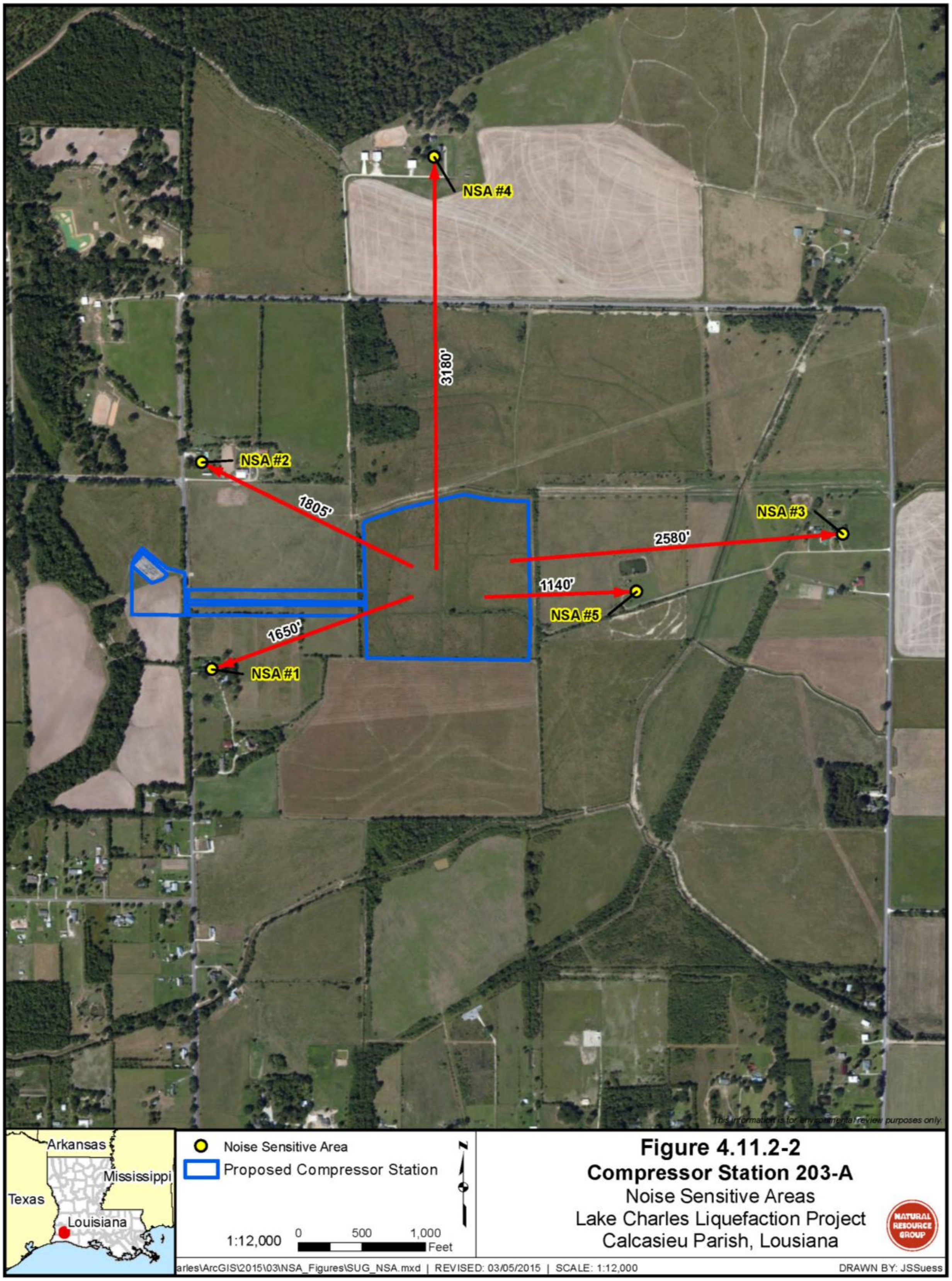

Figure 4.11.2-2
Compressor Station 203-A
Noise Sensitive Areas
Lake Charles Liquefaction Project
Calcasieu Parish, Lousiana

TABLE 4.11.2-3			
Ambient Noise Study Results for Compressor Station 203-A			
Location ID	Distance (feet)	Direction	Existing Ambient L_{dn} (dBA) June 2013
NSA 1	1,650	West-southwest	53.2
NSA 2	1,805	Northwest	49.0
NSA 3	2,580	East-northeast	52.5
NSA 4	3,180	North	54.3
NSA 5[a]	1,140	East	52.5

[a] NSA 5 was identified after the preconstruction survey was conducted. The existing ambient sounds level at this NSA is assumed to be the same as measured at NSA 3.

Longville Compressor Station

Ambient noise level measurements were recorded at the existing Longville Compressor Station in February 2008 after the installation of an additional compressor unit (Compressor Unit 4522) not associated with the Lake Charles Liquefaction Project. Based on the 2008 noise survey and pre-existing noise levels at the station, the estimated existing sound levels at the nearest NSAs due to the full operation of all existing compressor units are provided in table 4.11.2-4 (see also figure 4.11.2-3). Trunkline reviewed the area during other project-related noise surveys in 2013 and did not identify any new NSAs or additional projects that would increase ambient noise levels in the vicinity of this facility.

TABLE 4.11.2-4			
Ambient Noise Study Results for the Longville Compressor Station			
Location ID	Distance (feet)	Direction	Estimated Existing Ambient L_{dn} (dBA) – February 2008
NSA 1	1,470	Southwest	68.6
NSA 2	1,120	North-northwest	66.8
NSA 3	880	North-northeast	60.6
NSA 4	1,360	Southeast	55.0

HDD Locations

Ambient noise measurements were not taken at the proposed HDD locations. For the purposes of this analysis and based on a review of aerial photography, estimated background noise levels at the HDD entry and exit locations are based on published EPA data for the Rural Residential Area category. Locations of NSAs for the HDD entry and exit locations and estimated background noise levels are provided in the next section.

4.11.2.3 Construction Noise Impacts and Mitigation

Liquefaction Facility and LNG Terminal

The most prevalent sound generating equipment and activity during construction of the liquefaction facility and LNG terminal modifications is anticipated to be internal combustion engines associated with construction equipment and pile driving. The sound levels experienced at the NSAs would depend on the type of equipment used, the mode of operation of the equipment, the length of time the equipment is in use, the amount of equipment used simultaneously, and the distance between the sound generation source and the receptor. Sheet and pile driving could produce peak sound levels that would be perceptible above the background sound levels during construction. H&K conducted an analysis of construction noise based on standard construction equipment, anticipated power levels, and estimated number of equipment units potentially operating at one time as shown in table 4.11.2-5.

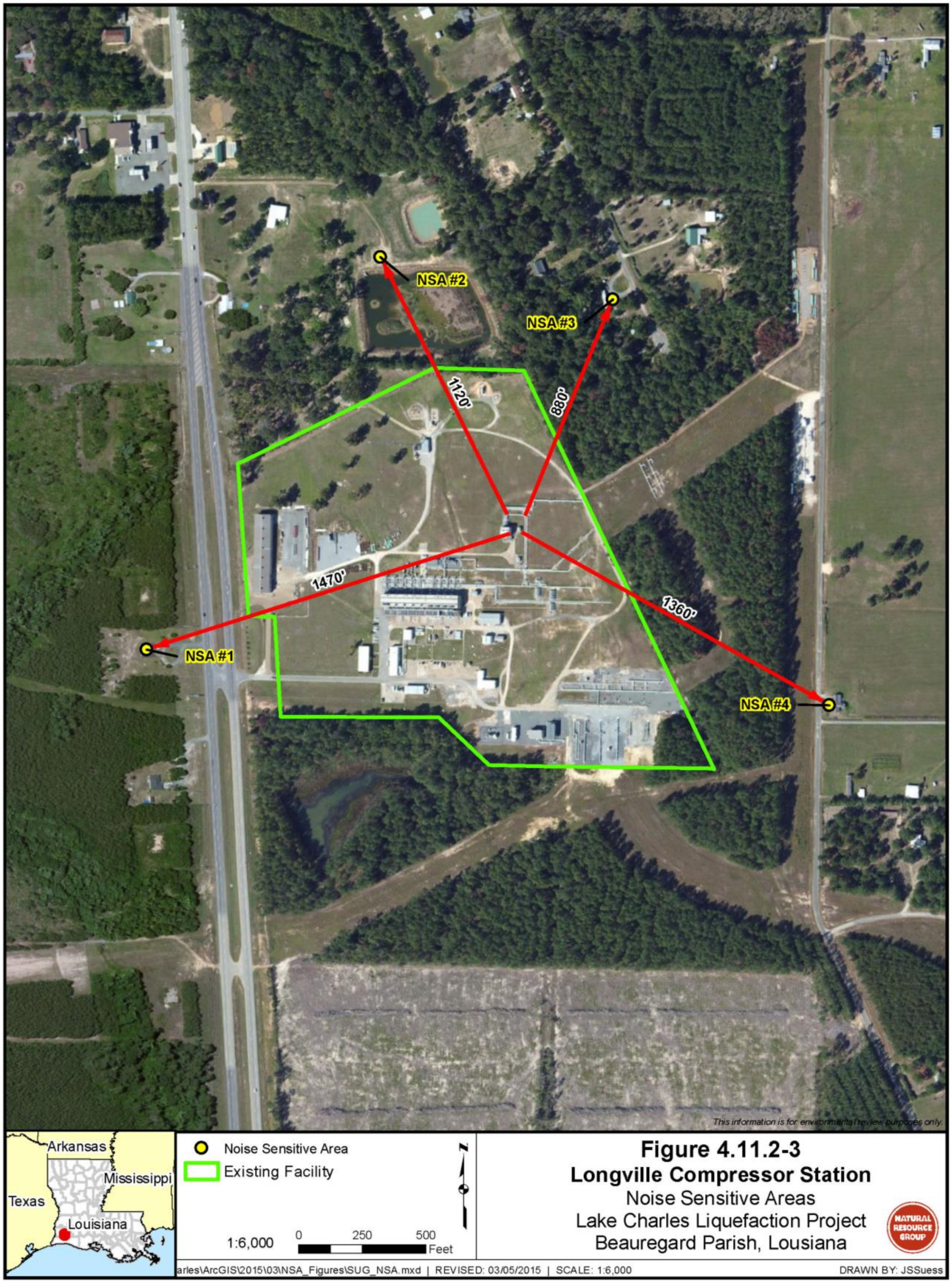
NSA #1
NSA #2
NSA #3
NSA #4
1120'
880'
1470'
1360'
This information is for environmental review purposes only.
Arkansas
Mississippi
Texas
Louisiana
Noise Sensitive Area
Existing Facility
1:6,000
0
250
500
Feet
Figure 4.11.2-3
Longville Compressor Station
Noise Sensitive Areas
Lake Charles Liquefaction Project
Beauregard Parish, Lousiana
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TABLE 4.11.2-5		
Construction Equipment Noise Summary for the Lake Charles Liquefaction Facility		
Equipment Type	Sound Power Level (dBA)	Number of Units Operating
Power Train 1		
Crane	105	4
Backhoe	105	4
Bulldozer	111	4
Grader	115	4
Pile Drivers	123	5
Power Train 2		
Crane	105	4
Backhoe	105	4
Bulldozer	111	4
Grader	115	4
Power Train 3		
Crane	105	4
Backhoe	105	4
Bulldozer	111	4
Grader	115	4
Auxiliary Building		
Crane	105	4
Backhoe	105	4
Bulldozer	111	4
Grader	115	4

Increases in noise levels during construction activities would be intermittent and would generally occur during daylight hours. However, certain activities may need to be conducted during nighttime hours to avoid construction schedule delays. The level of construction-related noise would also vary over the course of the about 5-year construction period depending on the phase of construction in progress.

For the purposes of modeling potential construction noise, is was assumed that the equipment would operate 100 percent of the time during the day (7:00 am to 10:00 pm) and 50 percent of the time during the night (10:00 pm to 7:00 am) for power trains 1, 2, and 3, and only during the day for the auxiliary building. It was assumed that all pile driving activities would only occur during the day. Based on these assumptions, the modeling found that the estimated noise impact at the nearest NSAs would be less than 55 dBA L_{dn}.

Non-Liquefaction Facilities

Compressor Station 203-A

Construction activities at Compressor Station 203-A would include earthwork and construction of the site foundations and equipment. Construction is expected to last about 12 months. For this analysis it was assumed that earthwork activities would produce the most amount of noise during construction. Table 4.11.2-6 lists the construction equipment, horsepower, assumed maximum number of equipment units that may be operating at one time, and the estimated noise (dBA) associated with the equipment at a distance of 50 feet.

TABLE 4.11.2-6 **Noise-generating Construction Equipment for Compressor Station 203-A**			
Type of Equipment	Equipment Power Rating/Capacity (hp)	Estimated Maximum Number Operating at One Time	Estimated dBA (at 50 feet)
Diesel generator	100	1	75
Bulldozer	250–700	1	82
40 TN RT crane	150–200	1	83
Side boom	130–210	1	80
Cherry picker	150–250	1	81
Welding trucks	200–300	7	74
Backhoe	130–210	1	80
Front-end loader	150–250	1	85

The nearest NSA to the construction activities for Compressor Station 203-A is NSA 5, which is located at a distance of 1,140 feet. The estimated noise impact at NSA 5 would be equal to or less than 63 dBA or a L_{dn} of 61 dBA, since only daytime construction would be conducted. Although estimated noise levels during construction of Compressor Station 203-A would exceed the 55-dBA L_{dn} noise threshold, construction noise would be temporary and localized, and would not cause a significant long-term impact on ambient noise levels at any of the identified NSAs.

Longville Compressor Station

Construction activities at the Longville Compressor Station would include earthwork and construction of the site foundations and equipment. Construction is expected to last about 12 months. For this analysis it was assumed that earthwork activities would produce the most noise during construction. Table 4.11.2-7 lists the construction equipment, horsepower, assumed maximum number of equipment units that may be operating at one time, and the estimated noise (dBA) associated with the equipment at a distance of 50 feet.

TABLE 4.11.2-7 **Noise-generating Construction Equipment for the Longville Compressor Station**			
Type of Equipment	Equipment Power Rating/Capacity (hp)	Estimated Maximum Number Operating at One Time	Estimated dBA (at 50 feet)
Diesel generator	100	1	75
Bulldozer	250–700	1	82
Small crane	250–3,500	1	83
Cherry picker	150–250	1	81
Welding trucks	200–300	3	74
Backhoe	130–210	1	80
Front-end loader	150–250	1	85

The nearest NSA to the construction activities for the Longville Compressor Station is NSA 3 located at a distance of 880 feet. Estimated construction noise levels at NSA 3 would be equal to or less than 65 dBA or an L_{dn} of 63 dBA, since only daytime construction would occur. Because construction would take place during daytime hours, and would be temporary and localized, we conclude that construction activities would not cause a significant long-term impact on ambient noise levels at any of the identified NSAs.

HDD Locations

Trunkline proposes to conduct HDD crossings at three locations on the Mainline Connector (Arceneaux Bayou, Little Bayou, and Serpent Bayou), two locations on the Mainline 200-3 Loop (Bayou Lacassine and Indian Bayou Canal), and at the Calcasieu River as part of the Mainline 200-1 modifications. HDD construction involves various equipment and activities including power generation, mobile equipment, and mixing pumps. Typical equipment used at the HDD entry side includes:

- drilling rig and engine-driven hydraulic power unit;
- engine-driven mud pump(s) and engine-driven generator set(s);
- mud mixing/cleaning equipment and associated fluid systems shale shakers;
- mobile equipment including a crane, backhoe, front loader, forklift and/or trucks(s);
- frac tanks; and
- engine-driven lights.

Noise associated with the HDD exit side is typically lower but could result from use of the following equipment:

- backhoe, side boom and/or truck(s);
- engine-driven generator and pump; and
- engine-driven lights.

Of the above noise sources, Trunkline anticipates that the diesel engine power generation units would be the most significant noise generating sources.

H&K conducted an acoustical assessment to estimate the sound contribution of the HDDs for NSAs within 0.5 mile of each HDD entry or exit point. No NSAs were identified within 0.5 mile of the entry or exit point for Little Bayou; therefore, that HDD is not discussed further in this section. Table 4.11.2-8 shows the estimated the noise impact at the nearest NSAs to the other HDDs from the combined entrance and exit noise sources.

As shown in table 4.11.2-8, HDD noise is estimated to exceed a 55 dBA noise level (L_{dn}) and/or result in a greater than 10 dBA increase over ambient conditions at the Indian Bayou Channel at NSAs 1, 2, 3, 4, 5, 7, 8 and 9.

Trunkline anticipates that each HDD will take 3 to 8 weeks to complete depending on the site-specific subsurface conditions. Although Trunkline anticipates that the majority of HDD operations would take place during daytime hours, overnight operations might be necessary if the drilling is at a critical point where stopping could result in a loss of the drill hole or an unsuccessful drill. If necessary, work performed during nighttime hours would be limited the amount necessary to prevent the failure.

If drilling would exceed 55-dBA (L_{dn}), additional noise mitigation may be required. Potential noise mitigation measures that Trunkline would utilize at the HDD entry and exit sites include, but are not limited to, the following:

- construct a temporary noise barrier around the predominant noise-producing equipment which could include the use of acoustically-lined plywood panels or tents;
- utilize hospital-grade exhaust silencers on all engines;
- relocate equipment to utilize existing temporary and permanent barriers; and
- provide temporary relocation or monetary compensation to NSAs significantly impacted by the HDD drilling operations.

TABLE 4.11.2-8

HDD Noise Quality Analysis for the Lake Charles Liquefaction Project

HDD Location and Closest NSA(s) to Entry and Exit Points	Distance and Direction of NSA	Estimated Ambient L_{dn} (dBA)[a]	Unmitigated HDD Operations From Entry and Exit Operations L_{eq} (dBA)	Unmitigated HDD Operations From Entry and Exit Operations L_{dn} (dBA)	Unmitigated HDD Operations Plus Ambient L_{dn} (dBA)	Potential Increase Above Ambient (dB)
Arceneaux Bayou						
NSA 1 – entry side	2,506 feet southwest	45.0	45.5	51.9	52.7	7.7
NSA 2 – entry side	2,277 feet southeast	45.0	46.6	53.0	53.6	8.6
No NSAs within 0.5-mile radius of exit	-	-	-		-	-
Serpent Bayou						
No NSAs within 0.5-mile radius of entry	-	45.0	-		-	-
NSA 1 – exit side	1,892 feet southeast	45.0	21.5	27.9	45.1	0.1
NSA2 – exit side	2,231 feet southeast	45.0	18.3	24.7	45.0	0.0
Indian Bayou Canal						
NSA 1 – entry side	213 feet southeast	45.0	70.4	76.8	76.8	31.8
NSA 2 – entry side	514 feet east	45.0	62.1	68.5	68.5	23.5
NSA 3 – entry side	812 feet northeast	45.0	57.6	64.0	64.1	19.1
NSA 4 – entry side	1,069 feet northwest	45.0	54.8	61.2	61.3	16.3
NSA 5 – entry side	1,228 feet west	45.0	53.3	59.7	59.8	14.8
NSA 6 – entry side	1,172 feet northeast	45.0	47.1	53.5	54.1	9.1
NSA7– entry side	1,006 feet southeast	45.0	55.4	61.8	61.9	16.9
NSA 8 – exit side	1,003 feet northwest	45.0	50.5	56.9	57.2	12.2
NSA 9 – exit side	632 feet southwest	45.0	50.3	56.7	57.0	12.0
NSA 10– exit side	1,632 feet southwest	45.0	42.9	49.3	50.7	5.7
Lacassine Bayou						
NSA 1 – exit side	1,691 feet north	45.0	33.5	39.9	46.2	1.2
NSA 2 – exit side	2,152 feet south	45.0	35.5	41.9	46.7	1.7
NSA 3 – entry side	2,183 feet northwest	45.0	31.4	37.8	45.8	0.8
Calcasieu River						
NSA 1 – entry side	2,614 feet west	45.0	15.3	21.7	45.0	0.0
No NSAs within 0.5-mile radius of exit	-	-	-		-	-

[a] Estimated from EPA, 1974 Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare With an Adequate Margin of Safety, based on Rural Residential Area category.

To ensure that HDD-related noise does not exceed an L_{dn} of 55 dBA or result in a greater than 10 dBA increase over ambient noise levels, **we recommend that**:

- **Trunkline should file in the weekly construction status reports the following for the Indian Bayou Canal HDD entry and exit points:**

  a. the noise measurements from the nearest NSA, obtained at the start of drilling operations;

  b. the noise mitigation that Trunkline implemented at the start of drilling operations; and

  c. any additional mitigation measures that Trunkline would implement if the initial noise measurements exceeded an L_{dn} of 55 dBA at the nearest NSA and/or increased noise more than 10 dBA over ambient conditions.

Other Pipeline Construction Noise

Noise associated with construction of the pipeline facilities would be short term and temporary at any one location because of the assembly-line method of pipeline construction. While the noise levels attributable to the construction equipment could noticeably increase ambient noise levels at the NSAs nearest the pipeline right-of-way and the other Non-Liquefaction sites, the noise increase during the construction phase would be temporary and localized. Because Trunkline would primarily limit construction to daytime hours and implement noise mitigation measures at HDD sites, we conclude that construction noise would not have a significant impact on landowners and residents near the Non-Liquefaction Facilities.

4.11.2.4 Operational Noise Impacts and Mitigation

Liquefaction Facility and LNG Terminal

Noise Assessment for Normal Operations of the Liquefaction Facility

Operation of the proposed liquefaction facility would produce noise on a continuous basis. The primary noise-generating sources during the operation of the liquefaction facility would be:

- air-cooled heat exchangers;
- LNG refrigerant compressor gas turbine drive units;
- gas compressor units;
- inlet and discharge piping;
- expanders units, and
- packaged items.

H&K modeled operational noise to evaluate the noise levels that would be generated by operation of the liquefaction facility and modified LNG terminal, assess the noise impacts on NSAs, and to identify appropriate noise mitigation measures. The results of this analysis are summarized in table 4.11.2-9. Modeling assumed that all compressor units and all expander units would operate in an acoustically treated shed structure with partial sidewalls; inlet and discharge piping would be acoustically treated with 4-inch thick glass or mineral wool insulation covered with an outer solid acoustic liner; packaged items would have sufficient noise control to limit the sound pressure level to 75 dBA or less at a distance of 3 feet; and all packaged item units would operate simultaneously except for one.

TABLE 4.11.2-9

Estimated Noise Levels at Noise Sensitive Areas During Operation of the Lake Charles Liquefaction Facility

Location ID	Existing Ambient L_{dn} (dBA) June 2013	Liquefaction Project Impact L_{eq} (dBA)	Estimated Liquefaction Project L_{dn} (dBA)	Combined L_{dn} (dBA) (Existing plus Estimated)	Potential Noise Increase, L_{dn} (dBA)
NSA 1	54.8	47.2	53.6	57.3	2.5
NSA 2	50.9	42.5	48.9	53.0	2.1
NSA 3	45.1	43.0	49.4	50.8	5.7
NSA 4	48.5	42.6	49.0	51.8	3.3
NSA 5[a]	48.5	45.0	51.4	53.2	4.7

[a] Ambient noise measurements were not taken for NSA 5 and are assumed to be the same as NSA 4.

The modeling results indicate that with the incorporation of the proposed mitigation measures, the noise attributable to operation of the liquefaction facility would not exceed the 55 dBA L_{dn} noise threshold at any of the NSAs.

Operation of the liquefaction facility would occur in phases with the first and second liquefaction trains and associated facilities to be completed and in service in 2019, followed by the third liquefaction train in 2020. Therefore, to ensure that NSAs are not adversely impacted by the phased operation of the liquefaction facility, **we recommend that:**

- **Lake Charles LNG should file a full load noise survey with the Secretary for the liquefaction facility <u>no later than 60 days</u> after each liquefaction train is placed into service for the first and second liquefaction train. If the noise attributable to the operation of the equipment at the liquefaction facility exceeds an L_{dn} of 55 dBA at the nearest NSA, Lake Charles LNG should reduce operation of the liquefaction facilities or install additional noise controls until a noise level below an L_{dn} of 55 dBA at the nearest NSA is achieved. Lake Charles LNG should confirm compliance with the above requirement by filing a second noise survey with the Secretary <u>no later than 60 days</u> after it installs the additional noise controls.**

In compliance with the condition above, Lake Charles LNG would need to complete two noise surveys after the first and second liquefaction trains are placed in service to ensure that the phased-in liquefaction trains are below 55 dBA L_{dn} at the nearest NSA. If the noise levels reported in any of the noise surveys are over 55 dBA L_{dn}, they would need to implement the required mitigation to reduce the noise impacts on the nearest NSAs within the time specified in the condition. Once the third liquefaction train is installed and placed into service, **we recommend that:**

- **Lake Charles LNG should file a noise survey with the Secretary <u>no later than 60 days</u> after placing the entire liquefaction facility into service. If a full load noise survey is not possible, Lake Charles LNG should provide an interim survey at the maximum possible load and provide the full load survey <u>within 6 months</u>. If the noise attributable to the operation of all of the equipment at the liquefaction facility under interim or full load conditions exceeds an L_{dn} of 55 dBA at the nearest NSA, Lake Charles LNG should file a report on what changes are needed and should install the additional noise controls to meet the level <u>within 1 year</u> of the in-service date. Lake Charles LNG should confirm compliance with the above requirement by filing a second noise survey with the Secretary <u>no later than 60 days</u> after it installs the additional noise controls.**

Noise Assessment During Flaring

As described previously, the liquefaction facility would include a flare system consisting of startup flares and emergency flares. When in use, flares would be a source of noise. In order to evaluation the impacts of noise during flaring events, **we recommend that**:

- **Prior to the end of the draft EIS comment period, Lake Charles LNG should file with the Secretary noise estimates for flaring activities at the liquefaction facility and modified LNG terminal. This analysis should include supporting calculations and assumptions, and a description of how often flaring would occur and Lake Charles LNG's landowner notification procedures.**

Compressor Station 203-A

Noise Assessment for Operations at Full Load at Compressor Station 203-A

The noise impact evaluation for Compressor Station 203-A considers the noise produced by all significant sound sources associated with the proposed compressor station that could impact the sound contribution at the nearby NSAs. Significant sound sources include five Caterpillar G3616 compressor units, five Solar Mars 100 compressor units, and aboveground gas piping. The noise evaluation incorporates reductions from the proposed noise controls. Noise controls for the compressor building include acoustical specifications for wall, roof, and entry door materials; prohibition of windows, skylights, or open louvers; patching and sealing requirements; acoustical specifications for a double roll-up door system for equipment access; and acoustical specification for the ventilation system. Noise controls for the compressor equipment include the use of specified silencers, mufflers, ductwork, and acoustic blankets. Table 4.11.2-10 shows the estimated noise impact due to the full load operation of Compressor Station 203-A.

The modeling results indicate that with the incorporation of the proposed mitigation measures, operational noise at Compressor Station 203-A would not exceed the 55-dBA L_{dn} noise threshold at any of the NSAs.

TABLE 4.11.2-10

Estimated Noise Levels at Noise Sensitive Areas During Operation of Compressor Station 203-A

Location ID	Existing Ambient L_{dn} (dBA) June 2013	Estimated Compressor Station 203-A Project L_{dn} (dBA) at Normal Full Load Operations	Combined L_{dn} (dBA) (Existing plus Estimated)	Potential Noise Increase, L_{dn} (dBA)
NSA 1	53.2	52.7	56.0	2.8
NSA 2	49.0	51.8	53.7	4.7
NSA 3	52.5	48.2	53.9	1.4
NSA 4	54.3	46.0	54.9	0.6
NSA 5[a]	52.5	54.2	56.5	4.0

[a] NSA 5 was identified after the preconstruction survey was conducted. The existing ambient sounds level at this NSA is assumed to be the same as measured at NSA 3.

Based on the noise analysis above, noise levels attributable to operation of Compressor Station 203-A would be less than 55 dBA L_{dn} at all nearby NSAs. To ensure that the noise from the compressor station does not exceed an L_{dn} of 55 dBA at the nearest NSAs, **we recommend that:**

- **Trunkline should file a noise survey for Compressor Station 203-A no later than 60 days after placing the station into service. If a full power load condition noise**

survey is not possible, Trunkline should file an interim survey at the maximum possible power load within 60 days of placing the station into service and file the full power load survey within 6 months. If the noise attributable to operation of all equipment at the station under interim or full power load conditions exceeds a L_{dn} of 55 dBA at any nearby NSA, Trunkline should:

a. file a report with the Secretary, for review and written approval by the Director of OEP, on what changes are needed;

b. install additional noise controls to meet that level within 1 year of the in-service date; and

c. confirm compliance with this requirement by filing a second full power load noise survey with the Secretary for review and written approval by the Director of OEP no later than 60 days after it installs the additional noise controls.

Based on the noise analysis and our recommendation, we believe that operation of Compressor Station 203-A would have no significant impact on the noise environment in the vicinity of the station.

Noise Assessment for Normal Unit Blowdown Events at Compressor Station 203-A

The sound levels associated with high pressure gas venting are a function of initial blowdown pressure, the diameter and type of blowdown valve, and the diameter and arrangement of the downstream vent piping. Blowdown sound levels are loudest at the beginning of the blowdown event and they decrease as the blowdown pressure decreases.

Trunkline would install silencers on the gas blowdown equipment to limit the noise level to 60 dBA at a distance of 300 feet. NSA 5, which is the nearest NSA to Compressor Station 203-A, is about1,140 feet from the facility; therefore, the estimated sound level at this NSA would be about 52 dBA or less during unit blowdown events. This estimate assumes a direct line of site between the silencer outlet and NSA 5 with no shielding from structures or foliage. As estimated noise levels are below the 55-dBA threshold, blowdown events would be expected to have an insignificant impact on the nearest NSAs. To further minimize impacts of blowdown noise on nearby landowners, Trunkline would notify nearby landowner prior to performing blowdowns required for maintenance.

Longville Compressor Station

The primary sound sources associated with the proposed modifications at the Longville Compressor Station would include:

- turbine-compressor casing noise that penetrates the compressor building;
- noise from the turbine exhaust system;
- noise from the turbine air intake system;
- noise from the electric motor driven lube oil cooler; and
- noise radiated by any above ground piping.

Table 4.11.2-11 shows the estimated noise impact at normal full load operation of the Longville Compressor Station with the addition of the proposed modifications and associated proposed noise controls.

TABLE 4.11.2-11 **Estimated Noise Levels at Noise Sensitive Areas During Operation of the Longville Compressor Station**				
Location ID	Existing L_{dn} at Full Load Station Operation (dBA)	Estimated Longville Compressor L_{dn} (dBA) – Proposed Addition Only	Combined L_{dn} (dBA)	Potential Noise Increase (dBA)
NSA 1	68.6	39.0	68.6	0.0
NSA 2	66.8	41.7	66.8	0.0
NSA 3	60.6	44.0	60.7	0.1
NSA 4	55.0	39.8	55.1	0.1

The Longville Compressor Station was authorized in 1950 and placed into service in 1951. At that time, the Commission's regulations did not require the current noise level of an L_{dn} of 55 dBA. As shown in table 4.11.2-11, the noise levels from the existing equipment at the Longville Compressor Station are above an L_{dn} of 55 dBA at three of the four nearest NSAs. However, these existing facilities are not required to retroactively comply with noise standards that were later adopted by the Commission.

The modeling results indicate that the noise contribution from the proposed compressor unit replacement itself at the Longville Compressor Station would not exceed the 55-dBA L_{dn} noise threshold at any of the nearby NSAs. To ensure that there is no perceptible increase in noise levels resulting from operation of the Longville Compressor Station, **we recommend that:**

- **Trunkline should conduct noise surveys at the Longville Compressor Station to verify that the noise from all the equipment operated at full power load does not exceed the predicted noise levels above an L_{dn} of 55 dBA at any nearby NSAs. The results of the noise surveys should be filed with the Secretary <u>no later than 60 days</u> after placing the new compressor unit in service. If a full load condition noise survey is not possible, Trunkline should provide an interim survey at the maximum possible horsepower load <u>within 60 days</u> of placing the new compressor unit into service and provide the full load survey <u>within 6 months</u>. If the noise attributable to the operation of the modified compressor station at full or interim power load conditions exceeds predicted noise levels at any nearby NSAs, Trunkline should file a report on what changes are needed and should install the additional noise controls to meet the level <u>within 1 year</u> of the in-service date. Trunkline should confirm compliance with this requirement by filing a second noise survey with the Secretary <u>no later than 60 days</u> after it installs the additional noise controls.**

Based on the noise analysis and our recommendation, we conclude that operational noise impacts resulting from the proposed modifications at the Longville Compressor Station would be insignificant.

<u>Noise Assessment for Normal Unit Blowdown Events at the Longville Compressor Station</u>

The sound levels associated with high pressure gas venting are a function of initial blowdown pressure, the diameter and type of blowdown valve, and the diameter and arrangement of the downstream vent piping. Blowdown sound levels are loudest at the beginning of the blowdown event and they decrease as the blowdown pressure decreases.

Trunkline would install silencers on the gas blowdown equipment to limit the noise level to 50 dBA at a distance of 300 feet. NSA 3, which is the nearest NSA to the Longville Compressor Station, is about 880 feet from the facility; therefore, the estimated sound level at this NSA would be about 51 dBA during unit blowdown events. This estimate assumes a direct line of site between the silencer outlet and NSA 3 with no shielding from structures or foliage. As estimated noise levels are below the 55-dBA threshold, blowdown events would be expected to have an insignificant impact on the nearest NSAs. To further minimize impacts of blowdown noise on nearby landowners, Trunkline would notify nearby landowner prior to performing blowdowns required for maintenance.

4.12 RELIABILITY AND SAFETY

4.12.1 Regulatory Agencies

Three federal agencies share regulatory authority over the siting, design, construction, and operation of LNG import terminals: the Coast Guard, the DOT, and the FERC. The Coast Guard has authority over the safety of an LNG facility's marine transfer area and LNG marine traffic, as well as over security plans for the entire LNG facility and LNG marine traffic. Those standards are codified in 33 CFR Parts 105 and 127. The DOT establishes federal safety standards for siting, construction, operation, and maintenance of onshore LNG facilities, as well as for the siting of marine cargo transfer systems at waterfront LNG plants. Those standards are codified in 49 CFR 193. Under the NGA and delegated authority from the DOE, the FERC authorizes the siting and construction of LNG import and export facilities.

In 1985, the FERC and DOT entered into an MOU regarding the execution of each agency's respective statutory responsibilities to ensure the safe siting and operation of LNG facilities. In addition to FERC's existing ability to impose requirements to ensure or enhance the operational reliability of LNG facilities, the MOU specified that FERC may, with appropriate consultation with DOT, impose more stringent safety requirements than those in Part 193.

In February 2004, the Coast Guard, DOT, and FERC entered into an Interagency Agreement to ensure greater coordination among these three agencies in addressing the full range of safety and security issues at LNG terminals, including terminal facilities and tanker operations, and maximizing the exchange of information related to the safety and security aspects of the LNG facilities and related marine operations. Under the Interagency Agreement, the FERC is the lead federal agency responsible for the preparation of the analysis required under NEPA for impacts associated with terminal construction and operation. The DOT and Coast Guard participate as cooperating agencies, but remain responsible for enforcing their regulations covering LNG facility design, construction, and operation. All three agencies have some oversight and responsibility for inspection and compliance during the facility's operation.

As part of the review required for a FERC authorization, Commission staff must ensure that all proposed facilities would operate safely and securely. The design information that must be filed in the application to the Commission is specified by 18 CFR 380.12 (m) and (o). The level of detail necessary for this submittal requires the project sponsor to perform substantial front-end engineering of the complete facility. The design information is required to be site-specific and developed to the extent that further detailed design would not result in changes to the siting considerations, basis of design, operating conditions, major equipment selections, equipment design conditions, or safety system designs which we considered during our review process.

The FERC's filing regulations also require each applicant to identify how its proposed design would comply with DOT's siting requirements of 49 CFR 193, Subpart B. As part of our NEPA review, we use this information from the applicant, developed to comply with DOT's regulations, to assess whether or not a facility would have a public safety impact. As a cooperating agency, DOT assists FERC staff in evaluating whether an applicant's proposed siting meets the DOT requirements. If a facility is constructed and becomes operational, the facility would be subject to DOT's inspection program. Final determination of whether a facility is in compliance with the requirements of 49 CFR 193 would be made by DOT staff.

In accordance with 33 CFR 127, the Coast Guard has reviewed the proposed liquefaction facilities and stated that the existing WSA and LOR are adequate for the service associated with the proposed modifications. A copy of the correspondence between Lake Charles LNG and the Coast Guard is included in Appendix 11-D of Resource Report 11.[3]

Section 4.12.2 provides a brief history on LNG incidents and discusses the principal properties and hazards associated with LNG, refrigerants, stabilized condensate products, and toxic components; section 4.12.3 discusses our technical review of the preliminary design; section 4.12.4 discusses siting requirements for Lake Charles LNG's facilities; section 4.12.5 discusses the siting analysis of the LNG facility; section 4.12.6 discusses emergency response and evacuation planning; section 4.12.7 discusses LNG vessel safety; and section 4.13.8 provides conclusions regarding LNG facility reliability and safety. Section 4.13.9 discusses reliability and safety of the proposed pipeline facilities.

4.12.2 LNG Facility Hazards

With the exception of the October 20, 1944, failure at an LNG facility in Cleveland, Ohio, the operating history of the U.S. LNG industry has been free of safety-related incidents resulting in adverse effects on the public or the environment. The 1944 incident in Cleveland led to a fire that killed 128 people and injured 200 to 400 people.[4] The failure of the LNG storage tank was due to the use of materials inadequately suited for cryogenic temperatures. LNG migrating through streets and into underground sewers due to the lack of adequate spill impoundments at the site was also a contributing factor. Current regulatory requirements ensure that proper materials suited for cryogenic temperatures are used and that spill impoundments are designed and constructed properly to contain a spill at the site.

Another operational accident occurred in 1979 at the Cove Point LNG facility in Lusby, Maryland. A pump seal failure resulted in gas vapors entering an electrical conduit and settling in a confined space. When a worker switched off a circuit breaker, the gas ignited, causing heavy damage to the building and a worker fatality. With the participation of the FERC, lessons learned from the 1979 Cove Point accident resulted in changing the national fire codes to better ensure that the situation would not occur again.

On January 19, 2004, a blast occurred at Sonatrach's Skikda, Algeria, LNG liquefaction facility, which killed 27 and injured 56 workers. No members of the public were injured. Findings of the accident investigation suggested that a cold hydrocarbon leak occurred at Liquefaction Train 40 and was introduced to the high-pressure steam boiler by the combustion air fan. An explosion developed inside the boiler firebox, which subsequently triggered a larger explosion of the hydrocarbon vapors in the immediate vicinity. The resulting fire damaged the adjacent liquefaction process and liquid petroleum gas (LPG) separation equipment of Train 40, and spread to Trains 20 and 30. Although Trains 10, 20,

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3 Accession Number: 20140325-5137.

4 For a description of the incident and the findings of the investigation, see "U.S. Bureau of Mines, Report on the Investigation of the Fire at the Liquefaction, Storage, and Regasification Plant of the East Ohio Gas Co., Cleveland, Ohio, October 20, 1944," dated February 1946.

and 30 had been modernized in 1998 and 1999, Train 40 had been operating with its original equipment since start-up in 1981. To ensure that this potential hazard would be addressed at the proposed project, Lake Charles LNG would install hazard detection devices at all combustion and ventilation air intake equipment to enable isolation and deactivation of any combustion equipment whose continued operation could add to, or sustain, an emergency.

On March 31, 2014, an explosion and fire occurred at Northwest Pipeline Corporation's LNG peak-shaving facility in Plymouth, Washington. The facility was immediately shut down, and emergency procedures were activated, which included notifying local authorities and evacuating all plant personnel. No members of the public were injured. The accident investigation is still in progress. Once developed, measures to address any causal factors which led to this incident will be applied to all facilities under Commission jurisdiction.

4.12.2.1 Hazards Associated with the Proposed Equipment

Before liquefaction, Lake Charles LNG would pre-treat the feed gas for the removal of hydrogen sulfide (H_2S), CO_2, water (H_2O), and mercury (Hg). The removal of these substances from the feed gas stream can be hazardous as a result from the physical, chemical, flammability, and/or toxicity properties of Hg and H_2S. The process of removing H_2S would require the use of an amine solution, a hazardous substance, which is discussed below. Additionally, the feed gas may contain pentane and heavier hydrocarbons, including aromatic hydrocarbons such as benzene, toluene, and xylene. Although a small amount is expected, they are still considered hazardous substances.

Lake Charles LNG proposes a design capacity to handle up to 15 micrograms per normal cubic meter (µg/Nm3) Hg, 3.3 parts per million by volume H_2S, and 2 percent by volume CO_2. However, lower quantities and concentrations of these substances would be expected in the natural gas feed stream and would not pose a hazard to the public.

The CO_2 and H_2S would be removed from the feed gas by a closed-loop regenerative amine system which uses a Methyldiethanolamine (amine) solution. As the CO_2 and H_2S are removed by the amine solution, these substances would accumulate within the amine solution and reduce the effectiveness of the amine system. Therefore, the amine solution would be regenerated periodically, where an acid gas stream with concentrations up to 213 parts per million by mole H_2S and 95 mole percent CO_2 would be separated from the contaminated amine solution and routed to a Hydrogen Sulfide Removal Unit to remove the H_2S content. The resulting waste gas stream would be sent to the Thermal Oxidizer for further treatment to reduce emission prior to discharging to the atmosphere.

Mercury in the feed gas would be removed by absorption in mercury removal beds. Lake Charles LNG would replace the mercury removal beds by the end of their service life. Maintenance and safety procedures would cover the proper replacement and disposal of spent materials. The amine solution would be contained, as discussed under "Impoundment Sizing" in section 4.12.5.1. Therefore, the amine solution would not pose a significant hazard to the public, which would have no access to the on-site areas.

In addition to the removal of CO_2, H_2O, H_2S, and mercury, Lake Charles LNG would install a fractionation unit to condense pentane and heavier hydrocarbons that may be present in the feed gas. During this removal process, natural gas liquids (NGL) would be extracted and handled on site at temperature and pressure conditions under which a loss of containment would result primarily in a vapor release and the ability to produce damaging overpressures. The fractionation process would produce stabilized condensate, which includes pentane and heavier hydrocarbons, as well as a small trace of toxic components that include benzene, toluene, and xylene. The stabilized condensate would be stored on site at atmospheric pressure and temperature. Due to the temperature and pressure conditions under which the stabilized condensate would be stored and handled, a loss of containment would primarily result in a liquid release.

Although not a part of the pretreatment process, an aqueous ammonia solution would be used in the utility system to control emission of nitrogen oxide. An aqueous ammonia solution (19 percent by weight) would be used in the Selective Catalytic Reduction (SCR) units on the mixed refrigerant and propane compressor gas turbine drivers as the reduction agent to convert nitrogen oxide into nitrogen before emission. The aqueous ammonia solution would be stored on-site at atmospheric conditions. A release of aqueous ammonia would form a liquid pool and may produce a flammable cloud. However, its impact would be smaller in comparison to other flammable products stored and handled on-site.

A loss of the containment from the storage tanks or process piping would result in the formation of flammable or toxic vapor at the release location, as well as from any LNG or liquid flammable refrigerant that pooled. Releases occurring in the presence of an ignition source would most likely result in a fire at the vapor source. A spill without ignition would form a vapor cloud that would travel with the prevailing wind until it either dispersed below the flammable limits or encountered an ignition source. In some instances, ignition of a vapor cloud may produce damaging overpressures. These hazards are described in more detail below.

Loss of Containment

Lake Charles LNG would store the following on site: LNG at atmospheric pressure and at a cryogenic temperature of about –260°F; liquid ethane at 46°F and 405 pounds per square in gauge (psig); liquid propane at ambient temperature and 153 psig (similar to the conditions typically used in propane storage and domestic distribution), stabilized condensate, and aqueous ammonia (19 percent by weight) at ambient conditions.

The mixed refrigerant process stream would consist of nitrogen, CH_4, ethane, and propane. Cryogenic temperatures as low as –243°F would occur within the MR process stream used to liquefy the feed gas. The temperature of NGL in the heavy hydrocarbon removal process stream would be as low as –83°F. Loss of containment of LNG and mixed refrigerant liquid (MRL), and NGL could lead to the release of both liquid and vapor into the immediate area. Exposure to either cold liquid or vapor could cause freeze burns and, depending on the length of exposure, more serious injury or death. However, spills would be contained to on-site areas and the cold state of these releases would be greatly limited due to the continuous mixing with the warmer air. The cold temperatures from the release would not present a hazard to the public, which would not have access to on-site areas.

LNG and portions of the MRL stream are cryogenic liquids that would quickly cool any materials contacted by the liquid on release, causing extreme thermal stress in materials not specifically designed for such conditions. These thermal stresses could subsequently subject the material to brittleness, fracture, or other loss of tensile strength. These temperatures, however, would be accounted for in the design of equipment and structural supports, and would not be substantially different from the hazards associated with the storage and transportation of liquid oxygen (–296ºF) or several other cryogenic liquids that have been routinely produced and transported in the United States.

A rapid phase transition (RPT) can occur when a cryogenic liquid is spilled onto water and changes from liquid to gas, virtually instantaneously. Unlike an explosion that releases energy and combustion products from a chemical reaction, an RPT is the result of heat transferred to the liquid inducing a change to the vapor state. RPTs have been observed during LNG test spills onto water. In some test cases, the overpressures generated were strong enough to damage test equipment in the immediate vicinity of the LNG release point. The sizes of the overpressure events have been generally small and are not expected to cause significant damage. The average overpressures recorded at the source of the RPTs during the Coyote tests have ranged from 0.2 pounds per square inch (psi) to 11 psi.[5] These events are typically limited to the area within the spill and are not expected to cause damage outside of the area engulfed by the LNG pool. However, a RPT may affect the rate of pool spreading and the rate of vaporization for a spill on water.

Vapor Dispersion

In the event of a loss of containment, LNG, ethane, propane, and NGL would vaporize on release from any storage or process facilities. Depending on the size of the release, cryogenic liquids, such as LNG and MRL, may form a liquid pool and vaporize. Additional vaporization would result from exposure to ambient heat sources, such as water or soil. When released from a containment vessel or transfer system, LNG will generally produce 620 to 630 standard cubic feet (ft^3) of natural gas for each cubic foot of liquid. Ethane will produce about 300 ft^3 of gas for each cubic foot of liquid. Propane will produce about 260 ft^3 of gas for each cubic foot of liquid. The composition of the extracted NGL would vary throughout the heavy hydrocarbon removal process and may produce up to about 260 ft^3 of gas for each cubic foot of liquid. In the event of a loss of containment of stabilized condensate, the stabilized condensate would spill primarily as a liquid and form a pool, but would vaporize much more slowly than propane.

The vapor may form a toxic or flammable cloud depending on the material released. The dispersion of the vapor cloud will depend on the physical properties of the cloud, the ambient conditions, and the surrounding terrain and structures. Generally, a denser-than-air vapor cloud would sink to the ground due to the relative density of the vapor to the air and would travel with the prevailing wind, while a lighter-than-air vapor cloud would rise and travel with the prevailing wind. The density will depend on the material releases and the temperature of the material. For example, a LNG release would initially form a denser-than-air vapor cloud and transition to lighter-than-air vapor cloud as the vapor disperses downwind and mixes with the warm surrounding air. However, experimental observations and vapor dispersion modeling indicate a LNG vapor cloud would not typically be warm, or buoyant, enough to lift off from the ground before the LNG vapor cloud disperses below its lower flammable limit (LFL). A liquid ethane release would form a denser-than-air vapor cloud that would sink to the ground due to the cold temperature of the vapor. As the ethane vapor cloud disperses downwind and mixes with the warm surrounding air, the ethane vapor would become neutrally buoyant. A propane release would form a denser-than-air vapor cloud that would sink to the ground; however, propane would remain denser than the surrounding air, even after warming to ambient temperatures. Any NGL release would form a denser-than-air vapor cloud, even after warming to ambient temperatures.

The vapor cloud would continue to be hazardous until it dispersed below toxic levels and/or flammable limits. Toxicity is primarily dependent on the concentration of the vapor cloud in the air and the exposure duration, while flammability of the vapor cloud is primarily dependent just on the concentration of the vapor when mixed with the surrounding air. In general, higher concentrations within the vapor cloud would exist near the spill, and lower concentrations would exist near the edge of the cloud as it disperses downwind.

[5] The Lawrence Livermore National Laboratory conducted seven tests (the Coyote series) on vapor cloud dispersion, vapor cloud ignition, and RPTs at the Naval Weapons Center in China Lake, California in 1981.

Toxicity is defined by a number of different agencies for different purposes. Acute Exposure Guideline Level (AEGL) and Emergency Response Planning Guidelines (ERPG) can be used for emergency planning, prevention, and response activities related to the accidental release of hazardous substances.[6] Other federal agencies, such as the DOE, EPA, and NOAA, use AEGLs and ERPGs as the primary measure of toxicity.[7,8,9]

There are three AEGLs and ERPGs which are distinguished by varying degrees of severity of toxic effects with AEGL-1 and ERPG-1 (level 1) being the least severe to AEGL-3 and ERPG-3 (level 3) being the most severe. AEGL-1 is the airborne concentration of a substance that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic non-sensory effects. However, these effects are not disabling and are transient and reversible upon cessation of the exposure. AEGL-2 is the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape. AEGL-3 is the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience life-threatening health effects or death. ERPG levels have similar definitions, but are based on the maximum airborne concentration below which it is believed nearly all individuals could be exposed for up to 1 hour without experiencing similar effects defined in each of the AEGLs. The EPA provides ERPGs (1 hour) and AEGLs at varying exposure times (10 minutes, 30 minutes, 1 hour, 4 hours, and 8 hours) for a list of chemicals. AEGLs are used preferentially as they are more inclusive and provide toxicity levels at various exposure times. The preferential use of AEGLs is also done by DOE and NOAA. The toxic properties for the various material components stored and processed on site are tabulated in table 4.12.2-1.

In addition, methane and heavier hydrocarbons are classified as simple asphyxiants and may pose extreme health hazards, including death, if inhaled in significant quantities within a limited time. Very cold methane and heavier hydrocarbons vapors may also cause freeze burns. However, the locations of concentrations where cold temperatures and oxygen-deprivation effects could occur are greatly limited due to the continuous mixing with the warmer air surrounding the spill site. For that reason, exposure injuries from contact with releases of methane and heavier hydrocarbons normally represent negligible risks to the public.

Flammable vapors can develop when a flammable material is above its flash point and concentrations are between the LFL and the upper flammable limit (UFL). Concentrations between the LFL and UFL can be ignited, and concentrations above the UFL or below the LFL would not ignite. The flammable properties for the various material components stored and processed on site are tabulated in table 4.12.2-2.

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6 U.S. Environmental Protection Agency, *Dose-Response Assessment for Assessing Health Risks Associated With Exposure to Hazardous Air Pollutants*, http://www2.epa.gov/fera/dose-response-assessment-assessing-health-risks-associated-exposure-hazardous-air-pollutants, July 3, 2014.

7 U.S. Department of Energy, *Temporary Emergency Exposure Limits for Chemicals: Methods and Practice*, DOE Handbook, DOE-HDBK-1046-2008, August 2008.

8 U.S. Environmental Protection Agency, *40 CFR 68 Final Rule: Accidental Release Prevention Requirements: Risk Management Programs Under Clean Air Act Section 112(r)(7)*, 61 Federal Register 31667-31732, Vol. 61, No. 120, Thursday, June 20, 1996.

9 U.S. National Oceanic and Atmospheric Administration, *Public Exposure Guidelines*, http://response.restoration.noaa.gov/oil-and-chemical-spills/chemical-spills/resources/public-exposure-guidelines.html, December 3, 2013.

TABLE 4.12.2-1

Toxicity Levels of Various Material Components (in ppm)[a,b,]

Material Components	Acute Exposure Guideline Level	10 min	30 min	60 min	4 hr	8 hr
Ammonia	AEGL 1	30	30	30	30	30
	AEGL 2	220	220	160	110	110
	AEGL 3	2,700	1,600	1,100	550	390
Benzene	AEGL 1	130	73	52	18	9
	AEGL 2	2,000 [c]	1,100	800	400	200
	AEGL 3	9,700 [d]	5,600 [c]	4,000 [c]	2,000 [c]	990
Hydrogen Sulfide	AEGL 1	0.75	0.60	0.51	0.36	0.33
	AEGL 2	41	32	27	20	17
	AEGL 3	76	59	50	37	31
Toluene	AEGL 1	200	200	200	200	200
	AEGL 2	3,100 c	1,600	1,200	790	650
	AEGL 3	13,000 [d]	6,100 [c]	4,500 [c]	3,000 [c]	2,500 [c]
Xylenes	AEGL 1	130	130	130	130	130
	AEGL 2	2,500 [c]	1,300 [c]	920 [c]	500	400
	AEGL 3	7,200 [d]	3,600 [c]	2,500 [c]	1,300 [c]	1,000 [c]

[a] U.S. Environmental Protection Agency, Acute Exposure Guideline Levels, http://www.epa.gov/oppt/aegl/pubs/chemlist.htm, December 3, 2013.

[b] American Industrial Hygiene Association, 2013 ERPG/WEEL Handbook, http://www.aiha.org/get-involved/AIHAGuidelineFoundation/EmergencyResponsePlanningGuidelines, 2013.

[c] Greater than or equal to 10 percent LFL.

[d] Greater than or equal to 50 percent LFL.

TABLE 4.12.2-2

Flammable Properties[a]

Material Component	Flash Point	LFL (percent volume)	UFL (percent volume)
Methane	–283°F	5.0	15.0
Ethane	–211°F	3.0	12.5
Propane	–155°F	2.1	9.5
n-Butane	–76°F	1.8	8.5
i-Butane	–105°F	1.8	8.4
n-Pentane	–56°F	1.4	7.8
i-Pentane	–60°F	1.4	7.6
n-Hexane	–7.6°F	1.2	7.5
Benzene	11°F	1.4	7.1
Toluene	45°F	1.2	7.1
m-Xylene	77°F	1.1	7.0
o-Xylene	75°F	1.1	6.0
p-Xylene	77°F	1.1	7.0
Hydrogen sulfide	–116°F	4.0	44

[a] Society of Fire Protection Engineers, The SFPE Handbook of Fire Protection Engineering, Fourth Edition, 2008.

The extent of the affected area and the severity of the impacts on objects within a vapor cloud would primarily be dependent on the material, quantity, and duration of the initial release, the surrounding terrain, and the environmental conditions present during the dispersion of the cloud. Lake Charles LNG has modeled the extent of the potential vapor dispersion hazards for the project, which is discussed in section 4.12.5.

Flammable Vapor Ignition

If the flammable portion of a vapor cloud encounters an ignition source, a flame would propagate through the flammable portions of the cloud. In most circumstances, the flame would be driven by the heat it generates. This process is known as a deflagration, or a flash fire because of its relatively short duration. However, exposure to a deflagration, or flash fire, can cause severe burns and death, and can ignite combustible materials within the cloud. Lake Charles LNG has modeled the extent of the potential flammable vapor dispersion hazards for the project, which is discussed in section 4.12.5.3.

If the deflagration in a flammable vapor cloud accelerates to a sufficiently high rate of speed, pressure waves that can cause damage would be generated. As a deflagration accelerates to super-sonic speeds, the large shock waves produced, rather than the heat, would begin to drive the flame, resulting in a detonation. The flame speeds are primarily dependent on the reactivity of the fuel, the ignition strength and location, the degree of congestion and confinement of the area occupied by the vapor cloud, and the flame travel distance. Lake Charles LNG has modeled the extent of the potential overpressure hazards for the project, which is discussed in section 4.12.5.4.

Once a vapor cloud is ignited, the flame front may propagate back to the spill site if the vapor concentration along this path is sufficiently high to support the combustion process. When the flame reaches vapor concentrations above the UFL, the deflagration could transition to a fireball and result in a pool or jet fire back at the source. A fireball would occur near the source of the release and would be of a relatively short duration compared to an ensuing jet or pool fire. The extent of the affected area and the severity of the impacts on objects in the vicinity of a fire would primarily be dependent on the material, quantity, and duration of the fire, the surrounding terrain, and the environmental conditions present during the fire. Lake Charles LNG has modeled the extent of the potential radiant heat hazards from a pool fire for the project, which is discussed in section 4.12.5.

Overpressures

If the deflagration in a flammable vapor cloud accelerates to a sufficiently high rate of speed, pressure waves that can cause damage would be generated. As a deflagration accelerates to super-sonic speeds, large pressure waves are produced, and a shock wave is created. This shock wave, rather than the heat, would begin to drive the flame, resulting in a detonation. Deflagrations or detonations are generally characterized as “explosions” as the rapid movement of the flame and pressure waves associated with them cause additional damage beyond that from the heat. The amount of damage an explosion causes is dependent on the amount the produced pressure wave is above atmospheric pressure (i.e. an overpressure) and its duration (i.e., pulse). For example, a 1 psi overpressure, often cited as a safety limit in U.S. regulations, is associated with glass shattering and traveling with velocities high enough to lacerate skin.

Flame speeds and overpressures are primarily dependent on the reactivity of the fuel, the ignition strength and location, the degree of congestion and confinement of the area occupied by the vapor cloud, and the flame travel distance.

The potential for unconfined LNG vapor cloud detonations was investigated by the Coast Guard in the late 1970s at the Naval Weapons Center in China Lake, California. Using methane, the primary component of natural gas, several experiments were conducted to determine whether unconfined LNG vapor clouds would detonate. Unconfined methane vapor clouds ignited with low-energy ignition sources (13.5 joules), produced flame speeds ranging from 12 to 20 mph. These flame speeds are much lower than the flame speeds associated with a deflagration with damaging overpressures or a detonation.

To examine the potential for detonation of an unconfined natural gas cloud containing heavier hydrocarbons that are more reactive, such as ethane and propane, the Coast Guard conducted further tests on ambient-temperature fuel mixtures of methane-ethane and methane-propane. The tests indicated that the addition of heavier hydrocarbons influenced the tendency of an unconfined natural gas vapor cloud to detonate. Less processed natural gas with greater amounts of heavier hydrocarbons would be more sensitive to detonation.

Although it has been possible to produce damaging overpressures and detonations of unconfined LNG vapor clouds, the feed gas stream proposed for the project would have lower ethane and propane concentrations than those that resulted in damaging overpressures and detonations. The substantial amount of initiating explosives needed to create the shock initiation during the limited range of vapor-air concentrations also renders the possibility of detonation of these vapors at an LNG plant as unrealistic. Ignition of a confined LNG vapor cloud could result in higher overpressures. In order to prevent such an occurrence, Lake Charles LNG would take measures to mitigate the vapor dispersion and ignition into confined areas, such as buildings. Lake Charles LNG would install hazard detection devices at all combustion and ventilation air intake equipment to enable isolation and deactivation of any combustion equipment whose continued operation could add to, or sustain, an emergency. In general, the primary hazards to the public from an LNG spill that disperses to an unconfined area, either on land or water, would be from dispersion of the flammable vapors or from radiant heat generated by a pool fire.

In comparison with LNG vapor clouds, there is a higher potential for unconfined propane clouds to produce damaging overpressures, and an even higher potential for unconfined ethylene vapor clouds to produce damaging overpressures. Unconfined ethylene vapor clouds also have the potential to transition to a detonation much more readily than propane. This has been shown by multiple experiments conducted by the Explosion Research Cooperative to develop predictive blast wave models for low, medium, and high reactivity fuels and varying degrees of congestion and confinement (Pierorazio, 2005). The experiments used methane, propane, and ethylene, as the respective low, medium, and high reactivity fuels. In addition, the tests showed that if methane, propane, or ethylene are ignited within a confined space, such as in a building, they all have the potential to produce damaging overpressures. The MRL and NGL process streams would contain a mixture of components such as the ones discussed above (i.e., propane). Therefore, a potential exists for these process streams to produce unconfined vapor clouds that could produce damaging overpressures in the event of a release.

Discussion of these hazards and potential mitigation are in section 4.12.5 for the project facilities. Lake Charles LNG has also mitigated the risk for cascading event hazards for the project, which is also discussed in section 4.12.5.

Cascading Events

Fires and overpressures may also cause failures of nearby storage vessels, piping, and equipment if not properly mitigated. These failures are often termed cascading events or domino effects and can exceed the consequences of the initial hazard.

The failure of a pressurized vessel could cause fragments of material to fly through the air at high velocities, posing damage to surrounding structures and a hazard for operating staff, emergency personnel, or other individuals in proximity to the event. In addition, failure of a pressurized vessel when the liquid is at a temperature significantly above its normal boiling point could result in a boiling-liquid-expanding-vapor explosion (BLEVE). BLEVEs can produce overpressures when the superheated liquid rapidly changes from a liquid to a vapor upon the release from the vessel. BLEVEs of flammable fluids may also ignite upon its release and cause a subsequent fireball.

Failures of nearby storage vessels, piping, and equipment and the potential for cascading events are discussed in section 4.12.5.6.

4.12.3 Technical Review of the Facility Preliminary Engineering Design

Operation of the proposed facility poses a potential hazard that could affect the public safety if strict design and operational measures to control potential accidents are not applied. The primary concerns are those events that could lead to an LNG spill of sufficient magnitude to create an off-site hazard as discussed in section 4.12.2. However, it is important to recognize the stringent requirements in place for the design, construction, operation, and maintenance of the facility, as well as the extensive safety systems proposed to detect and control potential hazards.

In general, we consider an acceptable design to include various layers of protection or safeguards in the facility design to reduce the risk of a potentially hazardous scenario from developing into an event that could impact the off-site public. These layers of protection are independent of one another so that any one layer would perform its function regardless of the action or failure of any other protection layer or initiating event. Such design features and safeguards typically include:

- a facility design that prevents hazardous events through the use of suitable materials of construction; operating and design limits for process piping, process vessels, and storage tanks; adequate design for wind, flood, seismic, and other outside hazards;

- control systems, including monitoring systems and process alarms, remotely-operated control and isolation valves, and operating procedures to ensure the facility stays within the established operating and design limits;

- safety-instrumented prevention systems, such as safety control valves and emergency shutdown systems, to prevent a release if operating and design limits are exceeded;

- physical protection systems, such as appropriate electrical area classification, proper equipment and building spacing, pressure relief valves, spill containment, and structural fire protection, to prevent escalation to a more severe event;

- site security measures for controlling access to the facility, including security inspections and patrols; response procedures to any breach of security and liaison with local law enforcement officials; and

- on-site and off-site emergency response, including hazard detection and control equipment, firewater systems, and coordination with local first responders to mitigate the consequences of a release and prevent it from escalating to an event that could impact the public.

We believe the inclusion of such protection systems or safeguards in a facility design can minimize the potential for an initiating event to develop into an incident that could impact the safety of the off-site public. In addition, siting of the facility with regard to potential off-site consequences can be further used to minimize impacts to public safety. As discussed in section 4.12.4, DOT's regulations in 49 CFR 193, Subpart B require a siting analysis be performed by Lake Charles LNG.

As part of the application, Lake Charles LNG provided a FEED for the project. In developing the FEED, Lake Charles LNG conducted a hazard identification study of the preliminary site layout, plot plans, and process flow diagrams to identify potential risk scenarios. This helped to establish the required safety control levels and identify whether additional process and safety instrumentation, mitigation, and/or administrative controls would be needed. We have analyzed the information filed by Lake Charles LNG to determine the extent that layers of protection or safeguards to enhance the safety, operability, and reliability of the facility are included in the FEED.

The objectives of our FEED review focused on the engineering design and safety concepts of the various protection layers, as well as the projected operational reliability of the proposed facilities. The design would use materials of construction suited to the pressure and temperature conditions of the process design. Piping would be designed in accordance with ASME B31.3. Pressure vessels would be designed in accordance with ASME Section VIII and the storage tanks would be designed in accordance with American Petroleum Institute (API) Standard 620, per 49 CFR 193 and the NFPA's Standard 59A (NFPA 59A). All LNG storage tanks would also include boil-off gas compression to prevent the release of boil-off to the atmosphere in accordance with NFPA 59A for an inherently safer design. Valves and other equipment would be designed to generally accepted good engineering practices. LNG facilities would be designed to withstand a sustained wind of 150 miles per hour (mph), which converts to 183 mph at a 3-second gust per 49 CFR §193.2067[10]. The wind forces on shop fabricated containers of LNG or other hazardous fluids with a capacity of not more than 70,000 gallons would be based on applicable wind load data in ASCE/SEI/ 7-05. TLNG proposes to design all other facilities to 3-second gust wind speed of 110 mph.

The ground surface of the liquefaction facilities would be elevated to about +11.0 feet North American Vertical Datum 1988 (NAVD88) in order to be above the flood elevations. The Lake Charles LNG site would be located 24 miles north of the Gulf of Mexico shoreline. Therefore, the tsunami hazard would be negligible.

Lake Charles LNG would install process control valves and instrumentation to safely operate and monitor the facility. Alarms would have visual and audible notification in the control room to warn operators that process conditions may be approaching design limits. Operators would have the capability to take action from the control room to mitigate an upset.

Lake Charles LNG would develop facility operation procedures after completion of the final design; this timing is fully consistent with accepted industry practice. We have made recommendations for Lake Charles LNG to provide more information on the operating and maintenance procedures as they are developed, including safety procedures, hot work procedures and permits, abnormal operating conditions procedures, and personnel training. In addition, we have measures such as labeling of instrumentation and valves, piping, and equipment and car-seals/locks, to address human factor considerations and improve facility safety. An alarm management program would also be in place to ensure effectiveness of the alarms.

[10] A 150-mph sustained wind speed would correspond to a 183-mph, 3-second gust using the Durst Curve in ASCE 7-05 and a 185-mph, 3-second gust using a 1.23 gust factor for onshore winds at a coast line recommended in World Meteorological Organization, *Guidelines for Converting Between Various Wind Averaging Periods in Tropical Cyclone Conditions*. These wind speeds are equivalent to approximately a 14,000-year mean return interval or 0.36-percent probability of exceedance in a 50-year period for the site based on ASCE 7-05 wind speed return period conversions.

Safety valves and instrumentation would be installed to monitor, alarm, shutdown, and isolate equipment and piping during process upsets or emergency conditions. Safety instrumented systems would comply with International Society for Automation (ISA) Standard 84.01 and other generally accepted good engineering practices. We also made recommendations on the design, installation, and commissioning of instrumentation and emergency shutdown equipment to ensure appropriate cause and effect alarm or shutdown logic and enhanced representation of the emergency shutdown valves in the facility control system.

Safety relief valves and flares would be installed to protect the process equipment and piping. The safety relief valves would be designed to handle process upsets and thermal expansion within piping, per NFPA 59A and ASME Section VIII, and would be designed based on API 520, 521, 527, and other generally accepted good engineering practices. In addition, we made recommendations to ensure the design and installation of pressure and vacuum relief devices are adequate.

The security requirements for the liquefaction facilities are governed by 49 CFR 193, Subpart J - Security. This subpart includes requirements for conducting security inspections and patrols, liaison with local law enforcement officials, design and construction of protective enclosures, lighting, monitoring, alternative power sources, and warning signs. Requirements for maintaining safety of the liquefaction facility are in the USCG regulations in 33 CFR 127. Lake Charles LNG proposed to install access control system, intrusion detection system, and security cameras at plant entrances, security gates, perimeter fence, LNG loading/unloading docks, and buildings.

Requirements for maintaining security of the liquefaction facility can be found in 33 CFR 105. These security requirements were authorized by the Maritime Transportation Security Act (MTSA) of 2002, which requires all terminal owners and operators to submit a Facility Security Assessment and a Facility Security Plan to the Coast Guard for review and approval. Some of the responsibilities of the applicant include, but are not limited to:

- designating an Facility Security Officer with a general knowledge of current security threats and patterns, risk assessment methodology, and the responsibility for implementing the Facility Security Assessment and Facility Security Plan and performing an annual audit for the life of the project;
- conducting a Facility Security Assessment to identify site vulnerabilities, possible security threats and consequences of an attack, and facility protective measures;
- developing a Facility Security Plan based on the Facility Security Assessment, with procedures for: responding to transportation security incidents; notification and coordination with local, state, and federal authorities; prevention of unauthorized access; measures and equipment to prevent or deter dangerous substances and devices; training; and evacuation;
- implementing scalable security measures to provide increasing levels of security at increasing maritime security levels for facility access control, restricted areas, cargo handling, vessel stores and bunkers, and monitoring;
- ensuring the Transportation Worker Identification Credential program is properly implemented; and
- reporting all breaches of security and security incidents to the National Response Center.

The Trunkline LNG Terminal has an existing Facility Security Plan which has been approved by the USCG. Lake Charles LNG would update the Facility Security Plan to include the changes in operations and the increased facility footprint associated with the liquefaction project.

In the event of a release, drainage systems from LNG storage and liquefaction process facilities would direct a spill away from equipment in order to minimize flammable vapors from dispersing to confined, occupied, or public areas and to minimize heat from impacting adjacent equipment and public areas if ignition occurs. Spacing of vessels and equipment between each other, from ignition sources, and to the property line would meet the requirements of NFPA 59A (2001 edition), as referenced in 49 CFR 193.2401.

Lake Charles LNG performed a preliminary fire protection evaluation to ensure that adequate hazard detection, hazard control, and firewater coverage would be installed to detect and address any upset conditions. Structural fire protection, proposed to prevent failure of structural supports of equipment and pipe racks, would comply with NFPA 59A and other generally accepted good engineering practices. Lake Charles LNG would also install hazard detection systems to detect, alarm, and alert personnel in the area and control room to initiate an emergency shutdown and/or initiate appropriate procedures, and would meet NFPA 72 and other generally accepted good engineering practices. Hazard control devices would be installed to extinguish or control incipient fires and releases, and would meet NFPA 59A and NFPA 10, 15, 17, and other generally accepted good engineering practices. Lake Charles LNG would provide automatic firewater systems and monitors for use during an emergency to cool the surface of storage vessels, piping, and equipment exposed to heat from a fire, and would meet NFPA 59A, 20, 22, and 24 requirements. We have made recommendations for Lake Charles LNG to provide more information on the design, installation, and commissioning of hazard detection, hazard control, and firewater systems as Lake Charles LNG would further develop this information during the final design phase.

Lake Charles LNG would also have written emergency procedures in accordance with 49 CFR 193 and 33 CFR 127. The emergency procedures would provide for protection of personnel and the public as well as the prevention of property damage that may occur as a result of incidents at the facility. Lake Charles LNG would also be required to develop an emergency response plan (ERP) in accordance with EPAct 2005. As discussed further in section 4.13.6, an ERP has been in place since the Trunkline LNG Terminal re-commissioned the import of LNG in 1989; however, Lake Charles LNG would need to update the existing ERP to include the proposed liquefaction facilities and emergencies related to refrigerant handling.

As a result of the technical review of the information provided by Lake Charles LNG in the submittal documents, we identified a number of concerns in information data request letters issued on July 3, 2014 and November 18, 2014 relating to the reliability, operability, and safety of the proposed design. Lake Charles LNG provided written responses to the information data request on July 24, 2014 and November 25, 2014. Some of these responses indicated that Lake Charles LNG would correct or modify its design in order to address issues raised in the information request. These responses are referenced in table 4.12.3-1. As a result, **we recommend that:**

- **<u>Prior to construction of the final design</u>, Lake Charles LNG should file with the Secretary, for review and approval by the Director of OEP, information/revisions pertaining to Lake Charles LNG's response to the Engineering Information Requests identified in table 4.12.3-1 of the EIS.**

TABLE 4.12.3-1 **Lake Charles LNG Responses Indicating Corrections or Modifications to the Front-End Engineering Design**		
Date of FERC Engineering Information Request	FERC Engineering Information Request	Filing Date of Lake Charles LNG Response
July 3, 2014	Resource Report 13: 1, 2(b), 6, 9, 11, 12, 13, 15(a), 15(e), 19, 21, 23, 24, 25, 26, 27, 29, 30, 32, 39, 40, 42, 45, 48, 53, 57, and 60	July 24, 2014
November 18, 2014	3, 4, and 5	November 25, 2014

The FEED and specifications submitted for the proposed facilities to date are preliminary, but would serve as the basis for any detailed design to follow. If authorization is granted by the Commission, the next phase of the project would include development of the final design, including final selection of equipment manufacturers, process conditions, and resolution of some safety-related issues. We do not expect that the detailed design information to be developed would result in changes to the basis of design, operating conditions, major equipment selections, equipment design conditions, or safety system designs that were presented as part of the FEED.

A more detailed and thorough hazard and operability review (HAZOP) analysis would be performed by Lake Charles LNG during the final design phase to identify the major hazards that may be encountered during the operation of facilities. The HAZOP study would be intended to address hazards of the process, engineering and administrative controls, and would provide a qualitative evaluation of a range of possible safety, health, and environmental effects which may result from the design or operation of the facility. Recommendations to prevent or minimize these hazards would be generated from the results of the HAZOP review.

Once the design has been subjected to a HAZOP review, Lake Charles LNG's design development team would track changes in the facility design, operations, documentation, and personnel. Lake Charles LNG would evaluate these changes to ensure that the safety, health, and environmental risks arising from these changes are addressed and controlled. Resolutions of the recommendations generated by the HAZOP review would be monitored by FERC staff. We have included a recommendation that Lake Charles LNG should file a HAZOP study on the completed final design.

Information regarding the development of the final design, as detailed below, would need to be filed with the Secretary for review and written approval by the Director OEP before equipment construction at the site would be authorized. To ensure that the concerns we've identified relating to the reliability, operability, and safety of the proposed design are addressed by Lake Charles LNG, and to ensure that the facility is subject to the Commission's construction and operational inspection program, **we recommend that the following measures should apply to the Lake Charles Liquefaction Project LNG facilities. Information pertaining to these specific recommendations should be filed with the Secretary for review and written approval by the Director of OEP either: <u>prior to initial site preparation</u>; <u>prior to construction of final design</u>; <u>prior to commissioning</u>; <u>prior to introduction of hazardous fluids</u>; or <u>prior to commencement of service</u>, as indicated by each specific condition. Specific engineering, vulnerability, or detailed design information meeting the criteria specified in Order No. 683 (Docket No. RM06-24-000), including security information, should be submitted as critical energy infrastructure information (CEII) pursuant to 18 CFR 388.112. See Critical Energy Infrastructure Information, Order No. 683, 71 Fed. Reg. 58,273 (October 3, 2006), FERC Stats. & Regs. ¶31,228 (2006). Information pertaining to items such as: offsite emergency response; procedures for public notification and evacuation; and construction and operating reporting requirements, would be subject to public disclosure. All information should be filed <u>a minimum of 30 days</u> before approval to proceed is requested.**

- **Prior to initial site preparation, Lake Charles LNG should provide procedures for controlling access during construction.**

- **Prior to initial site preparation, Lake Charles LNG should file the quality assurance and quality control procedures for construction activities.**

- **Prior to initial site preparation, Lake Charles LNG should file a plot plan of the final design showing all major equipment, structures, buildings, and impoundment systems.**

- **The final design should include change logs that list and explain any changes made from the FEED provided in Lake Charles LNG's application and filings. A list of all changes with an explanation for the design alteration should be provided and all changes should be clearly indicated on all diagrams and drawings.**

- **The final design should provide up-to-date Process Flow Diagrams with heat and material balances and piping and instrumentation diagrams (P&ID), which include the following information:**

  a. equipment tag number, name, size, duty, capacity, and design conditions;

  b. equipment insulation type and thickness;

  c. valve high pressure side and internal and external vent locations;

  d. piping with line number, piping class specification, size, and insulation type and thickness;

  e. piping specification breaks and insulation limits;

  f. all control and manual valves numbered;

  g. relief valves with size and set points; and

  h. drawing revision number and date.

- **The final design should provide P&IDs, specifications, and procedures that clearly show and specify the tie-in details required to safely connect the project to the existing facility.**

- **The final design should provide an up-to-date complete equipment list, process and mechanical data sheets, and specifications.**

- **The final design should provide complete drawings and a list of the hazard detection equipment. The drawings should clearly show the location and elevation of all detection equipment. The list should include the instrument tag number, type and location, alarm indication locations, and shutdown functions of the hazard detection equipment.**

- **The final design should provide complete plan drawings and a list of the fixed and wheeled dry-chemical, hand-held fire extinguishers, and other hazard control equipment. Drawings should clearly show the location by tag number of all fixed, wheeled, and hand-held extinguishers. The list should include the equipment tag number, type, capacity, equipment covered, discharge rate, and automatic and manual remote signals initiating discharge of the units.**

- **The final design should provide facility plans and drawings that show the location of the firewater and foam systems. Drawings should clearly show: firewater and foam piping; post indicator valves; and the location, and area covered by, each monitor, hydrant, deluge system, foam system, water-mist system, and sprinkler. The drawings should also include P&IDs of the firewater and foam system.**

- **The final design should include an updated fire protection evaluation of the proposed facilities carried out in accordance with the requirements of NFPA 59A 2001, chapter 9.1.2 as required by 49 CFR Part 193. The evaluation should consider the need for clean agent fire suppression in the new switchgears and motor control centers. A copy of the evaluation, a list of recommendations and supporting justifications, and actions taken on the recommendations should be filed.**

- **The final design should specify that for hazardous fluids, piping and piping nipples 2 inches or less in diameter are to be no less than schedule 160 for carbon steel and no less than schedule 80 for stainless steel, or are designed to withstand external loads, including vibrational loads in the vicinity of rotating equipment and live loads of operators in areas accessible by operators.**

- **The final design should provide an air gap or vent installed downstream of process seals or isolations installed at the interface between a flammable fluid system and an electrical conduit or wiring system. Each air gap should vent to a safe location and be equipped with a leak detection device that: should continuously monitor for the presence of a flammable fluid; should alarm the hazardous condition; and should shutdown the appropriate systems.**

- **The final design should provide electrical area classification drawings.**

- **The final design should provide spill containment system drawings with dimensions and slopes of curbing, trenches, and impoundments.**

- **The final design of the hazard detectors should account for the calibration gas when determining the LFL set points for methane, propane, ethane, and condensate.**

- **The final design should include a hazard and operability review of the completed design prior to issuing the P&IDs for construction. A copy of the review, a list of recommendations, and actions taken on the recommendations, should be filed.**

- **The final design should include the cause-and-effect matrices for the process instrumentation, fire and gas detection system, and emergency shutdown system. The cause-and-effect matrices should include alarms and shutdown functions, details of the voting and shutdown logic, and setpoints.**

- **The final design should include a drawing showing the location of the emergency shutdown (ESD) buttons. ESD buttons should be easily accessible, conspicuously labeled, and located in an area which would be accessible during an emergency.**

- **The final design should include a plan for clean-out, dry-out, purging, and tightness testing. This plan should address the requirements of the American Gas Association's Purging Principles and Practice required by 49 CFR 193, and should provide justification if not using an inert or non-flammable gas for cleanout, dry-out, purging, and tightness testing.**

- **The final design should include the sizing basis and capacity for the final design of pressure and vacuum relief valves for major process equipment, vessels, and storage tanks.**

- **The final design should provide the procedures for pressure/leak tests which address the requirements of ASME VIII and ASME B31.3, as required by 49 CFR 193.**

- **The final design should include a structural evaluation of each LNG storage tank that accounts for the modifications to the tanks, internal pump columns, and piping systems. The evaluation should include the following:**

  a. modification details;

  b. structural design loading and acceptance criteria used to evaluate the structural integrity of the LNG storage tanks, internal pump columns, piping and associated supports;

  c. effects of the modifications on the tanks' structural design; and

  d. review and approval by the tank manufacturer to verify the structural integrity of the tank is adequate to support the modifications and proposed operating conditions and other design loadings.

- **The final design of the thermal relief valve PSV-880 discharge should not be directed downstream of emergency shutdown valve ESDV-510.**

- **The final design should specify that the design pressure of the Hot Oil Expansion Drum, A801-F, should be consistent with the design pressure of the hot oil system.**

- **The final design of the inlet and discharge piping to/from PSV-060A/B on the Rich Amine Flash Drum should be stainless steel and should discharge to the low pressure flare header to be consistent with the flare pressure design philosophy.**

- **The final design should include a piping specification that applies to the design conditions of the regeneration piping systems associated with the dehydrators.**

- **The final design of the discharge from pressure controlled vents PV-144 and PV-124 on the mixed refrigerant system should be directed to the low pressure cold flare header.**

- **The final design should include a full evaluation and justification for the exclusion of suction drums for the medium pressure and high pressure stages of the medium and high pressure mixed refrigerant compressors. The evaluation should include consideration for settle out condensation under all conditions.**

- **The final design of the firewater pump testing system should include flow and pressure transmitters that connect to the distributed control system. The P&IDs should show the test piping from the discharge of each pump connecting to a common header upstream of the flow and pressure transmitters.**

- **The final design should provide details of the heating element for the Flare Knockout Drums and the method of insertion and removal.**

- **The <u>final design</u> should evaluate the installation of a forward pressure control valve with flow reset, rather than a flow control valve (i.e., FV-82127), on the regeneration stream to the Ethane Treatment Beds.**

- **The <u>final design</u> should demonstrate that the design pressure of the Propane Transfer Pump, 8202-J, and the set pressure of the discharge relief valve PSV-82087 would be consistent with the propane transfer pump shutoff pressure conditions.**

- **The <u>final design</u> should provide procedures of how to prevent the flare system from overloading due to excessive intentional and inadvertent venting from the blowdown valves.**

- **The <u>final design</u> of the refrigerant storage system should allow the isolation of individual pressure relief valves while providing full relief capacity, during pressure relief valve maintenance or testing.**

- **<u>Prior to commissioning</u>, procedures should be developed for providing the facility with fire water coverage during such times as the fire water system would be out of service, in particular for removing and flushing brackish water from the system.**

- **<u>Prior to commissioning</u>, Lake Charles LNG should file plans and detailed procedures for: testing the integrity of on-site mechanical installation; functional tests; introduction of hazardous fluids; operational tests; and placing the equipment into service.**

- **<u>Prior to commissioning</u>, Lake Charles LNG should provide a detailed schedule for commissioning through equipment startup. The schedule should include milestones for all procedures and tests to be completed: prior to introduction of hazardous fluids; and during commissioning and startup. Lake Charles LNG should file documentation certifying that each of these milestones has been completed before authorization to commence the next phase of commissioning and startup would be issued.**

- **<u>Prior to commissioning</u>, Lake Charles LNG should tag all equipment, instrumentation, and valves in the field, including drain valves, vent valves, main valves, and car-sealed or locked valves.**

- **<u>Prior to commissioning</u>, Lake Charles LNG should file a tabulated list and drawings of the proposed hand-held fire extinguishers. The list should include the equipment tag number, extinguishing agent type, capacity, number, and location. The drawings should show the extinguishing agent type, capacity, and tag number of all hand-held fire extinguishers.**

- **<u>Prior to commissioning</u>, Lake Charles LNG should file updates addressing the liquefaction facilities in the operation and maintenance procedures and manuals, as well as safety procedures.**

- **<u>Prior to commissioning</u>, Lake Charles LNG should maintain a detailed training log to demonstrate that operating staff has completed the required training.**

- **<u>Prior to introduction of hazardous fluids</u>, Lake Charles LNG should complete a firewater pump acceptance test and firewater monitor and hydrant coverage test.**

The actual coverage area from each monitor and hydrant should be shown on facility plot plan(s).

- **<u>Prior to introduction of hazardous fluids</u>, Lake Charles LNG should complete all pertinent tests (Factory Acceptance Tests, Site Acceptance Tests, Site Integration Tests) associated with the Distributed Control System and the Safety Instrumented System that demonstrates full functionality and operability of the system.**

- **<u>Prior to commencement of service</u>, Lake Charles LNG should label piping with fluid service and direction of flow in the field in addition to the pipe labeling requirements of NFPA 59A.**

- **<u>Prior to commencement of service</u>, progress on the construction of the proposed systems should be reported in <u>monthly</u> reports filed with the Secretary. Details should include a summary of activities, problems encountered, contractor non-conformance/deficiency logs, remedial actions taken, and current project schedule. Problems of significant magnitude should be reported to the FERC <u>within 24 hours</u>.**

In addition, we recommend the following measures should apply throughout the life of the facilities:

- **The facility should be subject to regular FERC staff technical reviews and site inspections on at least an <u>annual basis</u> or more frequently as circumstances indicate. Prior to each FERC staff technical review and site inspection, Lake Charles LNG should respond to a specific data request, including information relating to possible design and operating conditions that may have been imposed by other agencies or organizations. Up-to-date detailed P&IDs reflecting facility modifications and provision of other pertinent information not included in the semi-annual reports described below, including facility events that have taken place since the previously submitted semi-annual report, should be submitted.**

- **Semi-annual operational reports should be filed with the Secretary to identify changes in facility design and operating conditions, abnormal operating experiences, activities (including ship arrivals, quantity and composition of imported and exported LNG, liquefied and vaporized quantities, boil-off/flash gas, etc.), plant modifications, including future plans and progress thereof. Abnormalities should include, but not be limited to: unloading/loading/shipping problems, potential hazardous conditions from off-site vessels, storage tank stratification or rollover, geysering, storage tank pressure excursions, cold spots on the storage tanks, storage tank vibrations and/or vibrations in associated cryogenic piping, storage tank settlement, significant equipment or instrumentation malfunctions or failures, non-scheduled maintenance or repair (and reasons therefore), relative movement of storage tank inner vessels, hazardous fluids releases, fires involving hazardous fluids and/or from other sources, negative pressure (vacuum) within a storage tank and higher than predicted boil-off rates. Adverse weather conditions and the effect on the facility also should be reported. Reports should be submitted <u>within 45 days after each period ending June 30 and December 31</u>. In addition to the above items, a section entitled "Significant Plant Modifications Proposed for the Next 12 Months (dates)" also should be included in the semi-annual operational reports. Such information would provide FERC staff with early notice of anticipated future construction/maintenance projects at the LNG facility.**

- **Significant non-scheduled events, including safety-related incidents (e.g., LNG, condensate, refrigerant, or natural gas releases, fires, explosions, mechanical failures, unusual over pressurization, and major injuries) and security-related incidents (e.g., attempts to enter site, suspicious activities) should be reported to FERC staff. In the event an abnormality is of significant magnitude to threaten public or employee safety, cause significant property damage, or interrupt service, notification should be made immediately, without unduly interfering with any necessary or appropriate emergency repair, alarm, or other emergency procedure. In all instances, notification should be made to FERC staff within 24 hours. This notification practice should be incorporated into the LNG facility's emergency plan. Examples of reportable hazardous fluids related incidents include:**

  a. fire;

  b. explosion;

  c. estimated property damage of $50,000 or more;

  d. death or personal injury necessitating in-patient hospitalization;

  e. release of hazardous fluids for five minutes or more;

  f. unintended movement or abnormal loading by environmental causes, such as an earthquake, landslide, or flood, that impairs the serviceability, structural integrity, or reliability of an LNG facility that contains, controls, or processes hazardous fluids;

  g. any crack or other material defect that impairs the structural integrity or reliability of an LNG facility that contains, controls, or processes hazardous fluids;

  h. any malfunction or operating error that causes the pressure of a pipeline or LNG facility that contains or processes hazardous fluids to rise above its MAOP (or working pressure for LNG facilities) plus the build-up allowed for operation of pressure limiting or control devices;

  i. a leak in an LNG facility that contains or processes hazardous fluids that constitutes an emergency;

  j. inner tank leakage, ineffective insulation, or frost heave that impairs the structural integrity of an LNG storage tank;

  k. any safety-related condition that could lead to an imminent hazard and cause (either directly or indirectly by remedial action of the operator), for purposes other than abandonment, a 20 percent reduction in operating pressure or shutdown of operation of a pipeline or an LNG facility that contains or processes hazardous fluids;

  l. safety-related incidents to hazardous fluids vessels occurring at or en route to and from the LNG facility; or

  m. an event that is significant in the judgment of the operator and/or management even though it did not meet the above criteria or the guidelines set forth in an LNG facility's incident management plan.

  In the event of an incident, the Director of OEP has delegated authority to take whatever steps are necessary to ensure operational reliability and to protect human

life, health, property or the environment, including authority to direct the LNG facility to cease operations. Following the initial company notification, FERC staff would determine the need for a separate follow-up report or follow-up in the upcoming semi-annual operational report. All company follow-up reports should include investigation results and recommendations to minimize a reoccurrence of the incident.

In addition to the final design review, we would conduct inspections during construction and would review additional materials, including quality assurance and quality control plans, nonconformance reports, and cooldown and commissioning plans, to ensure that the installed design is consistent with the safety and operability characteristics of the FEED. We would also conduct inspections during operation to ensure that the facility is operated and maintained in accordance with the filed design throughout the life of the facility. Based on our analysis and recommendations presented above, we believe that the FEED presented by Lake Charles LNG would include acceptable layers of protection or safeguards which would reduce the risk of a potentially hazardous scenario from developing into an event that could impact the off-site public.

4.12.4 LNG Facility Siting Requirements

The principal hazards associated with the substances involved in the liquefaction of LNG result from cryogenic and flashing liquid releases, flammable and toxic vapor dispersion, vapor cloud ignition, pool fires, BLEVEs, and overpressures. As discussed in section 4.12.3, our FEED review indicates that sufficient layers of protection would be incorporated into the facility design to mitigate the potential for an initiating event to develop into an incident that could impact the safety of the off-site public. Siting of the facility with regard to potential off-site consequences is also required by DOT's regulations in 49 CFR 193, Subpart B to ensure that impact to the public would be minimized. The Commission's regulations under 18 CFR 380.12(o)(14) require Lake Charles LNG to identify how the proposed design complies with the siting requirements of DOT's regulations in 49 CFR 193, Subpart B. As part of our review, we used Lake Charles LNG's information, developed to comply with DOT's regulations, to assess whether or not the facility would have a public safety impact. The Part 193 requirements state that an operator or government agency must exercise control over the activities that can occur within an "exclusion zone," defined as the area around an LNG facility that could be exposed to specified levels of thermal radiation or flammable vapor in the event of a release. Approved mathematical models must be used to calculate the dimensions of these exclusion zones. The 2001 edition of NFPA 59A, an industry consensus safety standard for the siting, design, construction, operation, maintenance, and security of LNG facilities, is incorporated into Part 193 by reference, with regulatory preemption in the event of conflict. The following sections of Part 193 specifically address the siting requirements applicable to each LNG container and LNG transfer system:

- Part 193.2001 (b)(3), Scope of part, excludes any matter other than siting provisions pertaining to marine cargo transfer systems between the marine vessel and the last manifold or valve immediately before a storage tank;

- Part 193.2051, Scope, states that each LNG facility designed, replaced, relocated or significantly altered after March 31, 2000, must be provided with siting requirements in accordance with Subpart B and NFPA 59A (2001). In the event of a conflict with NFPA 59A (2001), the regulatory requirements in Part 193 prevail;

- Part 193.2057, Thermal radiation protection, requires that each LNG container and LNG transfer system have thermal exclusion zones in accordance with Section 2.2.3.2 of NFPA 59A (2001); and

- Part 193.2059, Flammable vapor-gas dispersion protection, requires that each LNG container and LNG transfer system have a dispersion exclusion zone in accordance with Sections 2.2.3.3 and 2.2.3.4 of NFPA 59A (2001).

For the LNG facilities proposed for the project, these Part 193 siting requirements would be applicable to the following equipment:

- twelve 4,625 gpm in-tank pumps (three pumps per LNG storage tank) used for ship loading and associated piping and appurtenances; and six 6,962 gpm LNG product pumps (two pumps per liquefaction train) used for LNG storage tank loading and associated piping and appurtenances – Parts 193.2057 and 2059 require thermal and flammable vapor exclusion zones. NFPA 59A (2001) Section 2.2.3.2 specifies the thermal exclusion zone and Sections 2.2.3.3 and 2.2.3.4 specify the flammable vapor exclusion zone based on the design spills for containers and process areas; and

- three liquefaction heat exchangers (one per liquefaction train) and associated piping and appurtenances, including two 20-inch-diameter LNG rundown lines in parallel – Parts 193.2057 and 2059 require thermal and flammable vapor exclusion zones. NFPA 59A (2001) Section 2.2.3.2 specifies the thermal exclusion zone and Sections 2.2.3.3 and 2.2.3.4 specify the flammable vapor exclusion zone based on the design spills for containers and process areas.

Previous FERC environmental assessments/impact statements for past projects have identified inconsistencies and areas of potential conflict between the requirements in Part 193 and NFPA 59A (2001). Sections 193.2057 and 193.2059 require exclusion zones for each LNG container and LNG transfer system, and an LNG transfer system is defined in section 193.2007 to include cargo transfer system and transfer piping (whether permanent or temporary). However, NFPA 59A (2001) requires exclusion zones only for "transfer areas," which is defined as the part of the plant where the facility introduces or removes the liquids, such as truck loading or ship-unloading areas. The NFPA 59A (2001) definition does not include permanent plant piping, such as cargo transfer lines. Section 2.2.3.1 of NFPA 59A (2001) also states that transfer areas at the water edge of marine terminals are not subject to the siting requirements in that standard.

In FERC environmental assessments/impact statements for past projects, we have also noted that when the DOT incorporated NFPA 59A into its regulations, it removed the regulation that required impounding systems around transfer piping. As a result of that change, it is unclear whether Part 193 or the adopted sections of NFPA 59A (2001) require impoundments for LNG transfer systems. We note that Part 193 requires exclusion zones for LNG transfer systems, and that those zones were historically calculated based on impoundment systems. We also note that the omission of containment for transfer piping is not a sound engineering practice. For these reasons, we consider it prudent design practice to provide containment for all LNG transfer piping within a plant's property lines.

Federal regulations issued by the Occupational Safety and Health Administration (OSHA) under 29 CFR 1910.119 (Process Safety Management of Highly Hazardous Chemicals; Explosives and Blasting Agents (PSM)), and the EPA under 40 CFR 68 (Risk Management Plans) cover hazardous substances, such as methane, propane, and ethylene at many facilities in the U.S. However, OSHA and EPA regulations are not applicable to facilities regulated under 49 CFR 193. On October 30, 1992, shortly after the promulgation of the OSHA Process Safety Management regulations, OSHA issued a letter of interpretation that precluded the enforcement of PSM regulations over gas transmission and distribution facilities. In a subsequent letter on December 9, 1998, OSHA further clarified that this letter of interpretation applies to LNG distribution and transmission facilities.

In addition, EPA's preamble to its final rule in Federal Register, Volume 63, Number 3, 639 645, clarified that exemption from the requirements in 40 CFR 68 for regulated substances in transportation, including storage incident to transportation, is not limited to pipelines. The preamble further clarified that the transportation exemption applies to LNG facilities subject to oversight or regulation under 49 CFR 193, including facilities used to liquefy natural gas or used to transfer, store, or vaporize LNG in conjunction with pipeline transportation. Therefore, the above OSHA and EPA regulations are not applicable to facilities regulated under 49 CFR 193. As stated in section 193.2051, LNG facilities must be provided with the siting requirements of NFPA 59A (2001 edition). The siting requirements for flammable liquids within an LNG facility are contained in NFPA 59A, Chapter 2:

- NFPA 59A (2001 edition) Section 2.1.1 requires consideration of clearances between flammable refrigerant storage tanks, flammable liquid storage tanks, structures and plant equipment, both with respect to plant property lines and each other. This section also requires that other factors applicable to the specific site that have a bearing on the safety of plant personnel and surrounding public be considered, including an evaluation of potential incidents and safety measures incorporated in the design or operation of the facility.

- NFPA 59A (2001 edition) Section 2.2.2.2 requires impoundments serving flammable refrigerants or flammable liquids to contain a 10-minute spill of a single accidental leakage source or during a shorter time period based upon demonstrable surveillance and shutdown provisions acceptable to the DOT. In addition, NFPA Section 2.2.2.5 requires impoundments and drainage channels for flammable liquid containment to conform to NFPA 30, Flammable and Combustible Liquids Code.

- NFPA 59A (2001 edition) Section 2.2.3.2 requires provisions to minimize the damaging effects of fire from reaching beyond a property line, and requires provisions to prevent a radiant heat flux level of 1,600 BTU/ft^2-hr from reaching beyond a property line that can be built upon. The distance to this flux level is to be calculated with LNGFIRE or using models that have been validated by experimental test data appropriate for the hazard to be evaluated and that are acceptable to DOT.

- NFPA 59A (2001 edition) Section 2.2.3.4 requires provisions to minimize the possibility of any flammable mixture of vapors from a design spill from reaching a property line that can be built upon and that would result in a distinct hazard. Determination of the distance that the flammable vapors extend is to be determined with DEGADIS or alternative models that take into account physical factors influencing LNG vapor dispersion. Alternative models must have been validated by experimental test data appropriate for the hazard to be evaluated and must be acceptable to DOT. NFPA 59A (2001 edition) Section 2.2.3.5 requires the design spill for impounding areas serving vaporization and process areas to be based on the flow from any single accidental leakage source.

For the following liquefaction facilities that are proposed for the project, the refrigerant siting requirements from Part 193 and NFPA 59A (2001 edition) would be applicable to the following equipment:

- three liquefaction heat exchangers (one per liquefaction train) and associated piping and appurtenances;

- two mounded 155,940-gallon ethane storage bullets and associated piping;

- three mounded 260,000-gallon propane storage bullets and associated piping;
- two 711,000-gallon stabilized condensate storage tanks and associated piping;
- one 700-gpm propane transfer pump and associated piping and appurtenances;
- one 160-gpm ethane transfer pump and associated piping and appurtenances;
- two 115-gpm condensate transfer pumps and associated piping;
- nine 139-gpm NGL reinjection pumps (three pumps per liquefaction train) and associated piping and appurtenances;
- nine 94-gpm LPG reinjection pumps (three pumps per liquefaction train) and associated piping and appurtenances;
- six 348-gpm Debutanizer reflux pumps (two pumps per liquefaction train) and associated piping and appurtenances; and
- six 424-gpm Deethanizer reflux pumps (two pumps per liquefaction train) and associated piping and appurtenances.

4.12.5 LNG Facility Siting Analysis

Suitable sizing of impoundment systems and selection of design spills on which to base hazard analyses are critical for establishing an appropriate siting analysis. Although impoundment capacity and design spill scenarios for storage tank impoundments are well described by Part 193, a clear definition for other impoundments is not provided either directly by the regulations or by the adopted sections of NFPA 59A (2001). Under NFPA 59A (2001) Section 2.2.2.2, the capacity of impounding areas for vaporization, process, or LNG transfer areas must equal the greatest volume that can be discharged from any single accidental leakage source during a 10-minute period or during a shorter time period based upon demonstrable surveillance and shutdown provisions acceptable to the DOT. However, no definition of single accidental leakage source is provided in the regulations.

We consider it prudent design practice to size impoundments based on the greatest flow capacity from a single pipe for 10 minutes, recognizing that different spill scenarios may be used for the single accidental leakage sources for the hazard calculations required by Part 193. A similar approach is used with impoundments for process vessels, where the impoundments should be able to contain the contents of the largest process vessel served while smaller design spills may be appropriate for Part 193 calculations.

4.12.5.1 Impoundment Sizing

Table 4.12.5-1 lists the spill volumes and their corresponding impoundment systems. There are four existing sub-impoundment sumps, called Tank Area Impoundment Sump, where each sub-impoundment sump is located within one of the four LNG storage tank dikes. Potential spills at the LNG storage tank area occurring from the 20-inch-diameter in-tank pump withdrawal header during export operation or from the 24-inch-diameter LNG rundown line during liquefying operation would drain toward the existing Tank Area Impoundment Sump. The existing Tank Area Impoundment Sump is 75-feet-long, 75-feet-wide, and 14-feet-deep, with a usable capacity of 550,560 gallons. Each existing LNG storage tank would be equipped with three larger LNG in-tank pumps, each rated at 4,625 gpm with a maximum runout flow rate of 5,509 gpm. With all three LNG in-tank pumps operating, the maximum volume for a 10-minute spill from the LNG in-tank pump withdrawal header would be 165,270 gallons. . Any liquid volume remaining in the export piping after the 10-minute spill would be contained within the LNG storage tank dike.

TABLE 4.12.5-1

Impoundment Area Sizing

Source	Spill Size (gallons)	Impoundment System	Impoundment Size (gallons)
20-inch in-tank pump withdrawal header	162,270	Tank area impoundment sump	550,560
24-inch LNG rundown line (LNG tank area)	250,950	Tank area impoundment sump	550,560
24-inch LNG rundown line (liquefaction area)	250,950	Liquefaction area sump	261,820
18-inch chilled gas	18,750	NGL impoundment	35,900
24-inch LNG rundown line (between liquefaction area and LNG storage tank area)	250,950	Rundown line sumps	261,820
6-inch-diameter propane transfer pump	9,830	Refrigerant storage impoundment	73,310
Refrigerant truck	8,000	Refrigerant storage impoundment	73,310
Condensate storage tank	710,990	Condensate containment	852,780
Amine storage tank	144,390	Amine containment	554,300
Mixed amine storage tank	352,510	Amine containment	554,300
Aqueous ammonia tank	25,000	Ammonia containment	78,545

LNG produced from each liquefaction train would combine into a common 24-inch-diameter header located south of the liquefaction area. This common 24-inch-diameter header would feed into two 20-inch-diameter LNG product lines in parallel, which would span about 2,000 feet between the liquefaction area and the LNG storage tank area to eventually merge into a 24-inch-diameter header at the LNG storage tank area. Any spills from the 24-inch-diameter LNG rundown header at the LNG storage tank area would be sloped toward the existing Tank Area Impoundment Sump. The maximum runout flow rate of each LNG product pump from the liquefaction area would be 8,365 gpm. With all three liquefaction trains operating in parallel, a 10-minute spill volume from the 24-inch-diameter LNG rundown line would be 250,950 gallons. These spills would be contained in the existing Tank Area Impoundment Sump.

At the liquefaction process area, there would be three liquefaction trains. Each liquefaction train would include two insulated concrete impoundment sumps: 1) the Liquefaction Area Sump would be located south of the liquefaction train and would contain LNG or refrigerant liquid spills from liquefaction facilities; and 2) the NGL Impoundment would be located north of the liquefaction train and would serve hydrocarbon liquid spills from the NGL extraction facilities. The Liquefaction Area Sump would be 50-feet-long by 50-feet-wide by 20-feet-deep with a usable volume of 261,820 gallons. The largest spill into the Liquefaction Area Sump would be from the 24-inch-diameter LNG rundown line header south of the liquefaction process area. With three LNG product pumps operating in parallel during liquefaction, a 10-minute spill volume from the 24-inch-diameter LNG rundown line would be 250,950 gallons. This spill would be contained within the Liquefaction Area Sump. The containment system in the liquefaction area would be arranged such that any piping inventory remaining after 10 minutes would continue to flow to the trench and contained within the adjacent Liquefaction Area Sump. The NGL Impoundment would be 20-feet-long by 20-feet-wide by 18-feet-deep with a usable volume of 35,900 gallons. The largest spill into the NGL Impoundment would be a 10-minute spill volume of 18,750 gallons from the 18-inch-diameter chilled gas line to the Demethanizer. Since the NGL Impoundment would be over 90-percent larger than the 10-minute spill volume, a spill from the 18-inch-diameter chilled gas line and any piping inventory in this piping segment remaining after 10 minutes would be contained within the NGL Impoundment.

Lake Charles LNG proposes to construct two other insulated concrete impoundment sumps to contain any spills along the rundown lines between the liquefaction area and the LNG storage tank area. These new sumps would measure 50-feet-long by 50-feet-wide by 20-feet-deep with a usable volume of 261,820 gallons. As described above, a 10-minute maximum spill volume accounting for the effect of pump runout would be 250,950 gallons. This spill would be contained within the Rundown Line Sumps. Any piping inventory in this piping segment remaining after 10 minutes would be contained in the trench.

The refrigerant storage area would be located about 700 feet north of the liquefaction area. Lake Charles LNG proposes to install three propane storage bullets and two ethane storage bullets. These tanks would be mounded to prevent the risk of BLEVE. Lake Charles LNG proposes to install a Refrigerant Storage Impoundment with dimensions of 35-feet-long by 35-feet-wide by 14-feet-deep with a usable volume of 73,310 gallons, to contain any potential liquid spills during the refrigerant makeup and the truck loading/unloading operations. This impoundment sump would also be lined with insulated concrete. The largest spill into the Refrigerant Storage Impoundment would from the propane transfer pump. Accounting for the effect of pump runout, the 10-minute spill volume from the propane transfer pump 6-inch-diameter discharge header would be 9,830 gallons. The Refrigerant Storage Impoundment would also contain the entire contents of an 8,000-gallon refrigerant truck.

Lake Charles LNG proposes to install two stabilized condensate product storage tanks, each with a maximum volumetric capacity of 710,990 gallons, east of the refrigerant storage area. Each stabilized condensate storage tank would have its own secondary diked containment. Containment for a stabilized condensate product storage tank would be 190-feet-long by 100-feet-wide by 6-feet-high with a usable volume of 852,780 gallons, which would contain the entire contents of a stabilized condensate product storage tank.

Lake Charles LNG proposes to install a 144,390-gallon Amine Storage Tank and a 352,510-gallon Mixed Amine Storage Tank within a 130-foot-long by 95-foot-wide by 6-foot-high diked area. The diked area would have a volumetric capacity of 554,300, gallons and would hold the entire contents of the Amine Storage Tank and Mixed Amine Storage Tank. Lake Charles LNG would also install a 25,000-gallon Aqueous Ammonia Tank within a 50-foot-long by 35-foot-wide by 6-foot-high diked area. This diked area would have a volumetric capacity of 78,545 gallons and would hold the entire contents of the Aqueous Ammonia Tank.

4.12.5.2 Design Spills

Design spills are used in the determination of the hazard calculations required by Part 193. Prior to the incorporation of NFPA 59A in 2000, the design spill in Part 193 assumed the full rupture of “a single transfer pipe which has the greatest overall flow capacity” for not less than 10 minutes (old Part 193.2059(d)). With the adoption of NFPA 59A, the basis for the design spill for impounding areas serving only vaporization, process, or LNG transfer areas became the flow from any single accidental leakage source. Neither Part 193 nor NFPA 59A (2001) defines “single accidental leakage source.”

In a letter to FERC staff, dated August 6, 2013, DOT requested that LNG facility applicants contact the Office of Pipeline Safety's Engineering and Research Division regarding the Part 193 siting requirements.[11] Specifically, the letter stated that DOT required a technical review of the applicant’s design spill criteria for single accidental leakage sources on a case-by-case basis to determine compliance with Part 193.

[11] August 6, 2013 Letter from Kenneth Lee, Director of Engineering and Research Division, Office of Pipeline Safety to Terry Turpin, LNG Engineering and Compliance Branch, Office of Energy Projects. Filed in Docket Number PF12-8 on August 13, 2013. Accession Number 20130813-4009

In response, Lake Charles LNG provided DOT with their design spill criteria and identified leakage scenarios for the proposed equipment. DOT reviewed the data and methodology Lake Charles LNG used to determine the single accidental leakage sources for the design spills based on the flow from various leakage sources including piping, containers, and equipment containing LNG, refrigerants, and other hazardous fluids. On September 19, 2014, DOT provided a letter to FERC staff stating that DOT had no objection to Lake Charles LNG's methodology for determining the single accidental leakage sources for candidate design spills to be used in establishing the Part 193 siting requirements for the proposed LNG liquefaction facilities.[12,13] The design spills produced by this method were identified in the documents reviewed by DOT and have been filed in the FERC docket for this project. These are the same design spills described in the following sections.

DOT's conclusions on the candidate design spills used in the siting calculations required by Part 193 was based on preliminary design information which may be revised as the engineering design progresses. If Lake Charles LNG's design or operation of the proposed facility differs from the details provided in the documents on which DOT based its review, then the facility may not comply with the siting requirements of Part 193. As a result, **we recommend that:**

- **<u>Prior to the construction of the final design</u>, Lake Charles LNG should file with the Secretary, for review and approval by the Director of OEP, certification that the final design is consistent with the information provided to DOT as described in the design spill determination letter dated September 19, 2014 (Accession Number 20140919-4005). In the event that any modifications to the design alters the candidate design spills on which the Title 49 CFR Part 193 siting analysis was based, Lake Charles LNG should consult with DOT on any actions necessary to comply with Part 193.**

As design spills vary depending on the hazard (vapor dispersion, overpressure, or radiant heat), the specific design spills used for Lake Charles LNG's Liquefaction siting analyses are discussed under "Vapor Dispersion Analysis," "Overpressure Analysis," and "Thermal Radiation Analysis."

4.12.5.3 Vapor Dispersion Analysis

As discussed in section 4.12.2, a release may form a toxic or flammable cloud depending on the material released. A large quantity of flammable material released without ignition would form a flammable vapor cloud that would travel with the prevailing wind until it either dispersed below the flammable limit or encountered an ignition source. In order to address these hazards, 49 CFR §193.2051 and 193.2059 require vapor dispersion evaluation of potential incidents and exclusion zones in accordance with applicable sections of NFPA 59A (2001). NFPA 59A, Section 2.1.1 requires consideration of clearances between flammable refrigerant storage tanks, flammable liquid storage tanks, structures and plant equipment, both with respect to plant property lines and each other. This section also requires that other factors applicable to the specific site that have a bearing on the safety of plant personnel and surrounding public be considered, including an evaluation of potential incidents and safety

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12 September 19, 2014 Letter "Re: Trunkline LNG, FERC Docket No. CP14-120-000, Design Spill Determination" from Kenneth Lee to Rich McGuire. Filed in Docket Number CP14-120-000 on September 19, 2014. Accession Number 20140919-4005.

13 PHMSA based this decision on the following documents: (1) Resource Report 11 Reliability and Safety, FERC Docket Accession Number 20140325-5137; (2) Modeling Assumption and Hazard Analysis Report, FERC Docket Accession Number 20140421-5205; (3) Lake Charles LNG's Response to FERC Data Request, FERC Docket Accession Number 20140724-5008; (4) Supplemental Information to the Proceeding Record re PHMSA, FERC Docket Accession Numbers 20140822-5137 and 20140822-5138; (5) Supplemental Information to the Proceeding Record re PHMSA, FERC Docket Accession Numbers 20140917-5153 and 20140917-5154.

measures incorporated in the design or operation of the facility. NFPA 59A Section 2.2.3.4 also requires provisions to minimize the possibility of any flammable mixture of vapors from a design spill from reaching a property line that can be built upon and that would result in a distinct hazard. Taken together, Part 193 and NFPA 59A (2001) require that flammable vapors either from an LNG tank impoundment or a single accidental leakage source do not extend beyond a facility property line that can be built upon and that other potential incidents (e.g. toxic releases) must also be considered.

Title 49 CFR §193.2059 requires that dispersion distances be calculated for a 2.5 percent average gas concentration (one-half the LFL of LNG vapor) under meteorological conditions which result in the longest downwind distances at least 90 percent of the time. Alternatively, maximum downwind distances may be estimated for stability Class F, a wind speed of 4.5 mph, 50 percent relative humidity, and the average regional temperature. Similar factors to account for model uncertainty (i.e., one-half the LFL of other flammable materials and one half the AEGL of toxic materials) and parameters (i.e. F stability, 2 m/s wind speed, 50-percent relative humidity, average regional temperature, and 0.03m surface roughness) have also been specified for other hazardous fluids.

The regulations in Part 193 specifically approve the use of two models for performing these dispersion calculations, DEGADIS and FEM3A. The use of alternative models is also allowed, but must be specifically approved by the DOT. Although Part 193 does not require the use of a particular source term model, modeling of the spill and resulting vapor production is necessary prior to the use of vapor dispersion models. In August 2010, the DOT issued Advisory Bulletin ADB-10-07 to provide guidance on obtaining approval of alternative vapor-gas dispersion models under Subpart B of 49 CFR 193. In October 2011, two dispersion models were approved by DOT for use in vapor dispersion exclusion zone calculations: PHAST-UDM Version 6.6 and Version 6.7 (submitted by Det Norske Veritas) and FLACS Version 9.1 Release 2 (submitted by GexCon). PHAST 6.7 and FLACS 9.1, with their built-in source term models, were used to calculate dispersion distances.

As discussed under "Design Spills" in section 4.12.5, failure scenarios must be selected as the basis for the Part 193 dispersion analyses. Process conditions at the failure location would affect the resulting vapor dispersion distances. In determining the spill conditions for these leakage sources, process flow diagrams for the proposed design, used in conjunction with the heat and material balance information (i.e., flow, temperature, and pressure), can be used to estimate the flow rates and process conditions at the location of the spill. In general, higher flow rates would result in larger spills and longer dispersion distances; higher temperatures would result in higher rates of flashing; and higher pressures would result in higher rates of jetting and aerosol formation. Therefore, two scenarios may be considered for each design spill:

1. The pressure in the line is assumed to be maintained by pumps and/or hydrostatic head to produce the highest rate of flashing and jetting (i.e. flashing and jetting scenario); and

2. The pressure in the line is assumed to be depressurized by the breach and/or emergency shutdowns to produce the highest rate of liquid flow within a curbed, trenched, or impounded area (i.e. liquid scenario).

Alternatively, a single scenario for each design spill could be selected if adequately supported with an assessment of the depressurization calculations and/or an analysis of process instrumentation and shutdown logic acceptable to DOT.

In addition, the location and orientation of the leakage source must be considered. The closer a leakage source is to the property line, the higher the likelihood that the vapor cloud would extend off-site. As most flashing and jetting scenarios would not have appreciable liquid rainout and accumulation, the siting of impoundment systems would be driven by liquid scenarios, while siting of piping and other remaining portions of the plant would be driven by flashing and jetting scenarios.

Lake Charles LNG reviewed multiple releases for the liquid scenarios and for the flashing and jetting scenarios. Lake Charles LNG used the following conditions, corresponding to 49 CFR §193.2059, for the vapor dispersion calculations: ambient temperature of 71.6°F, relative humidity of 50 percent, wind speeds of 1 to 2 m/s in various directions, atmospheric stability class of F and a ground surface roughness of 0.03 m. In addition, a sensitivity analysis to the wind speed and direction was provided to demonstrate the longest predicted downwind dispersion distance in accordance with the PHAST and FLACS Final Decisions.

Lake Charles LNG accounted for the facility geometry, including the impoundment and trench geometry details as established by available plant layout drawings. The plant geometry accounts for any on-site wind channeling that could occur. The releases were initiated after sufficient time had passed in the model simulations to allow the wind profile to stabilize from effects due to the presence of buildings and other on-site obstructions.

Vapor Dispersion Design Spill Analyses for LNG

As required by 49 CFR 193, design spills from containers with over the top withdrawal lines and no bottom penetrations should be the largest flow from the container (i.e., storage tank) withdrawal pumps for a 10-minute duration at full-rated capacity.[14] With 3 in-tank pumps running in parallel at their maximum pump runout, the maximum flow rate from the LNG storage tank withdrawal line would be 16,527 gpm. FLACS was used to predict the extent of the ½-LFL vapor cloud from a guillotine rupture of the 20-inch-diameter in-tank pump withdrawal header (i.e., liquid scenario). For the jetting and flashing scenario from this piping segment, Lake Charles LNG used PHAST to perform a vapor dispersion analysis for releases from a 1-inch hole at various elevations along the LNG storage tank height. The results showed that the longest ½-LFL distance would be from a jetting and flashing scenario at the base of the LNG storage tank.

The liquefaction area would be located about 2,000 feet north of the existing LNG storage tank area. The LNG rundown lines that deliver LNG product to the LNG storage tanks would be installed within the trench system. Lake Charles LNG proposed to install shrouds over the entire length of the trenches in order to mitigate the high momentum jetting and flashing releases and induced liquid rainout. However, during consultation with the DOT, the DOT determined that the proposed design for a shroud over the trench was a covered impoundment which is prohibited in 49 CFR § 193.2167. On January 23, 2015, Lake Charles LNG filed a revised mitigation design using vacuum insulated piping instead of the shroud for the entire LNG rundown piping segment from the LNG product pump discharge to the 24-inch-diameter rundown header at the LNG storage tank area. The proposed vacuum insulated piping design would include an outer piping that would be designed to withstand the mechanical stress and thermal environment of an LNG release from the inner piping, and instrumentation would be installed in

[14] Title 49 § 193.2059 incorporates by reference Table 2.2.3.5 of NFPA 59A (2001 edition).

the annular space between the inner piping and the outer piping to monitor any leaks from the inner piping. On January 30, 2015, DOT indicated that it has no objection to Lake Charles LNG's methodology for determining single accidental leakage sources with the use of the proposed vacuum insulated piping design. Lake Charles LNG has established provisions for maintaining the integrity of the vacuum insulated piping system in the event of potential mechanical stress and thermal movements which would be further developed in the final design phase. **Therefore, we are recommending that:**

- **<u>Prior to construction of the final design,</u> Lake Charles LNG should file with the Secretary, for review and written approval by the Director of OEP, the details of how the vacuum-insulated piping account for mechanical stress and thermal movements of the outer piping under cryogenic conditions. This information should be filed a minimum of 30 days before approval to proceed is requested.**

Lake Charles LNG submitted vapor dispersion analyses for releases from the LNG rundown lines impinging on the shroud. They assumed that a release inside the shroud would result in longer vapor dispersion than a similar release from the inner piping of the vacuum insulated piping design. Therefore, if the vapor dispersion from LNG releases inside the shroud can be maintained within Lake Charles LNG's property, similar LNG releases from the inner piping of the vacuum insulated piping system could be assumed to also remain within Lake Charles LNG's property. We agree with this assumption. Lake Charles LNG used ANSYS CFX, a commercially available computational fluid dynamics code, to determine the liquid rainout production. The resulting liquid and vapor mass flow rates were used as input to FLACS. Lake Charles LNG considered various LNG release locations along the LNG rundown lines between the liquefaction area and the LNG storage tank area. These LNG release scenarios would be from the 16-inch-diameter LNG product pump discharge header at the liquefaction area, the 20-inch-diameter dual LNG rundown lines between the liquefaction trains and the LNG storage tanks, and the 24-inch-diameter rundown header at the LNG storage tank area. Table 4.12.5-2 shows LNG release scenarios from the LNG storage tank area and liquefaction area.

TABLE 4.12.5-2

LNG Design Spills

Scenario	Location	Hole Diameter	Pressure (psig)	Temperature (°F)	Flow Rate (lb/hr)
1	In-tank pump header (liquid scenario)	20-inch	98	–257	3.58E6
2	In-tank pump header (jetting and flashing scenario)	1-inch	98	–257	5.72E4
3	LNG product pump at liquefaction area	5.3-inch	80	–254	1.44E6
4	Dual LNG rundown lines	6.7-inch	80	–254	2.32E6
5	LNG rundown header at storage tank area	8-inch	60	–244	2.89E6

Lake Charles LNG proposes to install a 20-foot-high vapor barrier along a portion of the east property line and a 12-foot-high vapor barrier adjacent to the rundown line, as shown in figure 4.12.5-1, to confine the vapor clouds and limit the extent of the vapor dispersion zones. In order to ensure that the vapor barriers are maintained throughout the life of the facility, **we recommend that:**

- **<u>Prior to construction of the final design,</u> Lake Charles LNG should file with the Secretary for review and written approval by the Director of OEP the procedures to maintain and inspect the vapor barriers provided to meet the siting provisions of 49 CFR § 193.2059. This information should be filed a minimum of 30 days before approval to proceed is requested.**

Lake Charles LNG's submitted simulations included different release directions, wind speeds, and wind directions. Figures 4.12.5-2 to 4.12.5-6 show the PHAST and FLACS results to the longest ½-LFL vapor clouds for LNG liquid release scenarios and jetting and flashing scenarios from the LNG storage tanks area and liquefaction area.

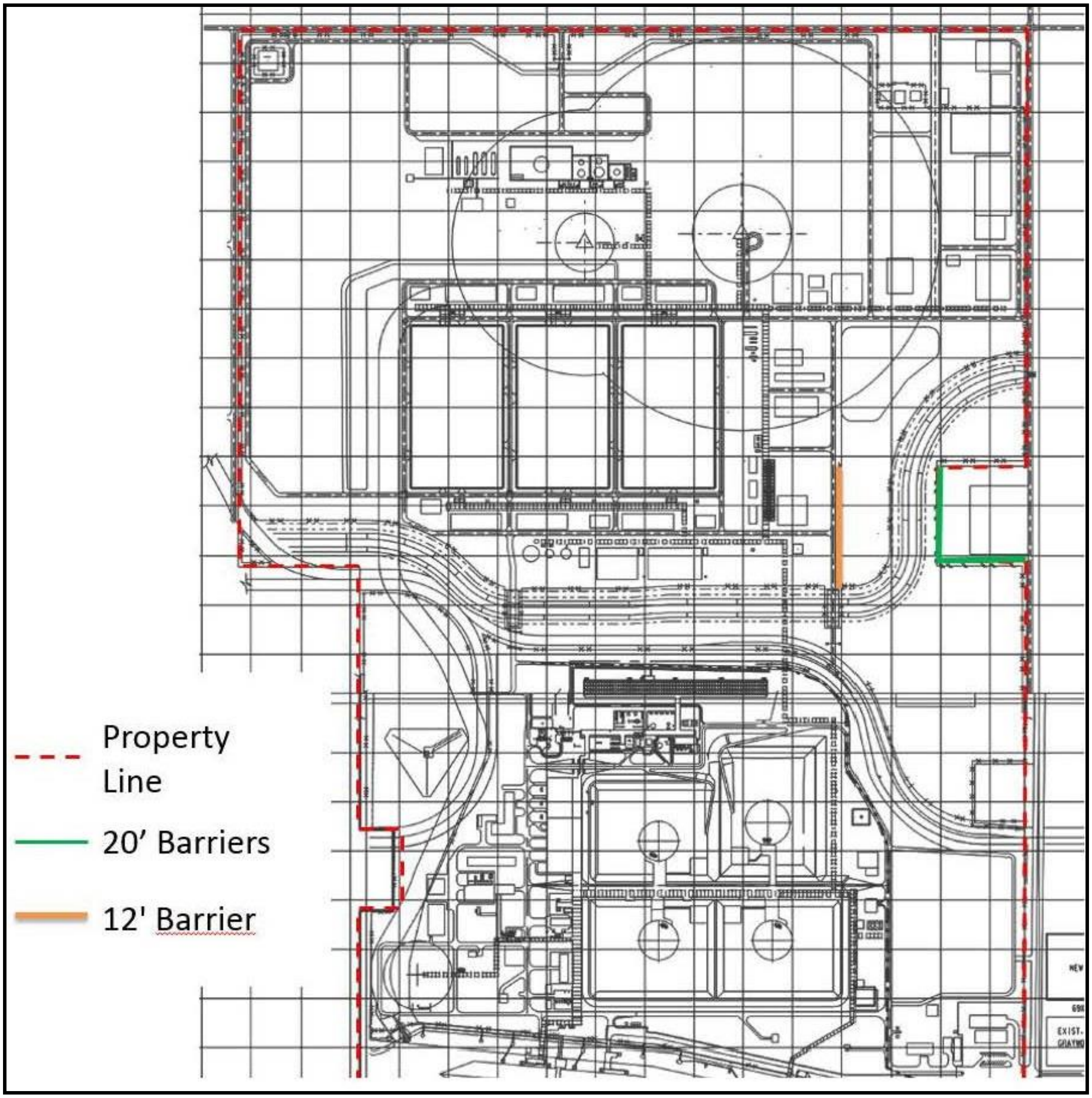

Figure 4.12.5-1 – Vapor Fences at Lake Charles LNG's Facility

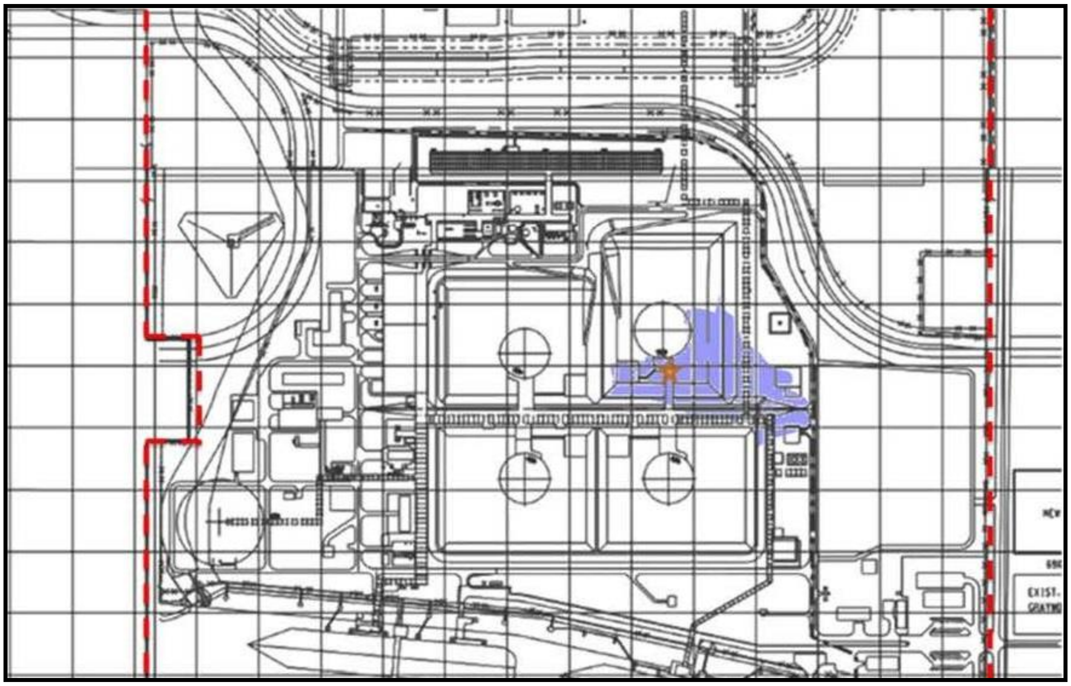

Figure 4.12.5-2 – LNG Release From a Guillotine Rupture of the In-tank Pump Header (1 m/s)

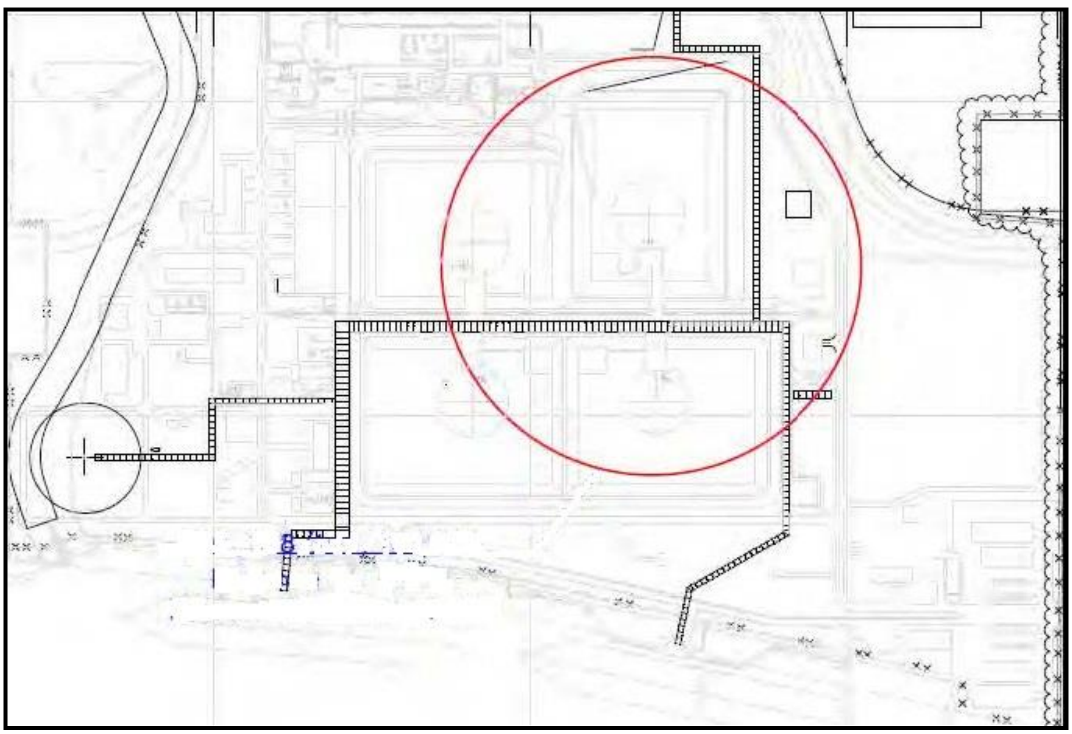

Figure 4.12.5-3 – Jetting and Flashing Scenario From the In-tank Pump Header

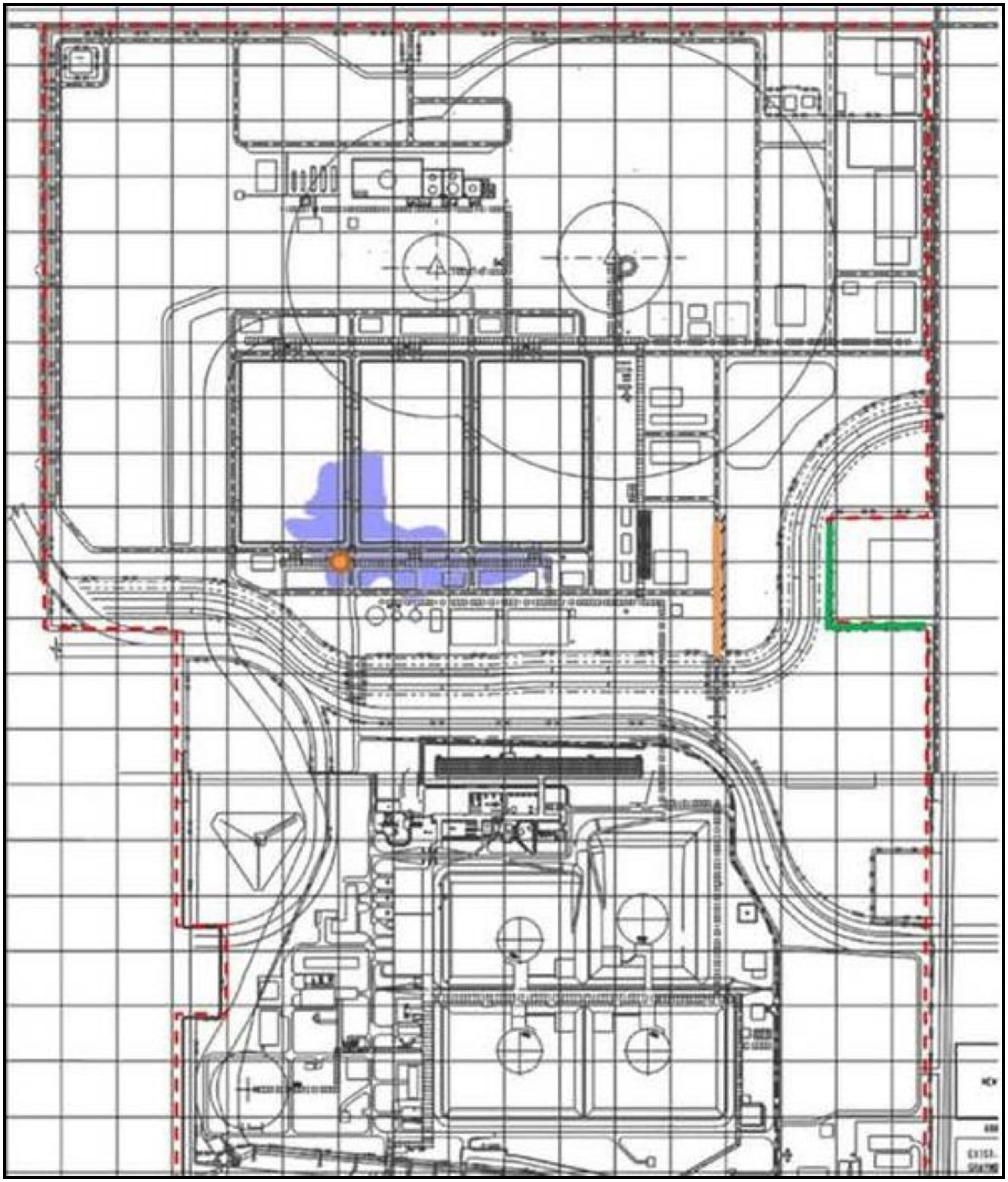

Figure 4.12.5-4 – Release from LNG Product Pump Header at the Liquefaction Area (1 m/s)

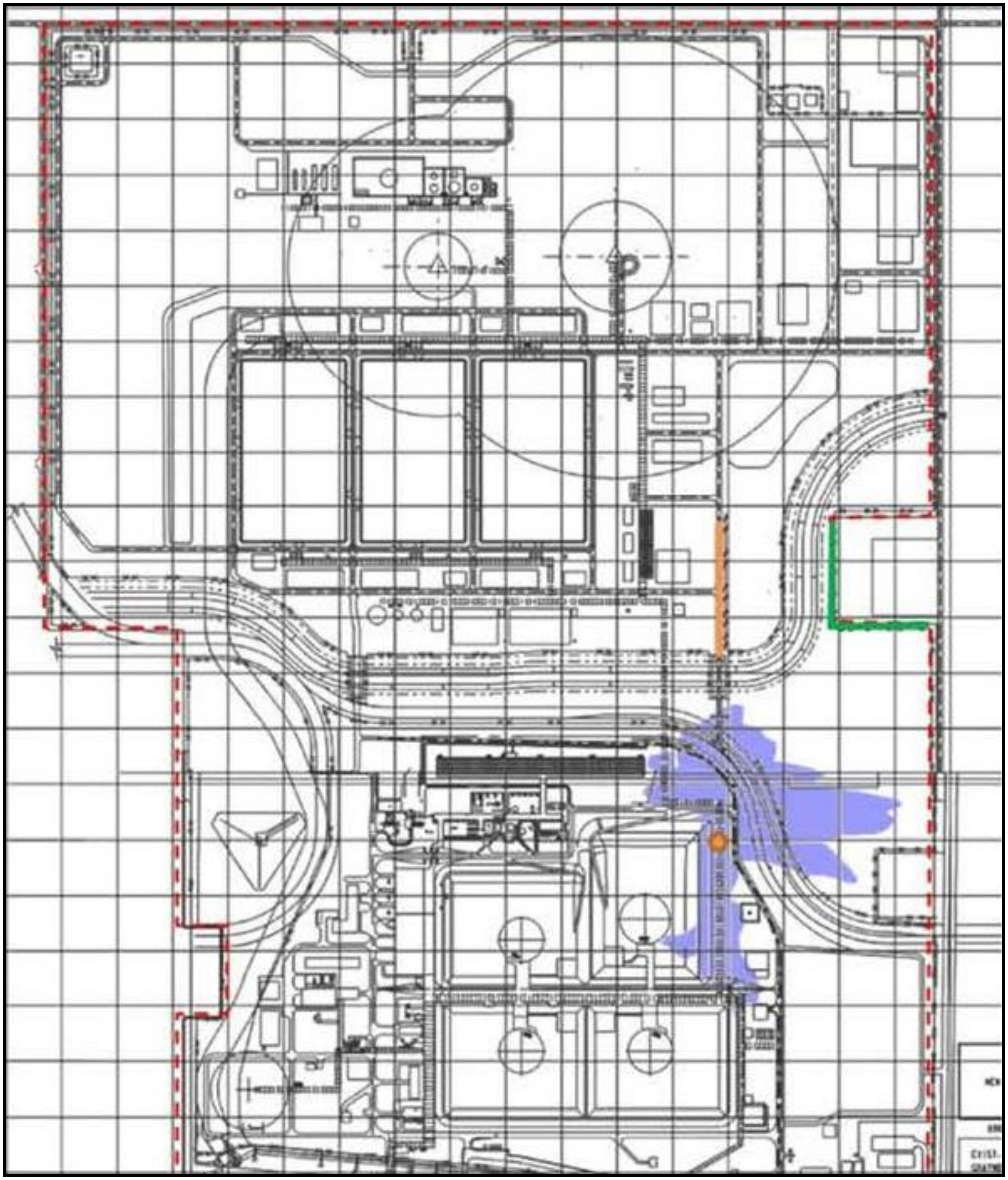

Figure 4.12.5-5 – Release from the LNG Rundown Lines (1 m/s)

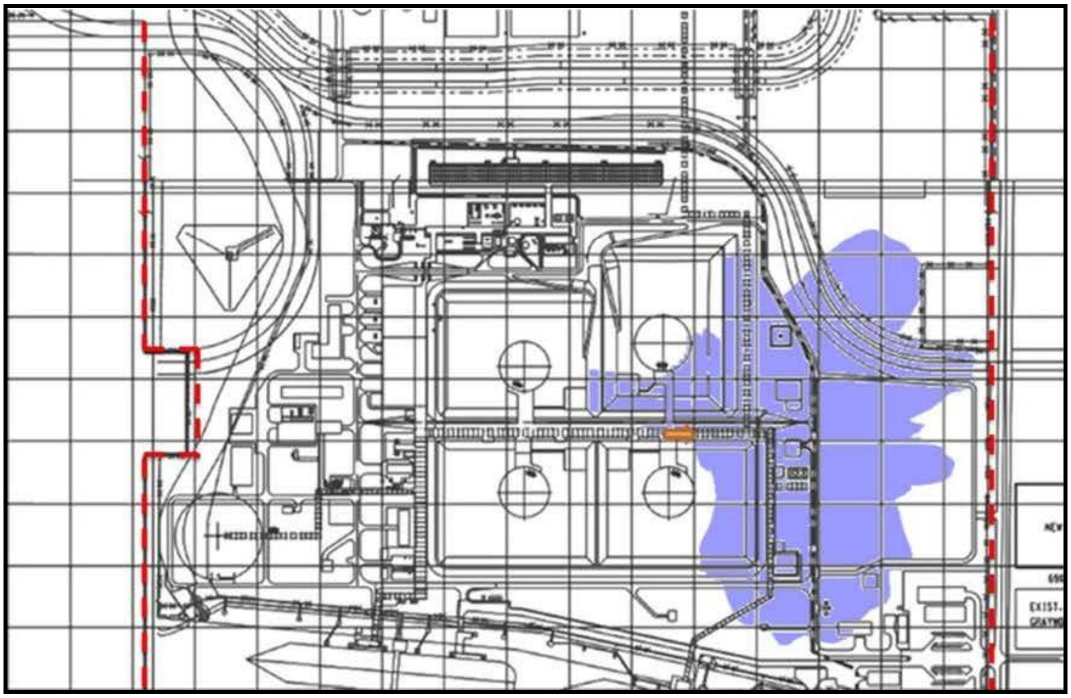

Figure 4.12.5-6 – Release from the LNG Rundown Header at the LNG Storage Tank Area (1 m/s)

The vapor dispersion simulation results shown in figures 4.12.5-2 through 4.12.5-6 indicate the ½-LFL vapor clouds for LNG release scenarios would remain within Lake Charles LNG's property. As Lake Charles LNG demonstrated that the vapor dispersion from LNG releases inside the shroud can be maintained within their property, similar LNG releases from the inner piping of the vacuum insulated piping system would also remain within Lake Charles LNG's property. Therefore, we conclude that the siting of the proposed project would not have a significant impact on public safety with respect to flammable vapor dispersion. If the facility is constructed and operated, compliance with the requirements of 49 CFR 193 would be addressed as part of DOT's inspection and enforcement program.

Vapor Dispersion Analyses for Other Hazardous Fluids

In addition to the LNG releases evaluated above, Lake Charles LNG considered other release scenarios for the MR, NGL, ethane, propane, and stabilized condensate. Only the spills that produced the highest release rates and consequently the longest ½-LFL vapor clouds are discussed in this section. At the liquefaction area, the highest rate of MR release would be from a 1-inch-diameter hole on the MR process piping between the propane chillers and the MR separator. Heavy hydrocarbon would be extracted from the feed gas stream, and the highest rate of NGL release would be from a 2-inch-diameter hole on the piping to the demethanizer. Propane would be used in the liquefaction cycle to pre-cool the feed gas and MR vapor. The worst-case scenario for a propane release at the liquefaction process area would be a guillotine rupture of the 4-inch-diameter propane process line to the Reclaimer Condenser.

The refrigerant make-up tanks would be mounded. For process releases outside of the refrigerant make-up tanks, a guillotine rupture of the 6-inch-diameter ethane make-up line would result in the highest rate of vapor flow. Lake Charles LNG also considered a guillotine rupture of the 4-inch-diameter condensate pump discharge piping at the stabilized condensate storage tank area.

At the truck unloading area, Lake Charles LNG considered design spills from the guillotine rupture of the 3-inch-diameter transfer hoses from the propane and ethane trucks to the propane and ethane make-up tanks. Table 4.12.5-3 shows the hole diameters that result in the highest rate of vapor flow for refrigerant, NGL, and condensate release scenarios from the liquefaction area, refrigerant storage area, condensate storage area, and refrigerant truck loading area.

TABLE 4.12.5-3

Other Hazardous Fluid Design Spills

Scenario	Location	Hole Diameter	Pressure (psig)	Temperature (°F)	Flow Rate (lb/hr)
1	MR to MR separator	1-inch	786	–29	1.42E5
2	NGL to demethanizer	2-inch	754	–123	2.08E5
3	Propane reclaim condenser	4-inch	94	44	5.62E5
4	Ethane make-up line	6-inch	866	47	3.09E4
5	Propane trucking hose	3-inch	94	44	5.87E4
6	Ethane trucking hose	3-inch	866	46	7.67E4
7	Condensate pump discharge	4-inch	310	100	3.86E4

Lake Charles LNG used PHAST to predict the distances to the ½-LFL vapor cloud. Table 4.12.5-4 provides the PHAST results for the MRL, NGL and refrigerants jetting and flashing scenarios as well as condensate liquid spill scenario.

TABLE 4.12.5-4

Vapor Dispersion Scenarios from MRL, NGL, Refrigerant, and Condensate Releases

Scenario	Material	Release Location	Approximate Downwind Distance to ½-LFL (feet)
1	MRL	Liquefaction process	355
2	NGL	Liquefaction process	450
3	Propane	Liquefaction process	735
4	Ethane	Refrigerant storage	210
5	Propane	Truck unloading	490
6	Ethane	Truck unloading	225
7	Condensate	Condensate storage	230

As Lake Charles LNG's calculations show the vapor dispersion would stay within Lake Charles LNG's property, we conclude that the siting of the proposed project would not have a significant impact on public safety. If the facility is constructed and operated, compliance with the requirements of 49 CFR 193 would be addressed as part of DOT's inspection and enforcement program.

Since the stabilized condensate would contain benzene, a toxic product, Lake Charles LNG used PHAST to calculate the dispersion distances to toxic threshold exposure limit based on the AEGLs. Additionally, Lake Charles LNG calculated the AEGLs for other toxic components present in the acid gas stream (i.e., hydrogen sulfide) and the NGL extraction process (i.e., toluene and xylene). Lake Charles LNG also considered an ammonia release from the aqueous ammonia vessel. Lake Charles LNG used PHAST to calculate the dispersion distances to toxic threshold exposure limits based on the toxicity levels that were at or below ½-AEGLs. Table 4.12.5-5 shows the distances to the ½-AEGLs for releases for hydrogen sulfide, benzene, toluene, xylene, and ammonia at the 10-minute exposure time.

TABLE 4.12.5-5 **Distance (in feet) to the ½-AEGL 1**		
Substance	Exposure Time (minutes)	½-AEGL 1 (feet)
Ammonia	10	660
Benzene	10	605
Hydrogen Sulfide	10	3,000
Toluene	10	385
Xylene	10	275

The maximum dispersion distance to the 0.375 ppm hydrogen sulfide concentration (i.e., ½ AEGL-1 at 10 minutes) was found to extend approximately 3,000 feet. The PHAST modeling did not show a hazardous result to the concentration associated with the ½ AEGL-2 and -3. TLNG stated that this toxic vapor cloud would extend over 3 businesses and no homes, schools, hospitals, or parks. The businesses within the ½ AEGL-1 distances include Alcoa, Targa, and WasteWater Plant. TLNG will update its Emergency Response Plan to notify all business owners in the event of an emergency that involves a hydrogen sulfide release. Additionally, the toxicity effects associated with AEGL-1 are non-disabling and reversible. The distances to the ½-AEGL 1 for the other substances listed in table 4.12.5-5 would remain within the facility boundary. As a result, we conclude that the siting of the proposed project would not have a significant impact on public safety with respect to the presence of the toxic components (i.e., hydrogen sulfide, benzene, toluene, xylene, and ammonia) would not present a significant impact to the public. If the facility is constructed and operated, compliance with the requirements of 49 CFR 193 would be addressed as part of DOT's inspection and enforcement program.

4.12.5.4 Overpressure Analysis

As discussed in section 4.12.2, the propensity of a vapor cloud to detonate or produce damaging overpressures is influenced by the reactivity of the material, the level of confinement and congestion surrounding and within the vapor cloud, and the flame travel distance. It is possible that the prevailing wind direction may cause the vapor cloud to travel into a partially confined or congested area.

LNG Vapor Clouds

As adopted by Part 193, section 2.1.1 of NFPA 59A (2001) requires an evaluation of potential incidents and safety measures incorporated in the design or operation of the facility be considered. As discussed under "Flammable Vapor Ignition" in section 4.13.2.1, unconfined LNG vapor clouds would not be expected to produce damaging overpressures.

The potential for unconfined LNG vapor cloud detonations was investigated by the Coast Guard in the late 1970s at the Naval Weapons Center in China Lake, California. Using methane, the primary component of natural gas, several experiments were conducted to determine whether unconfined LNG vapor clouds would detonate. Unconfined methane vapor clouds ignited with low-energy ignition sources (13.5 joules), produced flame speeds ranging from 12 to 20 mph. These flame speeds are much lower than the flame speeds associated with a deflagration with damaging overpressures or a detonation.

To examine the potential for detonation of an unconfined natural gas cloud containing heavier hydrocarbons that are more reactive, such as ethane and propane, the Coast Guard conducted further tests on ambient-temperature fuel mixtures of methane-ethane and methane-propane. The tests indicated that the addition of heavier hydrocarbons influenced the tendency of an unconfined natural gas vapor cloud to detonate. Less processed natural gas with greater amounts of heavier hydrocarbons would be more sensitive to detonation.

The Coast Guard indicated overpressures of 4 bar and flame speeds of 78 mph were produced from vapor clouds of 86 percent to 96 percent methane in near stoichiometric proportions using exploding charges as the ignition source. The 4 bar overpressure was the same overpressure produced during the calibration test involving exploding the charge ignition source alone, so it remains unclear that the overpressure was attributable to the vapor deflagration.

Additional tests were conducted to study the influence of confinement and congestion on the propensity of a vapor cloud to detonate or produce damaging overpressures. The tests used obstacles to create a partially confined and turbulent scenario, but found that flame speeds developed for methane were not significantly higher than the unconfined case and were not in the range associated with detonations.

Although it has been possible to produce damaging overpressures and detonations of unconfined LNG vapor clouds, Lake Charles LNG's project would be designed to receive feed gas with methane concentrations as low as 95 percent, which are not in the range shown to exhibit overpressures and flame speeds associated with high-order explosions and detonations.

Ignition of a confined LNG vapor cloud could result in higher overpressures. In order to prevent such an occurrence, Lake Charles LNG would take measures to mitigate the vapor dispersion and ignition into confined areas, such as buildings. Buildings would be located away from process areas, and combustion and ventilation air intake equipment would be required to have hazard detection devices that enable isolation of the air dampers. Hazard detection with shutdown capability would also be installed at air intakes of combustion equipment whose continued operation could add to, or sustain, an emergency.

Vapor Clouds from Other Hazardous Fluids

In comparison with LNG vapor clouds, there is a higher potential for unconfined propane clouds to produce damaging overpressures, and an even higher potential for unconfined ethylene vapor clouds to produce damaging overpressures. Unconfined ethylene vapor clouds also have the potential to transition to a detonation much more readily than propane. This has been shown by multiple experiments conducted by the Explosion Research Cooperative to develop predictive blast wave models for low, medium, and high reactivity fuels and varying degrees of congestion and confinement.[15] The experiments used methane, propane, and ethylene, as the respective low, medium, and high reactivity fuels. In addition, the tests showed that if methane, propane, or ethylene is ignited within a confined space, such as in a building, they all have the potential to produce damaging overpressures. The refrigerant streams would contain all three of these components (i.e., methane, propane, and ethylene). Therefore, a potential exists for unconfined vapor clouds that could produce damaging overpressures in the event of a release of refrigerant.

In order to evaluate this hazard, Lake Charles LNG used FLACS to perform an overpressure analysis. Lake Charles LNG used the vapor dispersion results, previously discussed in "Vapor Dispersion Analysis." Releases of the 4-inch-diameter propane process line from the liquefaction process area dispersing to the most confined and congested regions of the plant were evaluated in the overpressure

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[15] Pierorazio, A.J., Thomas, J.K., Baker, Q.A., Kethcum, D.E, "An Update to the Baker-Strehlow-Tang Vapor Cloud Explosion Prediction Methodology Flame Speed Table", American Institute of Chemical Engineers, Process Safety Progress, Vol. 24., No. 1, March 2005.

analyses. Various ignition locations and times were evaluated to predict the worst-case overpressure distances. Figures 4.12.5-7 and 4.12.5-8 show the FLACS results of 1 psi overpressures with a safety factor of 2 (i.e., ½ psi overpressure) for MR vapor cloud explosions at the liquefaction area.

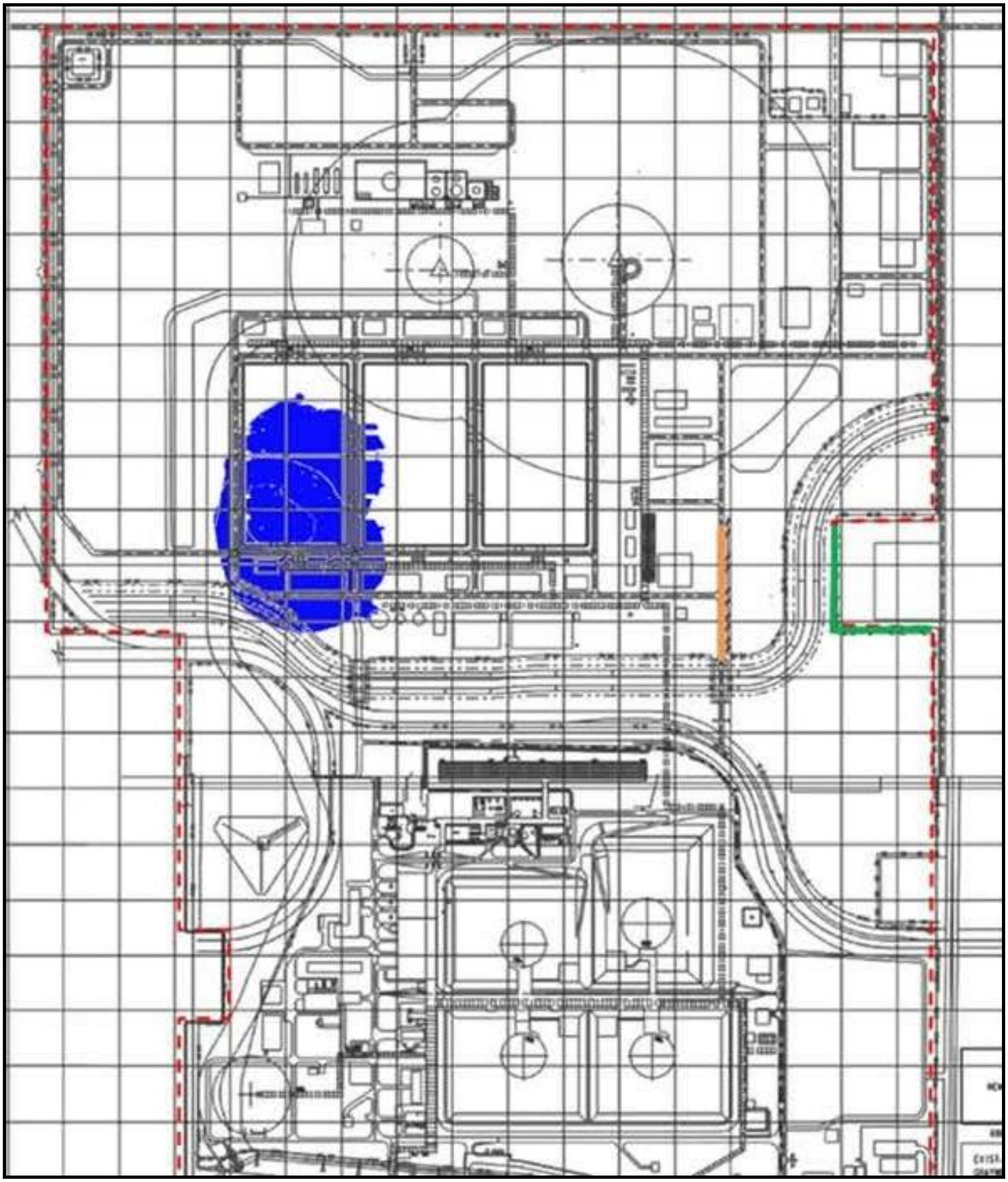

Figure 4.12.5-7 – Propane Overpressure Scenario at Train 1

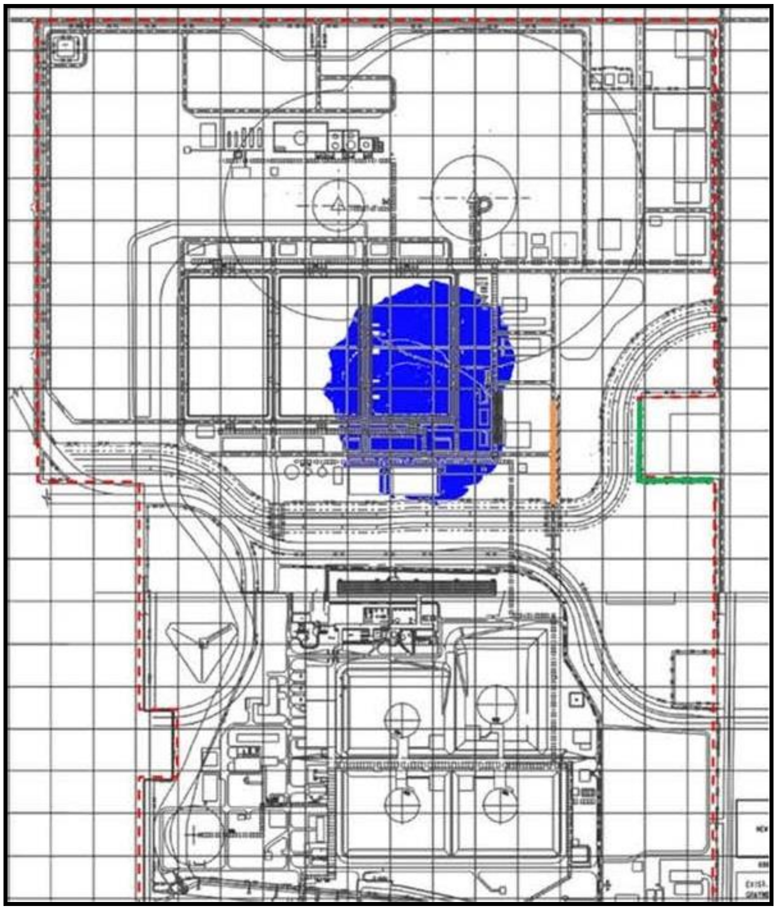

Figure 4.12.5-8 – Propane Overpressure Scenario at Train 3

FLACS results indicate that the ½ psi overpressure distances from the liquefaction area would remain within Lake Charles LNG's property. As a result, we conclude that the siting of the proposed project would not have a significant impact on public safety. If the facility is constructed and operated, compliance with the requirements of 49 CFR 193 would be addressed as part of DOT's inspection and enforcement program.

4.12.5.5 Thermal Radiation Analysis

As discussed in section 4.12.2, if flammable vapors are ignited, the deflagration could propagate back to the spill source and result in a pool fire causing high levels of thermal radiation (i.e., heat from a fire). In order to address this, 49 CFR § 193.2057 requires each LNG container and LNG transfer system to have a thermal exclusion zone in accordance with Section 2.2.3.2 of NFPA 59A (2001). Together, Part 193 and NFPA 59A (2001) specify different hazard endpoints for spills into LNG storage tank containment and spills into impoundments for process or transfer areas. For LNG storage tank spills, there are three radiant heat flux levels which must be considered:

- 1,600 Btu/ft^2-hr – This level can extend beyond the facility's property line that can be built upon but cannot include areas that, at the time of facility siting, are used for outdoor assembly by groups of 50 or more persons;

- 3,000 Btu/ft^2-hr – This level can extend beyond the facility's property line that can be built upon but cannot include areas that, at the time of facility siting, contain assembly, educational, health care, detention or residential buildings or structures; and

- 10,000 Btu/ft^2-hr – This level cannot extend beyond the facility's property line that can be built upon.

The requirements for spills from process or transfer areas are more stringent. For these impoundments, the 1,600 Btu/ft^2-hr flux level cannot extend beyond the facility's property line that can be built upon.

Part 193 requires the use of the LNGFIRE3 computer program model developed by the Gas Research Institute to determine the extent of the thermal radiation distances. Part 193 stipulates that the wind speed, ambient temperature, and relative humidity that produce the maximum exclusion distances must be used, except for conditions that occur less than 5 percent of the time based on recorded data for the area. Lake Charles LNG selected the following ambient conditions to produce the maximum exclusion distances: wind speeds of 0 to 24 mph, ambient temperature of 34°F, and 25 percent relative humidity. We agree with Lake Charles LNG's selection of atmospheric conditions.

As discussed in the EA for the Trunkline LNG Expansion Project (Docket No. CP02-60-000), the 1,600 BTU/ft^2-hr thermal flux from the existing Tank Area Impoundment Sump would remain within TLNG property. For the proposed liquefaction project, Lake Charles LNG used LNGFIRE3 to predict the thermal radiation distances as a result of fires from the Liquefaction Area Sump, NGL Impoundment, Rundown Line Sumps, Refrigerant Storage Impoundment, and Condensate Containment. Although LNGFIRE3 is specifically designed to calculate thermal radiation flux levels for LNG pool fires, LNGFIRE3 could also be used to conservatively calculate the thermal radiation flux levels for flammable hydrocarbons such as ethane, propane, NGL, and condensate. Two of the parameters used by LNGFIRE3 to calculate the thermal radiation flux is the mass burning rate of the fuel and the surface emissive power (SEP) of the flame, which is an average value of the thermal radiation flux emitted by the fire. The mass burning rate and SEP of an ethane, propane, NGL, and condensate fire would be less than an equally sized LNG fire. Since the thermal radiation from a pool fire is dependent on the mass burning rate and SEP, the thermal radiation distances required for ethane, propane, NGL, and condensate fires would not extend as far as the exclusion zone distances previously calculated for an LNG fire in the same sump.

The resulting maximum thermal radiation distances are shown in table 4.12.5-6 and figures 4.12.5-9 and 4.12.5-10. The 1,600-Btu/ft^2-hr heat fluxes from the proposed impoundment basins and secondary containment would remain within the facility property lines. As a result, we conclude that the siting of the proposed project would not have a significant impact on public safety with respect to radiant heat from these impoundments. If the facility is constructed and operated, compliance with the requirements of 49 CFR 193 would be addressed as part of DOT's inspection and enforcement program.

TABLE 4.12.5-6

Thermal Radiation Exclusion Zone for Impoundment Basins

	Thermal Flux Level (Btu/ft^2-hr)		
	10,000	3,000	1,600
Distance from Liquefaction Area Sump (feet)	N/A	N/A	281
Distance from NGL Impoundment (feet)	N/A	N/A	134
Distance from Rundown Line Sump (feet)	N/A	N/A	281
Distance from Refrigerant Storage Impoundment (feet)	N/A	N/A	211
Distance from Condensate Containment (feet)	N/A	N/A	563 (front) 628 (side)

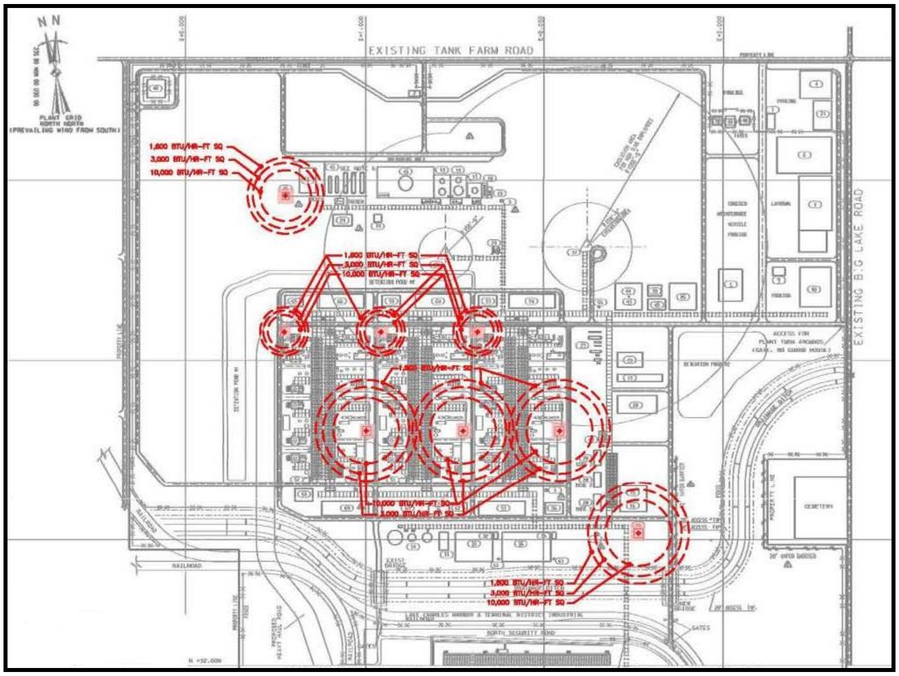

Figure 4.12.5-9 – Thermal Radiation Zones from the proposed Impoundment Sumps

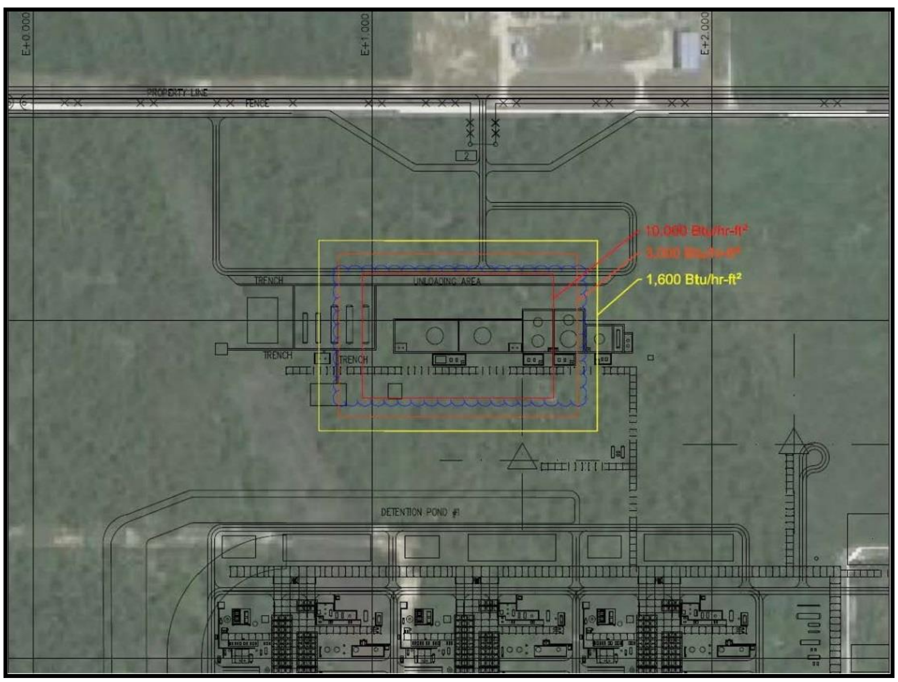

Figure 4.12.5-10 – Thermal Radiation Zones from the Condensate Containment

4.12.5.6 Cascading Events

The refrigerant and condensate storage tank area would be located about 700 feet to the north of the liquefaction area. The refrigerant storage bullets would be mounded, and the stabilized condensate would be stored in floating roof tanks at ambient pressure, which would not allow pressure buildup in the event of an adjacent fire. Moreover, Lake Charles LNG proposes to relocate the truck loading/unloading area outside of the 3,000 and 10,000 BTU/ft^2-hr heat flux levels. Therefore, the risk of a BLEVE at the refrigerant and condensate storage tanks would be negligible. We identified several process vessels that could be exposed to damaging heat flux due to a fire event from the impoundment sumps at the liquefaction area. On November 25, 2014, Lake Charles LNG proposed to install mitigation measures for these process vessels including passive protections such as thermal insulation and fireproofing as well as active protections such as automatic water spray systems and automatic blowdown system. We believe these mitigation measures would prevent the likelihood of a BLEVE occurring at the liquefaction area and recommended in section 4.12.3 for Lake Charles LNG to provide the final design information for these mitigation measures. As a result, we conclude that the siting of the proposed project would not have a significant impact on public safety.

4.12.6 Emergency Response

Section 3A(e) of the NGA, added by Section 311 of the EPAct, stipulated that in any order authorizing an LNG terminal, the Commission shall require the LNG terminal operator to develop an ERP in consultation with the Coast Guard and state and local agencies. The ERP has been in place since Lake Charles LNG re-commissioned the import of LNG in 1989 and has been updated as new projects have changed the configuration of the LNG Terminal. The existing ERP would need to be updated to include the proposed liquefaction facilities and emergencies related to refrigerant handling. Therefore, we recommend that:

- **<u>Prior to initial site preparation,</u> Lake Charles LNG should file the updated ERP to include the Liquefaction Facilities as well as instructions to handle on-site refrigerant and NGL-related emergencies. Lake Charles LNG should file the updated ERP with the Secretary for review and written approval by the Director of OEP.**

- **<u>Prior to initial site preparation,</u> Lake Charles LNG should file an ERP that includes a Cost-Sharing Plan identifying the mechanisms for funding all project-specific security/emergency management costs that would be imposed on state and local agencies. In addition to the funding of direct transit-related security/emergency management costs, this comprehensive plan should include funding mechanisms for the capital costs associated with any necessary security/emergency management equipment and personnel base. Lake Charles LNG should file the ERP, including the Cost-Sharing Plan, with the Secretary for review and written approval by the Director of OEP.**

4.12.7 LNG Vessel Safety

The Trunkline LNG Terminal received authorization to re-commission the import of LNG in November 1989 and has been receiving LNG import shipments. Exporting operations would alter the direction of loaded LNG carrier transits, with ships arriving empty but departing with a full cargo. However, there would be no changes in the expected number of vessels for the export project.

In a letter to the Coast Guard dated February 17, 2012, Lake Charles LNG detailed the proposed project modifications and estimated the ship traffic would not exceed the previously approved 225 vessels per year in Docket CP02-60-004. In a letter dated March 5, 2012, the Coast Guard stated that a new LOI would not be required for the service associated with the proposed project. However, the Coast Guard specified that applicable amendments to the Operations Manual, Emergency Manual, and Facility Security Plan must be made that capture changes to the operations associated with the project. As required by 33 CFR 105 and 127, Lake Charles LNG would amend these documents and submit them to the Coast Guard prior to operation of the facility as an export terminal.

4.12.8 Conclusions on Facility Reliability and Safety

As part of the NEPA review, Commission staff must assess whether the proposed facilities would be able to operate safely and securely. As a result of our technical review of the preliminary engineering design, we have made a number of recommendations to be implemented prior to initial site preparation, prior to construction of final design, prior to commissioning, prior to introduction of hazardous fluids, prior to commencement of service, and throughout the life of the facility to enhance the reliability and safety of the facility and to mitigate the risk of impact to the public. Based on our analysis and recommended mitigation, we believe that the facility design proposed by Lake Charles LNG includes acceptable layers of protection or safeguards which would reduce the risk of a potentially hazardous scenario from developing into an event that could impact the off-site public.

As a cooperating agency, DOT assisted FERC staff in evaluating whether Lake Charles LNG's proposed design would meet the DOT siting requirements. DOT reviewed the data and methodology Lake Charles LNG used to determine the design spills from various leakage sources, including piping, containers, and equipment containing hazardous liquids. Lake Charles LNG used those design spills to model hazardous releases. On September 19, 2014, DOT provided a letter to the FERC staff stating that DOT had no objection to Lake Charles LNG's methodology for determining the single accidental leakage sources for candidate design spills to be used in establishing the Part 193 siting requirements for the proposed LNG liquefaction facilities. Based on the hazardous area calculations we reviewed, we conclude that potential hazards from the siting of the facility at this location would not have a significant impact on public safety. If the facility is constructed and becomes operational, the facility would be subject to DOT's inspection and enforcement program. Final determination of whether a facility is in compliance with the requirements of 49 CFR 193 would be made by DOT staff.

The Coast Guard has also reviewed the proposed liquefaction facilities and stated that the existing waterway suitability assessment and Letter of Recommendation are adequate for the service associated with the proposed modifications.

4.12.9 Pipeline Safety Standards

The transportation of natural gas by pipeline involves some risk to the public in the event of an accident and subsequent release of gas. The greatest hazard is a fire or explosion following a major pipeline rupture.

Methane, the primary component of natural gas, is colorless, odorless, and tasteless. It is not toxic, but is classified as a simple asphyxiate, possessing a slight inhalation hazard. If breathed in high concentration, oxygen deficiency can result in serious injury or death.

Methane has an ignition temperature of 1,000 degrees Fahrenheit and is flammable at concentrations between 5 and 15 percent in air. Unconfined mixtures of methane in air are not explosive. However, a flammable concentration within an enclosed space in the presence of an ignition source can explode. It is buoyant at atmospheric temperatures and disperses rapidly in air.

The DOT regulates and enforces a regulatory program to provide adequate protection against risks to life and property posed by pipeline transportation and pipeline facilities under 49 USC 601. The Pipeline and Hazardous Materials Safety Administration (PHMSA) Office of Pipeline Safety (OPS) administers the national regulatory program to ensure the safe transportation of natural gas and other hazardous materials by pipeline. It develops safety regulations and other approaches to risk management that ensure safety in the design, construction, testing, operation, maintenance, and emergency response of pipeline facilities. Many of the regulations are written as performance standards which set the level of safety to be attained and allow the pipeline operator to use various technologies to achieve the required safety standard. PHMSA's mission is to protect people and the environment from the risks of pipeline incidents. This work is shared with state agency partners and others at the federal, state, and local level. Section 5(a) of the Natural Gas Pipeline Safety Act provides for a state agency to assume all aspects of the safety program for intrastate facilities by adopting and enforcing the federal standards, while section 5(b) permits a state agency that does not qualify under section 5(a) to perform certain inspection and monitoring functions. The states of Louisiana, Mississippi, and Arkansas all have section 5(a) certifications.

DOT pipeline standards are published in 49 CFR 190 to 199. Part 192 addresses natural gas pipeline safety issues. Under a Memorandum of Understanding on Natural Gas Transportation Facilities (Memorandum) dated January 15, 1993 between the DOT and the FERC, the DOT has the exclusive authority to promulgate federal safety standards used in the transportation of natural gas. Section 157.14(a)(9)(vi) of the FERC's regulations require that an applicant certify that it will design, install, inspect, test, construct, operate, replace, and maintain the facility for which a certificate is requested in accordance with federal safety standards and plans for maintenance and inspection, or certify that it has been granted a waiver of the requirements of the safety standards by the DOT in accordance with section 3(e) of the Natural Gas Pipeline Safety Act. The FERC accepts this certification and does not impose additional safety standards other than the DOT standards. If the Commission becomes aware of an existing or potential safety problem, there is a provision in the Memorandum to promptly alert the DOT. The Memorandum also provides for referring complaints and inquiries made by state and local governments and the general public involving safety matters related to pipelines under the Commission's jurisdiction. The FERC also participates as a member of the DOT's Technical Pipeline Safety Standards Committee which determines if proposed safety regulations are reasonable, feasible, and practicable.

Trunkline would design, construct, operate, and maintain the proposed Non-Liquefaction Facilities in accordance with the DOT's Minimum Federal Safety Standards in 49 CFR 192. The regulations at 49 CFR 192 are intended to ensure adequate protection for the public and to prevent natural gas facility accidents and failures. Part 192 specifies material selection and qualification, minimum design requirements, and protection from internal, external, and atmospheric corrosion. Part 192 also defines area classifications, based on population density in the vicinity of the pipeline, and specifies more rigorous safety requirements for populated areas. The class location unit is an area that extends 220 yards on either side of the centerline of any continuous 1-mile length of pipeline. The four area classifications are defined as follows:

- Class 1 – location with 10 or fewer buildings intended for human occupancy;
- Class 2 – location with more than 10 but less than 46 buildings intended for human occupancy;
- Class 3 – location with 46 or more buildings intended for human occupancy, or where the pipeline lies within 100 yards of any building or small well-defined outside area occupied by 20 or more people during normal use; and
- Class 4 – location where buildings with four or more stories aboveground are prevalent.

Class locations representing more populated areas require higher safety factors in pipeline design, testing, and operation. Buried pipelines constructed on land in Class 1 locations must be provided with a minimum coverage of 30 inches in normal soil and 18 inches in consolidated rock. Class 2, 3, and 4 locations, as well as drainage ditches of public roads and railroad crossings, require a minimum cover of 36 inches in normal soil and 24 inches in consolidated rock. All pipelines installed in navigable rivers, streams, and harbors must have a minimum cover of 48 inches in normal soil or 24 inches in consolidated rock.

Section 192.179 specifies the maximum distance from a point on a pipeline to a sectionalizing block valve: each point on a pipeline in a Class 1 location must be within 10.0 miles of a block valve, in Class 2 locations the distance is 7.5 miles, and in Class 3 and 4 locations, the distance is 4.0 and 2.5 miles respectively. Pipe wall thickness and pipeline design pressures, hydrostatic test pressures, MAOP, inspection and testing of welds, and frequency of pipeline patrols and leak surveys must also conform to higher standards in more populated areas.

Based on the definitions in 49 CFR 192, both the Mainline Connector, which consists of 11.4 miles of 42-inch-diameter greenfield pipeline, and the Mainline 200-3 Loop, which consists of 6.5 miles of 24-inch-diameter loop pipeline would be entirely located within Class 1 areas. Trunkline would provide 36 to 48 inches of cover, compared to the DOT-required 30 inches, for the entire length of pipelines, unless alternative measures are required on a site-specific basis as identified during easement acquisitions and permitting. Additionally, Trunkline would place block valves a maximum of 10 miles apart, and would install automatic shut-off valves. During operations, if a subsequent increase in population density adjacent to the right-of-way results in a change in class location for the pipeline, Trunkline may meet the new class location standard by reducing the operating pressure or by replacing the pipeline segment with pipe of sufficient grade and wall thickness to comply with the applicable DOT code of regulations for the new class location.

In 2002, Congress passed an act to strengthen the nation's pipeline safety laws. The Pipeline Safety Improvement Act of 2002 (HR 3609) was passed by Congress on November 15, 2002, and signed into law by the President in December 2002. Since December 17, 2004, gas transmission operators are required to develop and follow a written integrity management program that contains all the elements described in 49 CFR 192.911 and addresses the risks on each covered transmission pipeline segment. Specifically, the law requires pipeline operators to establish an integrity management program which applies to all high consequence areas (HCA). The DOT (68 FR 69778, 69 FR 18228, and 69 FR 29903) defines HCAs as they relate to the different class zones, potential impact circles, or areas containing an identified site as defined in 49 CFR 192.903.

The OPS published a series of rules from August 6, 2002, to May 26, 2004, (69 FR 29903) that defines HCAs where a gas pipeline accident could do considerable harm to people and their property and require an integrity management program to minimize the potential for an accident. This definition satisfies, in part, the Congressional mandate in 49 USC 60109 for OPS to prescribe standards that establish criteria for identifying each gas pipeline facility in a high-density population area.

The HCA may be defined in one of two ways. In the first method an HCA includes:

- current Class 3 and 4 locations;

- any area in Class 1 or 2 locations where the potential impact radius[16] is greater than 660 feet and there are 20 or more buildings intended for human occupancy within the potential impact circle;[17] or

- any area in Class 1 or 2 locations where the potential impact circle includes an identified site.

In the second method, an HCA includes any area within a potential impact circle which contains:

- 20 or more buildings intended for human occupancy; or
- an identified site.

An identified site is an outside area or open structure that is occupied by 20 or more persons on at least 50 days in any 12-month period; a building that is occupied by 20 or more persons on at least 5 days a week for any 10 weeks in any 12-month period; or a facility that is occupied by persons who are confined, are of impaired mobility, or would be difficult to evacuate.

Once a pipeline operator has determined the HCAs on its pipeline, it must apply the elements of its integrity management program to those segments of the pipeline within the HCAs. DOT regulations specify the requirements for the integrity management plan in 49 CFR 192.911. The pipeline integrity management rule for HCAs requires inspection of the entire pipeline in HCAs every 7 years.

Trunkline has determined that there are no HCAs along the proposed pipelines.

Trunkline's gas control center in Houston, Texas monitors system pressures, flows, and customer deliveries. The gas control center is manned 24 a day, 365 days a year. Trunkline also operates a district office in Lake Charles and area offices at compressor stations along the proposed pipeline route where personnel can respond appropriately to emergency situations and direct safety operations as necessary. Data acquisition systems are present at all meter stations along Trunkline's system. If system pressures fall outside a predetermined range, an alarm is activated and notice is transmitted to the gas control center, indicating that pressures at the station are not within an acceptable range. Trunkline has a pipeline construction crew and qualified contractors who are available to respond in the event of an emergency, and employs qualified field personnel who can be immediately dispatched to the scene of an emergency if the need should arise.

Trunkline conducts aerial and vehicle patrols of its existing pipeline facilities along with scheduled preventative maintenance, and performs annual patrol and leak detection surveys (semi-annual in Class 3 areas). Similar procedures would be implemented for the proposed Non-Liquefaction Facilities. The leak surveys are instrumental in early detection of leaks and can reduce the likelihood of pipeline failure. To prevent potential damage from external forces, Trunkline uses pipeline markers and right-of-way mowing to keep the pipeline route highly visible. Trunkline is also a member of the "One Call" and related pre-excavation notification organizations in Louisiana, which further reduces the potential for damage to the pipeline from third parties. To guard against corrosion, Trunkline would use cathodic protection systems on the proposed pipelines.

Safety features that would be installed at the new Compressor Station 203-A include, but are not limited to: back-up auxiliary power, fire detection system, gas detection system, emergency block and

[16] The potential impact radius is calculated as the product of 0.69 and the square root of the MAOP of the pipeline in pounds per square inch multiplied by the pipeline diameter in inches.

[17] The potential impact circle is a circle of radius equal to the potential impact radius.

blowdown valves, compressor unit alarm and shutdowns, emergency lighting and exits, safety and warning signs, fire extinguishers, and security gate and fence. Additionally, the station would have remote and local systems in place to continually monitor station activities, alarms, and shutdowns. Station design also includes overpressure protection and line break monitors.

The minimum standards for operating and maintaining pipeline facilities are prescribed in 49 CFR Part 192, including the requirement to establish a written plan governing these activities. Under 49 CFR 192.615, each pipeline operator must establish an emergency plan that includes written procedures to minimize the hazards in a natural gas pipeline emergency. Key elements of the plan include procedures for the following:

- receiving, identifying, and classifying emergency events, gas leakage, fires, explosions, and natural disasters;
- establishing and maintaining communications with local fire, police, and public officials, and coordinating emergency response;
- emergency shutdown of system and safe restoration of service; and
- making personnel, equipment, tools, and materials available at the scene of an emergency; and
- protecting people first and then property, and making them safe from actual or potential hazards.

Under 49 CFR 192.616, each operator must establish and maintain liaison with appropriate fire, police, and public officials to learn the resources and responsibilities of each organization that may respond to a natural gas pipeline emergency, and to coordinate mutual assistance. The operator must also establish a written continuing public education program to enable customers, the public, government officials, and those engaged in excavation activities to recognize a gas pipeline emergency and report it to appropriate public officials. Trunkline's existing liaison program encompasses the areas crossed by the proposed pipelines. Key elements of the liaison program include periodic safety training, special informational meetings and trainings at the request of the parishes, and periodic distribution of emergency telephone numbers and other pertinent information. Trunkline also uses a Public Awareness Program that requires the company to communicate with the affected public, emergency response officials, public officials, and excavators/contractors on a regular basis.

Trunkline would provide training to all employees responsible for operation and maintenance of the pipelines, compressor station, and meter stations installed or upgraded as part of the proposed project, including review of routine and emergency procedures. Employees responsible for future support of the facilities would be given hands-on training to familiarize them with new equipment. In addition to in-house training, equipment vendors would provide training prior to start-up of new facilities.

We received comments related to traffic and safety impacts of offsite staging areas. During construction, special care would be taken to protect the public, and to minimize traffic disruption, and control noise and dust to the extent practicable. Trunkline would implement safety measures which would include marking the construction work area boundary to ensure construction equipment, materials, and spoil would remain within the construction work areas; limiting access to the construction work areas to public roadways and designated access roads; welding and installing the pipeline as quickly as reasonably possible consistent with pipeline construction practices; and completing final cleanup and installation of permanent erosion control measures in a timely manner as required by the FERC Plan and Procedures. Prior to the initiation of construction, affected landowners would be informed of the schedule for upcoming construction activities and would be provided with a toll free number for questions or to report concerns.

Trunkline would also conduct safety training for construction personnel regarding safe construction practices to be implemented when working above, or excavating under, operating pipelines; working around electric powerlines or other aboveground or belowground utilities; traffic control; and protecting landowners and livestock from construction hazards.

4.12.9.1 Pipeline Accident Data

Title 49 CFR Part 191 requires all operators of natural gas transmission pipelines to notify the DOT of any significant incidents and to submit a report within 20 days. Significant incidents are defined as any leaks that:

- cause a death or personal injury requiring hospitalization; or
- involve property damage of more than $50,000 in 1984 dollars.[18]

During the 20-year period from 1994 through 2013, a total of 1,238 significant incidents were reported on the more than 300,000 total miles of natural gas transmission pipelines nationwide.

Additional insight into the nature of service incidents may be found by examining the primary factors that caused the failures. Table 4.12.8-1 provides the number of each incident by cause and the distribution of the causal factors from 1994 to 2013. The dominant causes of pipeline incidents are pipeline material, weld or equipment failure and corrosion, collectively constituting 48.5 percent of all significant incidents. The pipelines included in the data set in table 4.12.8-1 vary widely in terms of age, pipe diameter, and level of corrosion control. Each variable influences the incident frequency that may be expected for a specific segment of pipeline.

The frequency of significant incidents is strongly dependent on pipeline age. Older pipelines have a higher frequency of corrosion incidents and material failure since corrosion and pipeline stress/strain are time-dependent processes. The use of both an external protective coating and a cathodic protection system,[19] required on all pipelines installed after July 1971, significantly reduces the corrosion rate compared to unprotected or partially protected pipe.

[18] $50,000 in 1984 dollars is about $115,000 as of January 2014 (Bureau of Labor Statistics, 2013.)

[19] Cathodic protection is a technique to reduce corrosion (rust) of the natural gas pipeline that includes the use of an induced current or a sacrificial anode (like zinc) that corrodes at faster rate to reduce corrosion.

TABLE 4.12.8-1		
Natural Gas Transmission Pipeline Significant Incidents by Cause (1994 to 2013)[a]		
Cause	Number of Incidents	Percentage of Total Incidents[b]
Corrosion	293	23.6
Excavation[c]	211	17.0
Pipeline Material, Weld or Equipment Failure	309	24.9
Natural Force Damage	143	11.5
Outside Forces[d]	75	6.0
Incorrect Operation	34	2.7
All Other Causes[e]	173	13.9
TOTAL	1,238	-

a From PHMSA (PHMSA, 2014b)
b Due to rounding, column does not total 100 percent.
c Includes third-party damage.
d Fire, explosion, vehicle damage, previous damage, intentional damage.
e Miscellaneous causes or unknown causes.

Outside forces, excavation, and natural forces are the cause in 34.5 percent of significant pipeline incidents. These mostly result from the encroachment of mechanical equipment such as bulldozers and backhoes; earth movements due to soil settlement, washouts, or geologic hazards; weather effects such as winds, storms, and thermal strains; and willful damage. Table 4.12.8-2 provides a breakdown of outside force incidents by cause.

TABLE 4.12.8-2		
Outside Force Incidents by Cause (1994 to 2013)[a]		
Cause	**Number of Incidents**	**Percent of all Incidents[b]**
Third-party excavation damage	176	14.2
Operator excavation damage	25	2.0
Unspecified equipment damage/Previous damage	10	0.7
Heavy Rain/Floods	72	5.8
Earth Movement	35	2.8
Lightning/Temperature/High Winds	21	1.6
Unspecified Natural Force	15	1.2
Vehicle (not engaged with excavation)	45	3.6
Fire/Explosion	8	0.6
Previous mechanical damage	6	0.4
Intentional damage	1	0.1
Fishing or maritime activity	7	0.4
Electrical arcing from other equipment/facility	1	0.1
Unspecified outside force	7	0.4
TOTAL	429	-

a Excavation, outside forces, and natural force damage from table 4.12.8-1.
b Due to rounding, column does not equal 34.5 percent.

Older pipelines have a higher frequency of outside forces incidents partly because their location may be less well known and less well marked than newer lines. In addition, the older pipeline systems contain a disproportionate number of smaller diameter pipelines, which have a greater rate of outside forces incidents. Small-diameter pipelines are more easily crushed or broken by mechanical equipment or earth movements.

Since 1982, operators have been required to participate in "One Call" public utility programs in populated areas to minimize unauthorized excavation activities in the vicinity of pipelines. The "One Call" program is a service used by public utilities and some private sector companies (for example, oil pipelines and cable television) to provide preconstruction information to contractors or other maintenance workers on the underground location of pipes, cables, and culverts.

4.12.9.2 Impacts on Public Safety

The service incident data summarized in table 4.12.8-1 include pipeline failures of all magnitudes with widely varying consequences.

Although the transportation of natural gas via the pipeline involves some degree of risk to the public in the event of an accident and subsequent release of gas, it is important to examine the probabilistic level of risks for pipeline-related events. According to the PHMSA, there are 2.6 million miles of pipelines that cross the United States, and those pipelines offer a safe and cost-efficient way to transport natural gas (PHMSA, 2014a). Table 4.12.8-3 presents the average annual injuries and fatalities that occurred on natural gas transmission lines between 2009 and 2013. The data has been separated into employees and nonemployees to better identify a fatality rate experienced by the general public.

TABLE 4.12.8-3

Annual Average Injuries and Fatalities – Natural Gas Transmission Pipelines (2009 to 2013)[a]

	Injuries		Fatalities	
Year	Employees	Public	Employees	Public
2009	4	7	0	0
2010[b]	10	51	2	8
2011	1	0	0	0
2012	3	4	0	0
2013	0	2	0	0

[a] From PHMSA (PHMSA, 2014b)

[b] All of the public injuries and fatalities in 2010 were due to the Pacific Gas and Electric pipeline rupture and fire in San Bruno, California on September 9, 2010.

The majority of fatalities from pipelines involve local distribution pipelines. These are natural gas pipelines that are not regulated by the FERC and that distribute natural gas to homes and businesses after transportation through interstate natural gas transmission pipelines. In general, these distribution lines are smaller diameter pipes, often made of plastic or cast iron rather than welded steel, and tend to be older pipelines that are more susceptible to damage. In addition, distribution systems do not have large rights-of-way and pipeline markers common to the FERC-regulated natural gas transmission pipelines.

The nationwide totals of accidental fatalities from various manmade and natural hazards are listed in table 4.12.8-4 in order to provide a relative measure of the industry-wide safety of natural gas transmission pipelines. Direct comparisons between accident categories should be made cautiously, however, because individual exposures to hazards are not uniform among all categories. Furthermore, the fatality rate is more than 25 times lower than the fatalities from natural hazards such as lightning, tornados, and floods.

TABLE 4.12.8-4 **Nationwide Accidental Deaths**[a]	
Type of Accident	Annual Number of Deaths
All accidents	123,706
Motor Vehicle	43,945
Poisoning	29,846
Falls	22,631
Drowning	3,443
Fire, smoke inhalation, burns	3,286
Floods[b]	89
Lightning[b]	52
Tornado[b]	74
Natural gas distribution lines[c]	14
Natural gas transmission pipelines[c]	2

[a] All data, unless otherwise noted, reflects 2007 statistics from U.S. Census Bureau, Statistical Abstract of the United States: 2010 (129th Edition) Washington, DC, 2009 (http://www.census.gov/statab).

[b] NOAA National Weather Service, Office of Climate, Water and Weather Services, 30-year average (1983-2012) (http://www.weather.gov/om/hazstats.shtml).

[c] From PHMSA (PHMSA, 2014b)

The available data show that natural gas transmission pipelines continue to be a safe, reliable means of energy transportation. From 1994 to 2013, there were an average of 62 significant incidents and two fatalities per year (PHMSA, 2014b). The number of significant incidents over the more than 300,000 miles of natural gas transmission lines indicates the risk is low for an incident at any given location. As described above, the Lake Charles Liquefaction Project would be constructed and operated in accordance with DOT requirements; therefore we believe that operation of the Lake Charles Liquefaction Project would be safe and would represent only a slight increase in risk to the nearby public.

As discussed in section 4.12.8, the risk associated with the proposed Non-Liquefaction Facilities would be small. Although operation of the proposed Non-Liquefaction Facilities would incrementally increase the risk of a pipeline accident, the increase would be minor. As a result, the cumulative impact and risks associated with constructing or operating the Non-Liquefaction Facilities would be negligible.

4.13 CUMULATIVE IMPACTS

NEPA requires the lead federal agency to consider the potential cumulative impacts of proposals under its review. Cumulative impacts may result when the environmental effects associated with the proposed action are superimposed on or added to impacts associated with past, present, and reasonably foreseeable future projects. Cumulative impacts can result from individually minor, but collectively significant, actions taking place over a period of time.

The project-specific impacts of the Lake Charles Liquefaction Project are discussed in detail in other sections of this EIS. The purpose of this section is to identify and describe cumulative impacts that would potentially result from implementation of the Lake Charles Liquefaction Project. Our analysis of cumulative impacts includes other projects in the vicinity of the proposed Lake Charles Liquefaction Project that could affect the same resources as the proposed project in the same approximate time frame. To ensure that this analysis focuses on relevant projects and potentially significant impacts, the actions included in the cumulative impact analysis include projects that:

- impact a resource potentially affected by the proposed Lake Charles Liquefaction Project;

- impact that resource within all or part of the time span encompassed by the proposed construction or operation schedule of the Lake Charles Liquefaction Project; and

- impact that resource within all or part of the same geographical area affected by the Lake Charles Liquefaction Project. The geographical area considered varies depending on the resource being discussed, which is the general area (region of influence) in which the Lake Charles Liquefaction Project could contribute to cumulative impacts on that particular resource.

4.13.1 Projects and Activities Considered

With respect to past actions, Council on Environmental Quality guidance (2005) allows agencies to adopt a broad, aggregated approach without "delving into the historical details of individual past actions," an approach we have taken here. The current regional landscape in the Lake Charles area, which supports significant industrial and commercial components as well as existing infrastructure, forms the environmental baseline described in other sections of this EIS and against which the impacts of reasonably foreseeable future actions are considered. Present and recently completed projects are included with past projects as part of the environmental baseline. Reasonably foreseeable projects that might cause cumulative impacts in combination with the Lake Charles Liquefaction Project include projects that are under construction, approved, proposed, or planned. For FERC-regulated projects, proposed projects are those for which the proponent has submitted a formal application to the FERC, and planned projects are projects that are either in pre-filing or have been announced, but have not been proposed. Planned projects also include projects not under the FERC's jurisdiction that have been identified through publically available information such as press releases, internet searches, Lake Charles LNG's and Trunkline's communications with local agencies, and information available from the Southwest Louisiana (SWLA) Economic Development Alliance, which monitors proposed development activities in southwest Louisiana.

Table 4.13.1-1 lists the projects and activities we considered in this cumulative impact analysis based on information available at the time this EIS went to print. For each project, the table includes the location, a brief description, distance from the Lake Charles Liquefaction Project, status, or timeframe, and resources cumulatively affected in conjunction with the Lake Charles Liquefaction Facility. Project locations are identified in figure 4.13.1-1. As noted in the following subsections, some projects were eliminated from further discussion if it was determined that they would not meet the criteria listed above or if sufficient information is not available to allow for a meaningful analysis. Descriptions of potential cumulative impacts by resource category are presented in section 4.13.2. Impacts associated with maintenance of the existing Trunkline LNG Terminal and Trunkline pipeline facilities and permanent rights-of-way near the proposed new and modified pipeline facilities would also contribute to cumulative impacts and were considered in this analysis. In cases where quantitative information is not available for projects considered in this analysis (e.g. projects in the planning stages, or those contingent on economic conditions, availability of financing, or the issuance of permits), the potential impacts of those projects are considered qualitatively.

As discussed in other sections of this EIS, Lake Charles LNG proposes not to restore the ACWs that would be used during construction of the liquefaction facility to preconstruction condition after construction is complete. In accordance with landowner agreements, these areas would be cleared and slightly elevated, making them more suitable for landowners' future development plans. Although it is possible that some or all of these areas may be developed in the future, no specific plans have been announced, proposed, or approved. Therefore, potential cumulative impacts associated with possible future development of the ACWs cannot be evaluated.

TABLE 4.13.1-1

Reasonably Foreseeable Activities and Projects Considered in the Cumulative Impact Analysis[a] for the Lake Charles Liquefaction Project

Activity/Project	Location	Distance from Project (miles)	Description	Timeframe	Resources Cumulatively Affected[b]
INDUSTRIAL DEVELOPMENTS					
LNG Export Projects					
Sabine Pass LNG	Sabine Pass, TX	42	Sabine Pass LNG is building a liquefaction facility with a send out capacity of 2.0 Bcf/d on an 833-acre site adjacent to its existing Sabine Pass LNG Terminal. The project sponsor estimates that the project will create 356 permanent jobs, 589 new indirect jobs, and 3,000 construction jobs.	Construction in progress with two trains scheduled to be in service in 2016, two trains scheduled to be in service in 2017. Application for two additional trains filed in September 2013 is undergoing FERC review. If approved, these two trains are scheduled to be in service in 2019.	None Anticipated
Golden Pass LNG Liquefaction	Jefferson County, TX	44	Golden Pass Products LLC and Golden Pass Pipeline LLC propose to build a liquefaction facility with a send out capacity of 2.7 Bcf/d. The facility would be contiguous to and integrated with the existing 300-acre Golden Pass LNG terminal site, with about 275 additional acres required, as well as associated natural gas pipeline, compression, and other related facilities. The project sponsor estimates the project would create 45,000 direct and indirect construction jobs for 5 years, and 3,800 direct and indirect operational jobs over the life of the project.	FERC application was filed in July 2014 and is under review. Application indicated terminal construction start June 2015, pipeline construction start June 2017. Anticipated start-up dates for the three proposed liquefaction trains in September 2019, March 2020, and September 2020.	None Anticipated
Cameron LNG Liquefaction	Cameron Parish, LA	5	Cameron LNG is building a liquefaction facility with a send out capacity of 1.8 Bcf/d, 2 LNG carrier berths, connecting pipeline and 3 LNG storage tanks. The facility will be located on a 503-acre site north of Hackberry, Louisiana on the Calcasieu Ship Channel. In addition, Cameron LNG plans to construct two additional liquefaction trains (Trains 4 and 5) with a capacity of 4.985 MTPA and a fifth 160,000-m3 LNG storage tank (Tank 5). The project sponsor estimates the project will create 135 permanent jobs, and up to 3,900 construction jobs.	FERC authorized the project in June 2014 and issued a Notice to Proceed with Site Preparation in July 2014. Construction commenced in October 2014. Anticipated operations for Trains 1, 2, and 3 in early, mid, and end of 2018, respectively. On March 2, 2015, the FERC initiated its pre-filing process for Trains 4 and 5, with a capacity of 4.985 MTPA, and a fifth 160,000-m3 LNG storage tank (Tank 5). Trains 4 and 5 are anticipated to begin operation in 2019.	GW, SW, AR, LS, S, RT, VT, R, A

TABLE 4.13.1-1 (cont'd)

Reasonably Foreseeable Activities and Projects Considered in the Cumulative Impact Analysis[a] for the Lake Charles Liquefaction Project

Activity/Project	Location	Distance from Project (miles)	Description	Timeframe	Resources Cumulatively Affected[b]
Magnolia LNG Liquefaction	Lake Charles, LA (Calcasieu Parish)	<1	Magnolia proposes to build a liquefaction facility with a send out capacity of 1.07 Bcf/d. The facility would be located on 90 acres of land at the Port's Industrial Canal, off the Calcasieu Ship Channel. The project sponsor estimates the project would create 70 permanent jobs, 175 new indirect jobs, and 1,000 construction jobs.	FERC application was filed in April 2014. Scheduled in-service dates for proposed liquefaction Trains 1, 2, 3, and 4, assuming receipt of regulatory approvals, are June 2018, September 2018, December 2019, and March 2019, respectively.	GW, SW, W, VW, AR, LS, S, RT, VT, LU, R, A, N
Venture Global Calcasieu Pass Project	Cameron Parish, LA	23	Venture Global Calcasieu Pass, LLC (Venture Global) plans to develop an LNG export facility with a send out capacity of 1.34 Bcf/d. The facility would be located on a 203-acre site adjacent to the Calcasieu Ship Channel. The facility would use single mixed refrigerant blocks capable of producing a total of 10 million metric tons per annum of LNG. The project would include two marine berths and two LNG storage tanks, as well as two natural gas lateral pipelines, 19 miles long and 24 miles long. The project sponsor estimates that the project would create 625 construction jobs and 175 indirect jobs during construction, and about 93 full-time jobs during operation.	FERC initiated its pre-filing process on October 10, 2014. Anticipated construction start in October 2016 to meet December 2019 in-service date.	None Anticipated
Gasfin LNG Export Project	Cameron Parish, LA	23	Gasfin Development USA, LLC (Gasfin) plans to construct, own, and operate an LNG liquefaction and export facility with a send out capacity of 0.2 Bcf/d. The facility would be located on a 35-acre site along the Calcasieu River. Only limited public information is currently available for the Gasfin LNG project. As such, it is considered tentative at this stage.	Gasfin has not requested to initiate the FERC's pre-filing process, and has not announced a schedule.	None Anticipated

TABLE 4.13.1-1 (cont'd)

Reasonably Foreseeable Activities and Projects Considered in the Cumulative Impact Analysis[a] for the Lake Charles Liquefaction Project

Activity/Project	Location	Distance from Project (miles)	Description	Timeframe	Resources Cumulatively Affected[b]
Waller Point LNG	Cameron Parish, LA	22	Waller LNG has announced plans to develop a liquefaction facility with a send out capacity of 0.16 Bcf/d. The facility would be located on a 180-acre site. The project sponsor estimates the project would create 100 to 200 permanent jobs and 250 to 350 construction jobs. Only limited public information is currently available for the Waller LNG project. As such, it is considered tentative at this stage.	Waller LNG has not requested to initiate the FERC's pre-filing process and has not announced a schedule.	None Anticipated
SCT&E LNG	Cameron Parish, LA	22	SCT&E LNG has announced plans to develop a liquefaction facility with a send out capacity of 1.6 Bcf/d. The facility would be located on a 246-acre site on Monkey Island near the Calcasieu River and the Calcasieu Pass/Cameron Loop. SCT&E LNG plans for six liquefaction trains, each capable of producing up to 2 million tons of LNG per year.	SCT&E LNG has not requested to initiate the FERC's pre-filing process and has not announced a schedule.	None Anticipated
Pipeline System Projects					
Kinder Morgan Louisiana Pipeline LLC (KMLP) Lake Charles Expansion Project	Acadia, Calcasieu, and Evangeline Parishes, LA	<1	KMLP proposes to construct a new greenfield compressor station consisting of four 16,000 hp gas-fired turbine units near Eunice, LA, as well as miscellaneous pipeline facilities, meter station, and existing meter station modifications to provide a connection to a new delivery point at the proposed Magnolia LNG Terminal.	FERC application was filed June 2014. KMLP anticipates beginning construction in January 2017 to meet a January 2018 in-service date.	GW, S, RT, A
Cameron Interstate Pipeline, LLC (Cameron Interstate) – Cameron Pipeline Expansion	Cameron and Beauregard Parishes, Louisiana	14	Cameron Interstate will construct and operate about 21 miles of new 42-inch-diameter pipeline to enable bi-directional flow on its existing pipeline system, as well as a new 56,820 hp compressor station and interconnection facilities.	FERC granted Notice to Proceed with construction on October 31, 2014. Construction started in late 2014 with an anticipated 2017 in-service date.	GW, S, RT, A
Columbia Gulf Transmission, LLC/Cameron Access Project	Jefferson Davis, Calcasieu, and Cameron Parishes, LA	3	Columbia Gas Transmission plans to construct about 27 miles of greenfield pipeline, about 7 miles of loop pipeline, and a greenfield compressor station.	FERC application was filed March 2014, applicant anticipates starting construction in September 2016 and a December 2017 in-service date.	GW, S, RT, A

TABLE 4.13.1-1 (cont'd)

Reasonably Foreseeable Activities and Projects Considered in the Cumulative Impact Analysis[a] for the Lake Charles Liquefaction Project

Activity/Project	Location	Distance from Project (miles)	Description	Timeframe	Resources Cumulatively Affected[b]
Other Industrial Facilities					
G2X Energy, Inc. /Big Lake Fuels LLC	Lake Charles, LA (Calcasieu Parish)	<1	G2X proposes to build a natural gas-to-gasoline plant on 200 acres of land along the Industrial Canal at the Port of Lake Charles. The company estimates the project would create 243 new direct jobs and 748 new indirect jobs.	Air permits to construct and operate the facility were received in May 2014. Construction anticipated to begin in 2015. The facility is anticipated to be in operation in 2017.	GW, SW, W, VW, AR, LS, S, RT, VT, LU, R, A, N
IFG Port Holdings	Lake Charles, LA (Calcasieu Parish)	7	IFG is dismantling its existing facility and building a new export grain terminal. The project is expected to create 36 new direct jobs, and 20 indirect jobs will be created along with 200 temporary construction jobs.	Under construction. Anticipated to be completed in spring 2015.	VT, RT
Juniper GTL, LLC	Westlake, Calcasieu Parish, Louisiana	8	Juniper GTL, LLC plans to convert a dormant steam methane reformer to a natural gas-to-liquids facility. The project is estimated to create 125 construction jobs, 29 new direct jobs, and 112 new indirect jobs	Under construction. Anticipated completion in November 2015.	GW, S, RT, A
Sasol North America, Inc.	Westlake, LA (Calcasieu Parish)	9	Sasol proposes to build an ethane cracker complex in Westlake, LA. This new facility is expected to create 500 direct jobs.	Subject to regulatory approvals, the new ethane cracker is scheduled to be completed and operational by 2018.	GW, S, RT, A
Westlake Chemical Corporation	Lake Charles, LA (Calcasieu Parish)	5	Westlake Chemical Corporation plans to expand the capacity of its Petro 1 ethylene unit at the existing Lake Charles facility. Very limited information is publicly available at this time.	Late 2015 or early 2016 timeframe.	GW, S, RT, A
Utilities and Transportation					
Cove Lane Interchange Project	Cameron and Calcasieu Parishes, LA	5	The DOTD is constructing a three-phase road improvement project.	Under construction; anticipated to be completed in spring 2015.	None Anticipated
Entergy 230 kV Electrical Transmission Line	Cameron and Calcasieu Parishes, LA	5	Entergy planning 12-mile-long electrical transmission line to provide power to the Cameron LNG Liquefaction Project.	To be constructed concurrently with Cameron LNG Liquefaction Project.	S, RT, R, A

TABLE 4.13.1-1 (cont'd)

Reasonably Foreseeable Activities and Projects Considered in the Cumulative Impact Analysis[a] for the Lake Charles Liquefaction Project

Activity/Project	Location	Distance from Project (miles)	Description	Timeframe	Resources Cumulatively Affected[b]
Entergy Electrical Transmission Line and Substation	Calcasieu and Beauregard Parishes, LA	0	Entergy plans to construct a 19-mile-long 230 kV electric transmission line and a new substation to provide incremental power for the proposed Lake Charles LNG's liquefaction facility.	Timing dependent on approval of Lake Charles Liquefaction Project.	W, VW, S, RT, LU, R, A, N
Entergy Electric Transmission Line and Substation	Calcasieu Parish, LA	0	Entergy plans to construct a 1.3-mile-long, 230 kV electric transmission line from the existing Graywood substation to a new switching station to provide power for the Magnolia LNG Project.	Timing dependent on approval of Magnolia LNG and Lake Charles Expansion Projects.	W, VW, S, RT, LU, R, A, N
Cleco Electric Transmission Line	Acadia Parish, LA	<1	Cleco plans to construct a 1-mile-long, 34.5 kV electric transmission line from its existing distribution line to provide power for the KMLP Lake Charles Expansion Project.	Timing dependent on approval of Magnolia LNG and KMLP Lake Charles Expansion Projects.	GS, W, VW, S, RT, LU, A, N
Calcasieu Parish District 12 Water Works Tie-in	Calcasieu Parish, LA	<1	Calcasieu Parish District 12 Water Works would install an interconnect with its existing 12-inch-diameter water pipeline to provide potable water for the Magnolia LNG Project.	Timing dependent on approval of Magnolia LNG and KMLP Lake Charles Expansion Projects.	GS, GW, VW, S, RT, LU, R, A, N
COMMERCIAL DEVELOPMENTS					
Golden Nugget Casino	Lake Charles, LA (Calcasieu Parish)	6	The 740-room Golden Nugget Casino and resort was constructed on 242 acres of land owned by Lake Charles Harbor and Terminal District. The project will provide 1,500 permanent jobs.	Opened for business in December 2014.	GW, SWAR, S, RT A
Chennault International Airport	Lake Charles, LA (Calcasieu Parish)	11	Chennault International Airport recently expanded the airport facilities to include the addition of a 112,000- to 115,000-square-foot maintenance and repair hanger. It is estimated that this hanger will provide 500 jobs.	Construction completed in October 2014.	GW, S, RT, A
Northrop Grumman	Lake Charles, LA (Calcasieu Parish)	11	Northrop Grumman is adding a 25,000-square-foot multi-purpose building at the Chennault International Airport that will result in additional employment.	Construction completed.	GW, S, RT, A

TABLE 4.13.1-1 (cont'd)

Reasonably Foreseeable Activities and Projects Considered in the Cumulative Impact Analysis[a] for the Lake Charles Liquefaction Project

Activity/Project	Location	Distance from Project (miles)	Description	Timeframe	Resources Cumulatively Affected[b]
Port of Lake Charles	Lake Charles, LA (Calcasieu Parish)	6	Project to improve the railroads to handle traffic associated with transit between the Chennault International Airport and City Docks. Two more docks will also be added to Bulk Terminal 1. Anticipate 60 to 80 jobs to accommodate growth and 150 permanent operational jobs.	Unavailable.	S, RT
Sowela Training Facility	Lake Charles, LA (Calcasieu Parish)	10	The State of Louisiana has invested $20 million for a training center at SOWELA Technical Community College to support the construction for Sasol Ltd.	Under construction.	GW, S, RT, A
GOVERNMENT FACILITIES/ACTIVITIES					
COE Maintenance Dredging of Calcasieu River	Cameron and Calcasieu Parishes, LA	2	The COE conducts periodic dredging along the 68-mile Calcasieu River and navigation channel.	Dredging is ongoing on a bi-annual basis in the project area.	GS, SW, AR, LS, VT, R, A, N
Louisiana Marine Fisheries Enhancement, Research, and Science Center	Lake Charles, Calcasieu Parish, Louisiana	1	A new marine fisheries research center would be constructed on about 12 acres within a larger property. Construction would require about 30 people. Facility would be operated by 8 permanent staff.	In permitting. Final design and permitting would require about 18 months once funding is procured. Construction anticipated to take 16-24 months.	GS, GW, SW, W, VW, AR, S, RT, LU, R, A, N
RESIDENTIAL DEVELOPMENTS					
Graywood	Lake Charles, Calcasieu Parish, Louisiana	2	Planned community consisting of five neighborhoods and sports facilities.	Under construction	GW, S, RT, A
Belle Savanne	Sulphur, Calcasieu Parish, Louisiana	7	Mixed residential and commercial development, initially on 27 acres, to expand to about 300 acres.	Under construction	GW, S, RT, A
Pelican Lodge Workforce Housing	Lake Charles, Calcasieu Parish, Louisiana	11	New industrial employee temporary housing facility on 200 acres of Port of Lake Charles property. Anticipate 400 construction jobs. This facility will accommodate 4,000 workers.	Under construction. Anticipated to be completed in mid-2015.	GW, S, RT, A

TABLE 4.13.1-1 (cont'd)

Reasonably Foreseeable Activities and Projects Considered in the Cumulative Impact Analysis[a] for the Lake Charles Liquefaction Project

Activity/Project	Location	Distance from Project (miles)	Description	Timeframe	Resources Cumulatively Affected[b]
Walnut Grove Development	Lake Charles, Calcasieu Parish, Louisiana	8	Mixed residential and commercial development	Construction 2010 to 2019 Operation 2012 to 2019	GW, S, RT, A
Moss Lake Worker Village	Carlyss, Calcasieu Parish, Louisiana	5	Planned temporary housing project by First Flight Holdings, LLC on 100 acres of land on the Southland Field West Calcasieu Airport Property. The facility would provide temporary housing for workers employed to construct the Cameron LNG Liquefaction Project. The development would be designed to accommodate temporary housing for up to 2,500 workers	Calcasieu Planning and Zoning Board approved a conditioned zoning exception to allow the project. Construction not yet started.	GW, S, RT, A

[a] This table lists those projects that are most likely to contribute to the cumulative impacts within the vicinity of the proposed Lake Charles Liquefaction Project; it is not intended to provide an all-inclusive listing of projects in the region.

[b] A – Air
AR – Aquatic Resources
GS – Geology and Soils
GW – Groundwater
LS – Listed Species
LU – Land Use
N – Noise
R – Recreation
RT – Road Traffic
S – Socioeconomics
SW – Surface Water
VW – Vegetation and Wildlife
VT – Vessel Traffic
W - Wetlands

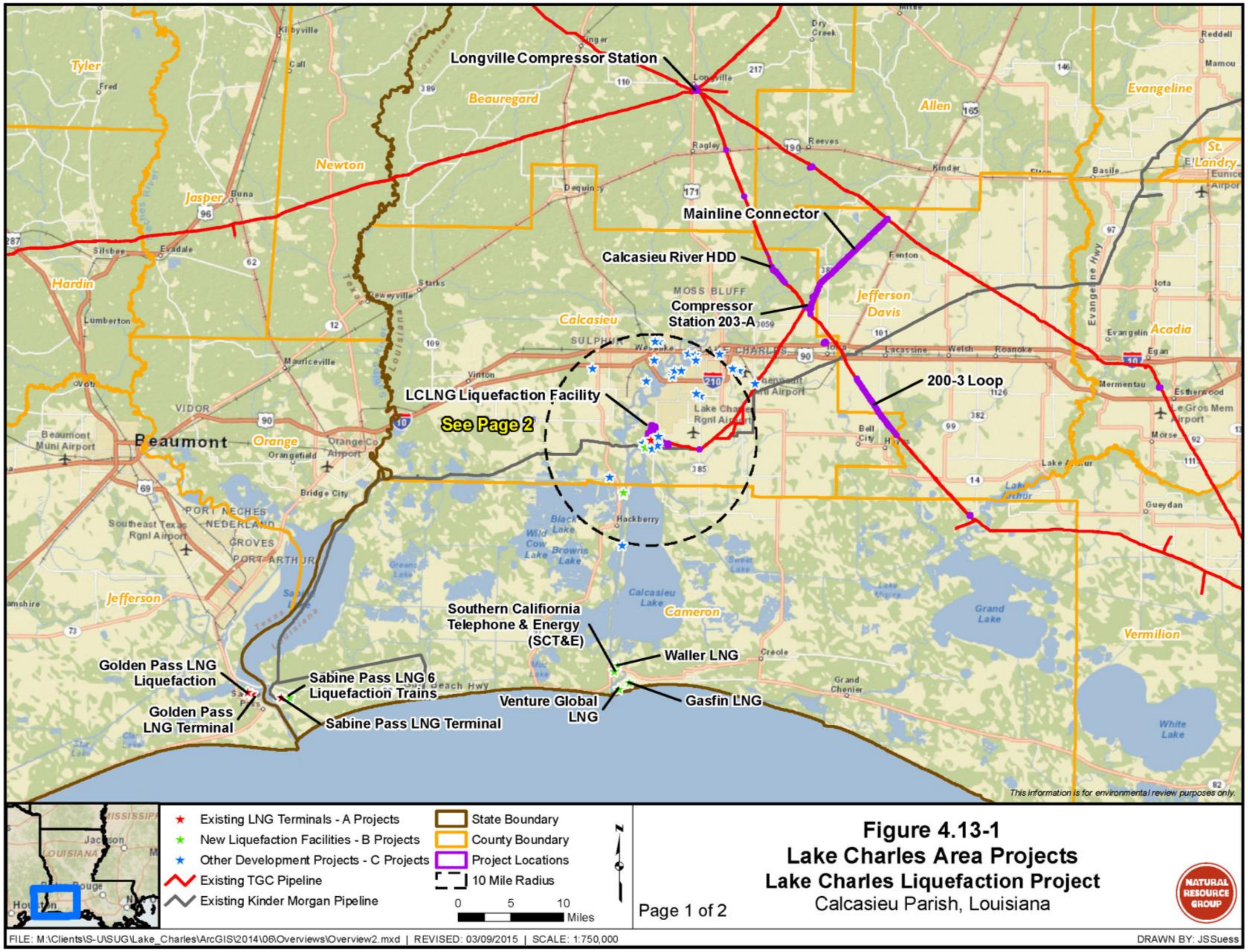

Figure 4.13-1
Lake Charles Area Projects
Lake Charles Liquefaction Project
Calcasieu Parish, Louisiana

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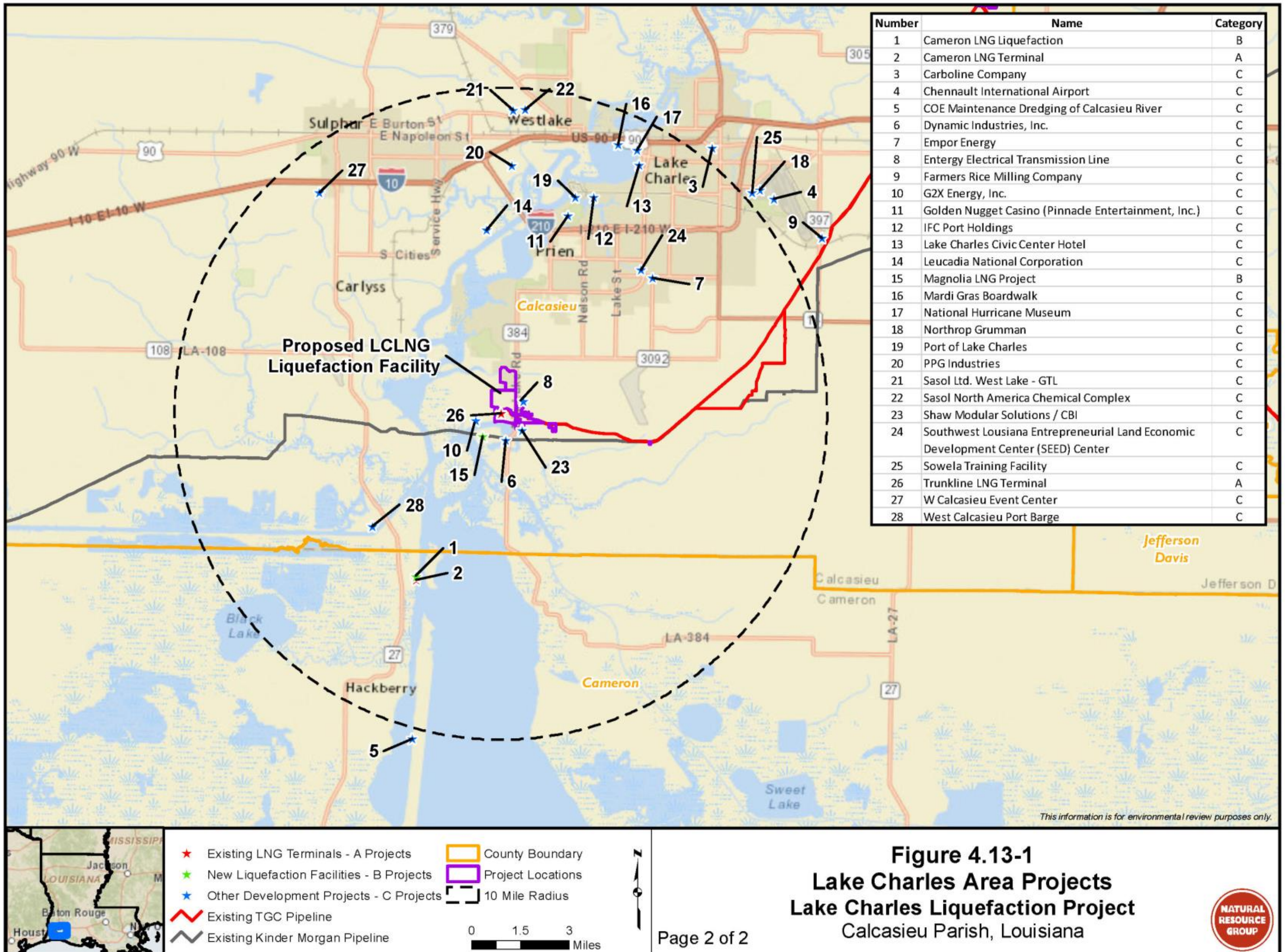

Number	Name	Category
1	Cameron LNG Liquefaction	B
2	Cameron LNG Terminal	A
3	Carboline Company	C
4	Chennault International Airport	C
5	COE Maintenance Dredging of Calcasieu River	C
6	Dynamic Industries, Inc.	C
7	Empor Energy	C
8	Entergy Electrical Transmission Line	C
9	Farmers Rice Milling Company	C
10	G2X Energy, Inc.	C
11	Golden Nugget Casino (Pinnacle Entertainment, Inc.)	C
12	IFC Port Holdings	C
13	Lake Charles Civic Center Hotel	C
14	Leucadia National Corporation	C
15	Magnolia LNG Project	B
16	Mardi Gras Boardwalk	C
17	National Hurricane Museum	C
18	Northrop Grumman	C
19	Port of Lake Charles	C
20	PPG Industries	C
21	Sasol Ltd. West Lake - GTL	C
22	Sasol North America Chemical Complex	C
23	Shaw Modular Solutions / CBI	C
24	Southwest Lousiana Entrepreneurial Land Economic Development Center (SEED) Center	C
25	Sowela Training Facility	C
26	Trunkline LNG Terminal	A
27	W Calcasieu Event Center	C
28	West Calcasieu Port Barge	C

Figure 4.13-1
Lake Charles Area Projects
Lake Charles Liquefaction Project
Calcasieu Parish, Louisiana

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4.13.1.1 LNG Liquefaction and Export Projects

We identified several liquefaction and export projects that are proposed, planned, or under construction in the vicinity of the proposed Lake Charles Liquefaction Project that have the potential to contribute to cumulative impacts when combined with the Lake Charles Liquefaction Project (see figure 4.13.1-1). In addition to the proposed Lake Charles Liquefaction Project, new liquefaction and export projects are proposed or underway at three other existing LNG terminals including the Sabine Pass, Golden Pass, and Cameron LNG terminals. The Sabine Pass and Cameron LNG liquefaction facilities are currently under construction, and the Golden Pass LNG Project is undergoing the FERC's environmental review. Two stand-alone liquefaction projects considered include the Magnolia LNG Project, which is undergoing the FERC's environmental review, and the Venture Global Calcasieu Pass Project, which is in the FERC's pre-filing process. Other planned liquefaction and export facilities in the general project area include the Gasfin, Waller Point, and SCT&E liquefaction projects, which have been announced but have yet not initiated the FERC's pre-filing process. Brief descriptions of each of the liquefaction and export projects are provided below. This cumulative impacts analysis considers the impacts of the potential construction and operation of the planned or proposed liquefaction and export projects.

Sabine Pass LNG Terminal and Liquefaction Project

The Sabine Pass LNG Terminal is in Cameron Parish, about 42 miles southwest of the proposed Lake Charles Liquefaction Project. The Sabine Pass Liquefaction Project was authorized by the Commission in April 2012[20] and is currently under construction adjacent to the Sabine Pass LNG Terminal. The initial phase of the project will include two liquefaction trains, Trains 1 and 2, which are expected to be placed into service in February and June 2016, respectively. The next phase, which is also under construction, will involve two more liquefaction trains (Trains 3 and 4), which are anticipated to be placed into service in April and August 2017, respectively. In September 2013, Sabine Pass filed an application to construct two additional liquefaction trains, Trains 5 and 6.[21] On December 12, 2014, the Commission issued an Environmental Assessment concluding that the approval of the project would not constitute a major federal action significantly affecting the quality of the human environment. If approved by the Commission, construction of Trains 5 and 6 could begin in mid-2015, with an anticipated in-service date of December 2019. Due to the distance of Sabine Pass LNG Terminal and Liquefaction Project from the proposed project, we do not believe it would contribute to the cumulative effects on any resources in the Lake Charles Liquefaction Project area, including air quality impacts as discussed in section 4.13.2.11.

Golden Pass LNG Terminal and Liquefaction Project

The Golden Pass LNG Terminal is in Jefferson County, Texas, about 44 miles southwest of the proposed Lake Charles Liquefaction Project (Golden Pass Products, LLC, 2014). Golden Pass Products, LLC filed its application with the FERC on July 7, 2014[22] to construct its Golden Pass Terminal Expansion Project for liquefaction of LNG at a facility contiguous to and integrated with the existing Golden Pass LNG terminal. The project would also include about 2.5 miles of natural gas pipeline, additional compression, and associated facility modifications. Due to the distance of this facility from the proposed Lake Charles Liquefaction Project, we do not believe the Golden Pass LNG terminal or the

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20 Docket No. CP11-72.

21 Docket No. CP13-552

22 Docket Nos. CP14-517 and CP14-518

associated liquefaction project would contribute to the cumulative effects on any resources in the Lake Charles Liquefaction Project area, including air quality impacts as discussed in section 4.13.2.11.

Cameron LNG Terminal and Liquefaction Project and Pipeline Expansion

The Cameron Liquefaction Project,[23] which was approved by the Commission in June 2014, will be located about 5 miles southwest of the Lake Charles Liquefaction Project within and immediately adjacent to the existing Cameron LNG Terminal in Cameron and Calcasieu Parishes, Louisiana (see figure 4.13.1-1) (FERC, 2014c). The project will include the construction and operation of three new liquefaction trains (about 5 mtpa for each train) scheduled to be completed in July 2017 (Train 1), January 2018 (Train 2), and July 2018 (Train 3). Also as part of this project, Cameron Interstate Pipeline, LLC will construct and operate 20.9 miles of new 42-inch-diameter natural gas pipeline, a new 56,280 hp compressor station, and appurtenant facilities in Cameron, Calcasieu, and Beauregard Parishes. Due to the potential overlapping construction schedules and proximity to the Lake Charles Liquefaction Project, the construction and/or operation of Cameron Liquefaction Project have the potential to contribute to the cumulative impacts on resources in the Lake Charles Liquefaction Project area.

Magnolia Liquefaction Project, Kinder Morgan Louisiana Pipeline (KMLP) Lake Charles

Magnolia filed an application with the FERC on April 30, 2014 for a stand-alone liquefaction and export facility in Calcasieu Parish, Louisiana less than 1 mile from the Lake Charles Liquefaction Project. The Magnolia LNG facility would be located west-southwest of the existing Trunkline LNG Terminal on the opposite (south) shore of the Industrial Canal off the Calcasieu Ship Channel (see figure 4.13.1-1). Magnolia's application is currently under review by the FERC.[24] If approved, Magnolia proposes to begin construction of four liquefaction trains (2 mtpa for each train) in 2015 and start commercial operation of the trains in a staggered fashion from June 2018 through March 2019. In an associated filing,[25] KMLP proposes to construct new natural gas header pipelines, modify certain existing interconnections, and construct a new compressor station in Acadia Parish, to connect the proposed Magnolia LNG terminal to its existing pipeline system. Construction and operation of the Magnolia Liquefaction Project would contribute to the cumulative impacts on resources in the Lake Charles Liquefaction Project area.

Venture Global Calcasieu Pass Project

Venture Global announced plans for a stand-alone LNG export terminal in Cameron Parish and has received DOE authorization for export to FTA countries (DOE, 2013b). Applications to increase export volumes and to export to non-FTA nations are pending before the DOE. The Venture Global Calcasieu Pass Project would be constructed about 23 miles south of the Lake Charles Liquefaction Project on the east side of the Calcasieu Ship Channel near the Gulf of Mexico (see figure 4.13.1-1). The Commission approved Venture Global's request to begin the pre-filing process on October 10, 2014.[26] Subject to the receipt of the necessary approvals, Venture Global plans to begin construction of the project in October 2016 to meet a December 2019 in-service date. Due to the location of this project, we do not believe construction and operation of the Venture Global Calcasieu Pass Project would contribute to cumulative impacts on resources in the Lake Charles Liquefaction Project area; therefore, we have not considered Venture Global Calcasieu Pass project in this analysis.

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23 Docket No. CP13-25

24 Docket No. CP14-347.

25 Docket No. CP14-511

26 PF15-2-000

Gasfin LNG Export Project

Gasfin announced plans for a stand-alone liquefaction and export project in Cameron Parish. The Gasfin LNG Export Project would be constructed about 23 miles south of the Lake Charles Liquefaction Project, on the east side of the Calcasieu Ship Channel (see figure 4.13.1-1). Gasfin has received DOE authorization for export to FTA countries, and has an application pending before the DOE for authorization to export to non-FTA countries (DOE, 2013a). The project is in the initial development phase and Gasfin has not requested initiation of the Commission's pre-filing process, nor released an anticipated schedule. Because the schedule and potential effects of the Gasfin LNG Project are unknown, it has not been included in this cumulative impact analysis.

Waller Point Liquefaction Project

Waller Point LNG announced plans for a stand-alone LNG export terminal in Cameron Parish. The Waller Point LNG Project would be constructed about 22 miles south of the Lake Charles Liquefaction Project on the western shore of the entrance to the Calcasieu Ship Channel (see figure 4.13.1-1). The project is in the initial development phase. Waller Point LNG has not submitted a request to enter the Commission's pre-filing process and a schedule has not been announced. Because the schedule and potential effects of this project are as yet unknown, it has not been included in this cumulative impact analysis.

Southern California Telephone & Energy Liquefaction Project

SCT&E LNG announced plans for a stand-alone LNG export terminal in Cameron Parish. The SCT&E LNG Project would be constructed about 22 miles south of the Lake Charles Liquefaction Project on Monkey Island near the eastern shore of the entrance to the Calcasieu Ship Channel (see figure 4.13.1-1). The project is in the initial development phase. SCT&E LNG submitted applications to the DOE to export to FTA and non-FTA countries in July 2014, but has not submitted a request to enter the Commission's pre-filing process or released an anticipated schedule. Because the schedule and potential effects of this project are as yet unknown, it has not been included in this cumulative impact analysis.

4.13.1.2 Pipeline System Projects

The KMLP Lake Charles Expansion Project and the Cameron Interstate Pipeline, LLC pipeline expansion are discussed above in conjunction with the Magnolia Liquefaction Project and the Cameron LNG Liquefaction Project, respectively.

Cameron Access Project

Columbia Gulf Transmission, LLC (Columbia Gulf) has initiated the FERC's pre-filing process for a project that would involve the construction of about 27 miles of 36-inch-diameter greenfield pipeline, about 7 miles of 30-inch-diameter loop pipeline, and a new 12,260-hp compressor station in Cameron, Calcasieu, and Jefferson Davis Parishes.27 At its closest point, the pipeline would be located about 3 miles south of the Lake Charles Liquefaction Facility. Columbia Gulf filed its application with the Commission in March 2015 and is requesting that the Commission provide a decision in time to allow for a September 2016 construction start and a December 2017 in-service date. Construction and operation of the Cameron Access Project has the potential to contribute to cumulative impacts on resources in the Lake Charles Liquefaction Project area.

[27] FERC Docket No. PF14-16-000

4.13.1.3 Other Industrial Facilities

G2X Energy Natural Gas-to-Gasoline Plant

G2X Energy's subsidiary, Big Lake Fuels LLC, plans to construct a natural gas-to-gasoline plant along the Industrial Canal of the Port of Lake Charles on a 200-acre site owned by the Lake Charles Harbor and Terminal District less than 1 mile west of the Lake Charles Liquefaction Project. The facility would convert domestic natural gas into about 12,500 barrels per day of sulfur, gasoline, and/or methanol. The project would be shipped to customers by marine vessels or by pipeline. Air permits for the project were issued in May 2014. G2X Energy expects to have construction of the facility completed by 2017. At the time this EIS was prepared, construction had not started on the project. If constructed, the G2X Energy Natural Gas-to-Gasoline Plant would contribute to the cumulative effects on resources in the Lake Charles Liquefaction Project area.

IFG Port Holdings, LLC Export Grain Terminal Expansion

IFG Port Holdings, LLC's export grain terminal at the Port of Lake Charles, is about 7 miles north-northeast of the Lake Charles Liquefaction Project site. The grain terminal is currently undergoing an extensive expansion and renovation while continuing to operate. When completed, the expanded and renovated facility will handle agricultural products such as rice, wheat, corn, soybeans, and dried distillers' grain for shipment to other countries. Construction of the expansion and renovations began in 2012 and is expected to be completed in 2015. These activities would be completed before the Lake Charles Liquefaction Project construction period, although operation of the facility would have the potential to contribute to the cumulative impacts on some resources in the Lake Charles Liquefaction Project area.

Juniper GTL, LLC – Gas-to Liquids Project

Juniper GTL, LLC (Juniper GTL) is renovating a dormant steam methane reformer at its Westlake chemical plant, about 8 miles north of the Lake Charles liquefaction facility site. The steam methane reformer will convert natural gas into synthesis gas, a combination of hydrogen and carbon monoxide, which is used to make products such as methanol and ammonia. The methane reformer will be part of a new $100 million natural gas-to-liquids facility, producing about 1,100 barrels per day of waxes, drilling fluids, diesel, and naptha. The new plant infrastructure is under construction and expected to be completed in 2015. Operation of the new facility would have the potential to contribute to cumulative impacts on some resources in the Lake Charles Liquefaction Project area.

Sasol North America, Inc. Projects

Sasol North America, Inc. (Sasol) operates a chemical complex in Westlake, Louisiana, just northwest of Lake Charles and the City of Lake Charles and about 9 miles directly north of the Lake Charles Liquefaction Project (Sasol, 2014). Sasol has announced plans to construct and operate an ethane cracker at the complex. The cracker would convert ethane contained in natural gas to ethylene, with a planned production rate of 1.5 million tons of ethylene and derivatives per year. Construction is anticipated to be completed by 2018, when the project is expected to become operational. The project would have the potential to contribute to cumulative impacts on some resources in the Lake Charles Liquefaction Project area.

Westlake Chemical Corporation – Petro 1 Ethylene Unit Expansion

Westlake Chemical Corporation's (Westlake Chemical) Lake Charles complex consists of three tracts within 2 miles of one another on over 1,300 acres, located about 5 miles northwest of the Lake Charles Liquefaction Project. The complex includes two ethylene plants, two polyethylene plants, and a styrene monomer plant. The combined capacity of the two ethylene plants is about 2.7 billion pounds per year. In the first quarter of 2013, Westlake Chemical completed the expansion of one of the ethylene units (Petro 2) and its conversion to 100 percent ethane feedstock capability, increasing ethylene capacity by about 240 million pounds annually. Westlake Chemical plans to expand the capacity of the other ethylene unit (Petro 1) in the late 2015 to early 2016 time frame. If constructed, construction and/or operation of this expansion would have the potential to contribute to cumulative impacts on some resources in the Lake Charles Liquefaction Project area.

4.13.1.4 Utilities and Transportation Projects

Louisiana Department of Transportation and Development Cove Lane Interchange Project

The primary roadways in the vicinity of the proposed Lake Charles Liquefaction Project are I-210 and I-10. The DOTD's Cove Lane Interchange Project in Calcasieu and Cameron Parishes is a three-phase project that includes a full interchange at Cove Lane and I-210, a roundabout at the intersection of Cove Lane and W. Prien Lake Road, and extension of Cove Lane north to connect with a new public roadway that will parallel I-210 on the north side of the interstate. The project is under construction and anticipated to be completed by spring 2015, prior to the commencement of construction for the Lake Charles Liquefaction Project. As a result, this project is not expected to contribute to the cumulative impact on resources in the Lake Charles Liquefaction Project area.

According to a review of public information on the Southwest Louisiana Alliance website for Calcasieu, Jefferson Davis, and Beauregard Parishes, there are no other new roadways planned in these parishes in the foreseeable future, and the only roadway projects likely to occur are maintenance projects, including resurfacing. As a result, land transportation projects are not expected to contribute to the cumulative impact on resources in the Lake Charles Liquefaction Project area.

Utilities

In the event that the Lake Charles Liquefaction and/or Magnolia LNG Liquefaction/KMLP Lake Charles Expansion Projects are approved, certain non-jurisdictional facilities would be constructed to serve the new facilities. Specifically, Entergy would to construct a 19-mile-long, 230 kV electric transmission line and a new substation to provide incremental power for the proposed Lake Charles LNG's liquefaction facility, and a 1.3-mile-long, 230 kV electric transmission line from the existing Graywood substation to a new switching station to provide power for the Magnolia LNG Project. Entergy would also construct minor facilities to provide power to Trunkline's proposed new Compressor Station 203-A and certain meter stations. Cleco would construct a 1-mile-long, 34.5 kV electric transmission line to provide power to the KMLP Lake Charles Expansion Project. Entergy also plans to construct a 12-mile-long, 230 kV electrical transmission line to provide power to the Cameron LNG Liquefaction Project.

In addition to the electric utilities, the Calcasieu Parish District 12 Water Works would construct an interconnect with an existing water pipeline to provide potable water for the Magnolia LNG Liquefaction facility.

4.13.1.5 Commercial and Residential Developments

Golden Nugget Casino and Hotel

Ameristar Casinos, Inc. began construction of a dockside casino and hotel on Lake Charles with an 18-hole golf course and other sport facilities in 2012. The project was sold in November 2013 to Golden Nugget, and construction was completed in December 2014. The resort will be about 6 miles north-northeast of the Lake Charles Liquefaction Project site on a 242-acre site adjacent to the L'Auberge Lake Charles Casino Resort. Construction of this facility is already completed, but operation of the casino could contribute to the cumulative impacts on some resources in the Lake Charles Liquefaction Project area.

Chennault International Airport Expansions

Chennault Airport, which is about 11 miles northeast of the Lake Charles Liquefaction Project, expanded to include the addition of a 112,000-square-foot maintenance and repair hangar at the Chennault International Airport in Lake Charles, Louisiana. Northrop Grumman is also adding a 25,000-square-foot maintenance repair center at the Chennault International Airport (Chennault International Airport, 2014). These expansions could potentially contribute to the cumulative impacts on certain resources in the Lake Charles Liquefaction Project area; however, the cumulative impacts would likely be minor given the distance and localized nature of the airport activities.

Port of Lake Charles

The Port of Lake Charles is planning rail improvements to handle traffic associated with transit between Chennault International Airport and the City Docks. In addition, two more docks will be added to Bulk Terminal 1. The proposed improvements would contribute to the cumulative impact on some resources in the Lake Charles Liquefaction Project area.

Southwest Louisiana Technical Community College Training Facility

The Southwest Louisiana Technical Community College (SOWELA) is in the process of constructing a training facility to provide work programs and training services to meet the demands of new and expanded petrochemical facilities in southwestern Louisiana. Construction of the facility started in October 2014. The SOWELA Training Facility could potentially contribute to the cumulative impact on some resources in the Lake Charles Liquefaction Project area; however, the cumulative impacts would likely be minor given the distance between the two projects.

Graywood Community

Graywood Community is a planned community in South Lake Charles, Louisiana located about 2 miles north of the Lake Charles Liquefaction Project facility site. The complex encompasses about 2,000 acres and includes five neighborhoods with mixed housing options, sports facilities, and other amenities. A sixth land tract is in the preliminary planning phase. The Graywood Community would have the potential to contribute to cumulative impacts on some resources in the Lake Charles Liquefaction Project given the short distance between the two projects, particularly if construction activities occur during the same timeframe.

Belle Savanne Residential/Commercial Development

The proposed Belle Savanne residential/commercial development is located in the Sulphur/Carlyss west of Lake Charles, about 7 miles northwest of the Lake Charles Liquefaction Project facility site. Phase I of the greenfield project would involve the construction of single-family residences on about 100 acres; Phase II would include multi-family residences and about 100,000 square feet of commercial development. Phase I land clearing began in late 2013/early 2014 and phased construction would likely be ongoing for several years. Construction of the Belle Savanne residential/commercial development would have the potential to contribute to cumulative impacts on some resources in the Lake Charles Liquefaction Project area, particularly if the construction activities occur during the same timeframe.

Pelican Lodge Workforce Housing

In November 2013, Greenfield Logistical Solutions of Louisiana LLC (Greenfield) began construction of the Pelican Lodge workforce housing complex located on a 200-acre property owned by the Port of Lake Charles about 11 miles northeast of the Lake Charles Liquefaction Project facility site. The $70 million complex will provide about 400 construction jobs and house up to 4,000 temporary construction personnel working on multiple development projects in the Lake Charles area over the next several years. In addition to housing and recreational amenities, workers will be provided transportation to and from job sites. Construction will follow a three-phased approach and is expected to be completed in mid-2015. The Pelican Lodge workforce housing complex would have the potential to contribute to cumulative impacts on some resources in the Lake Charles Liquefaction Project area.

Walnut Grove Development

The proposed Walnut Grove residential/commercial development is located on a 60-acre property on the north side of Contraband Bayou in Lake Charles, about 7 miles north northeast of the Lake Charles Liquefaction Project facility site. The proposed development includes various residence types, parks, and a town square. Construction began in 2009/2010 and is ongoing. The Walnut Grove development would have the potential to contribute to cumulative impacts on some resources in the Lake Charles Liquefaction Project area, particularly if the construction activities occur during the same timeframe.

Moss Lake Worker Village

First Flight Holdings, LLC (First Flight) plans to develop a temporary workforce housing complex on 100 acres of leased property at the Southland Field West Calcasieu Airport in Carlyss, about 5 miles west northwest of the Lake Charles Liquefaction Project site. The planned community is designed to accommodate varying workforce numbers, with 2,500 personnel at peak occupancy. In addition to temporary housing and recreational amenities, workers will be provided transportation to and from job sites. Based on First Flight's initial proposal, permanent infrastructure would remain in place after the temporary village has been removed allowing the complex to shelter families during any future natural disaster. In June 2014, the Calcasieu Parish Planning and Zoning board voted to approve a conditioned zoning exception to allow the workforce housing project. When the facility is no longer needed for construction workers, First Flight would have 6 months to remove the residential pods. The Moss Lake Worker Village would have the potential to contribute to cumulative impacts on some resources in the Lake Charles Liquefaction Project area, particularly if the construction activities occur during the same timeframe.

4.13.1.6 Government Activities

Dredging Projects

The COE conducts maintenance dredging in the Calcasieu Ship Channel. The frequency of dredging varies by reach, and is generally every other year in the portion of the channel adjacent to the Industrial Canal and existing Trunkline LNG terminal. The next anticipated dredging of the channel in the project area is currently anticipated to take place in 2015 (American Press, 2014). If maintenance dredging in the project area coincides with construction of the Lake Charles Liquefaction Project, it would contribute to the cumulative impact on some resources in the project area.

Louisiana Department of Wildlife and Fisheries - Louisiana Marine Fisheries Enhancement, Research, and Science Center

The Louisiana Marine Fisheries Enhancement, Research, and Science Center (Marine Center) would be a new facility developed as part of the compensation proposed under the Natural Resources Damage Assessment for the 2010 Deepwater Horizon Oil Spill in the Gulf of Mexico. The Marine Center would occupy two sites, one in Calcasieu Parish and one in Plaquemines Parish, Louisiana. The stated project goal is to establish state of the art facilities to responsibly develop aquaculture-based techniques for marine fishery management.

The Marine Center would be located on a 320-acre privately owned undeveloped tract, located about 1 mile south of the Lake Charles Liquefaction Project site, south of the Turning Basin and Henry Pugh Boulevard. The actual facility would occupy a small portion (about 12 acres) of the full tract. The proposed facilities include a multi-purpose building (including a hatchery) and pond complex to be used for marine fisheries research, production, education, and outreach. Water would be sourced from proposed on-site wells and the Turning Basin in the Industrial Canal. Water from the Turning Basin would enter a submersed intake structure and would be pumped to the site through a buried 10-inch-diameter pipeline. Two on-site wells are proposed, one for potable water and another for process water. Treated effluent would be discharged through a buried 24-inch-diameter pipeline and an outfall structure to an un-named tributary of the Calcasieu River and the Gulf Intracoastal Waterway, about 1,000 feet to the north.

In June 2014, the federal and state natural resource trustee agencies issued a Programmatic and Phase III Early Restoration Plan and Early Restoration Programmatic Environmental Impact Statement (Phase III ERP/PEIS) as part of the Natural Resource Damage Assessment for the Deepwater Horizon Oil Spill. The Phase III ERP/PEIS includes a detailed discussion of the Marine Center. A subsequent Record of Decision was issued in October 2014 in which the trustee agencies decided to implement 44 projects, including the center.

4.13.2 Potential Cumulative Impacts by Resource

The following sections address the potential cumulative impacts of the Lake Charles Liquefaction Project and the other projects identified within the cumulative impact area on specific environmental resources. The other projects considered in each section are those for which impacts on the resource(s) discussed would be within the same region of influence as those that would result from the Lake Charles Liquefaction Project and would occur within the same timeframe.

4.13.2.1 Geologic Conditions

The cumulative impact area for geologic resources and hazards was considered to be the area that would be affected by and adjacent to proposed construction areas for the Lake Charles Liquefaction Project.

The Lake Charles Liquefaction Project would not materially impact (i.e., permanently curtail or preclude the extraction of) marketable mineral resources in the project area. As discussed in section 4.1.2, there is an active gas and condensate producing well within the proposed liquefaction facility site. Lake Charles LNG are discussing a buyout of the active well with the well owner (i.e., Jordan Oil) and royalty owners, and have indicated that the well would be plugged and abandoned by Jordan Oil prior to the start of construction.

At the proposed liquefaction facility site, Lake Charles LNG would modify the existing topographic contours to accommodate its equipment and facilities and maintain adequate drainage from the site. This would involve cutting, filling, and grading activities as well as raising the elevation of the site and at the ACWs. The original topography and contours of the site and raised ACWs would not be restored following construction. Additionally, Lake Charles LNG would construct buildings and critical equipment at the liquefaction facility to an elevation of 15 feet AMSL to minimize the risk of flash flood and/or storm surge damage. These changes in elevation and topography would reduce the flood retention capacity of the liquefaction facility site and ACWs, which are located within the 100-year floodplain of the Calcasieu River. In the event of a major river flood, floodwater that would have normally spilled out onto the site and ACWs would be diverted to other areas, potentially increasing the risk of flooding in these areas. To the extent that the Magnolia LNG and G2X Energy Projects also require minor topographic changes at their respective sites that result in similar losses of flood retention capacity, there could be a cumulative impact on the floodplain of the river. However, given the acreages involved compared to the total flood retention capacity of the entire river basin, the effect would be likely be insignificant. The potential for cumulative impacts on other geologic conditions would be minor.

Construction and operation of the Non-Liquefaction Facilities would not contribute significantly to cumulative geology impacts. The proposed pipeline facilities and existing facility modifications would occur largely within previously disturbed areas, and the proposed new aboveground facilities would occupy relatively small footprints at various locations. Trunkline does not anticipate any blasting would be necessary in these areas and, following construction, would restore topographic contours along the pipeline rights-of-way and temporary workspaces for aboveground facilities to preconstruction conditions to the extent practicable. Therefore, the cumulative impact of the Non-Liquefaction Facilities on geologic resources would be negligible.

4.13.2.2 Soils

The cumulative impact area for soils was considered to be the area affected by and adjacent to the proposed construction areas for the Lake Charles Liquefaction Project. Soil resources in the vicinity of the proposed project have been affected by past and ongoing agricultural and commercial forestry processes and construction and maintenance of existing roads, railroads, natural gas and oil pipelines, utility lines, electrical transmission line rights-of-way, and the existing Trunkline LNG terminal. Construction activities such as clearing, grading, trench excavation, backfilling, and the movement of construction equipment may affect soil resources. Clearing would remove the protective vegetative cover and expose the soil to the effects of wind and rain, which would increase the potential for soil erosion and sedimentation of sensitive areas. Grading, spoil storage, and equipment traffic could compact soil, reducing porosity and increasing runoff potential. Lake Charles LNG and Trunkline would implement the FERC's Plan and Procedures, or alternative measures where justified, to protect soil resources and minimize soil impacts. This would include applying measures to control erosion and sedimentation during construction and ensuring proper restoration and revegetation of disturbed areas. As a result, most project-related impacts on soils would be short term. The greatest impact on soils would occur within areas permanently occupied by the proposed new aboveground facilities that would be paved, graveled, or covered with other fill material, and within the ACWs to be used during construction of the liquefaction facility that would not be restored to preconstruction condition.

Entergy's construction of the new non-jurisdictional substation and electric transmission line to provide power to the liquefaction facility would require some soil disturbance during construction that would result in similar short-term, localized impacts to those described above, and small areas of permanent conversion to impervious ground surface. The other Lake Charles area projects would not affect soils resources within the Lake Charles Liquefaction Project construction area. Additionally, the permanent or long-term soil impacts that would occur as a result of the Lake Charles Liquefaction Project would be localized within the area of the liquefaction facility and would not contribute significantly to cumulative impacts on soils.

4.13.2.3 Water Resources

The cumulative impact area established for groundwater resources includes the Chicot aquifer underlying the majority of the proposed Lake Charles Liquefaction Project. The cumulative impact areas associated with surface water resources are the Industrial Canal, Turning Basin, the Calcasieu Ship Channel, and the pipeline stream crossings. Beyond these areas, we expect suspended sediments would settle out from the water column and be re-deposited as a result of the relatively low flow rates of the affected waterbodies.

Several other LNG export projects are planned within the same region as the Lake Charles Liquefaction Project which would also result in ballast water discharges in the Calcasieu Ship Channel. However, all of the projects are expected to follow Coast Guard regulations with regard to ballast water. We do not anticipate the Lake Charles Liquefaction Project would contribute significantly to cumulative impacts associated with the intake or discharge of ballast water. Lake Charles LNG anticipates that a minimal number of the barges used for construction of the proposed liquefaction facility would have to take on or discharge ballast water, and Lake Charles LNG did not request an increase in the number of LNG carriers currently authorized to use the existing terminal during operation of the new liquefaction facility.

Lake Charles LNG would use about 65 million gallons of groundwater from the Chicot aquifer for construction of the proposed liquefaction facility. About 45 million gallons of this water would be obtained from two existing on-site wells and from two proposed new wells at the liquefaction facility site. This water would be obtained at a typical withdrawal rate of 56 gpm, with an anticipated peak withdrawal rate of 166 gpm. These withdrawal rates would be minor relative to the more than 10 million gpm that are currently withdrawn from the Chicot aquifer (DOTD and USGS, 2011). The remaining 20 million gallons of groundwater would come from the City of Lake Charles via its 17 municipal supply water wells. Lake Charles LNG has received the City's approval for this water.

The nearest offsite well (also drawing water from the Chicot aquifer) is more than 150 feet from the Lake Charles Liquefaction Project site. We were unable to quantify the water withdrawal from this well. We were also unable to accurately quantify the groundwater withdrawals required for construction of all of the other planned and proposed projects, but we assume their requirements would be similar in magnitude to the Lake Charles Liquefaction Project. If so, the greatest cumulative use of groundwater would occur during the construction of these projects to the extent they are built at the same time. However, the duration of this cumulative effect would be temporary, primarily limited to the construction period, and the overall cumulative impact would be negligible compared to the overall aquifer withdrawal rates.

During operation of the Lake Charles Liquefaction Project, water would be obtained from the City of Lake Charles municipal supply and the two proposed wells at the liquefaction facility. Lake Charles LNG estimates that the total daily average water consumption for plant operations would be 158,400 gallons per day, which would represent about 0.024 percent of the 648 million gallons withdrawn from the Chicot aquifer on a daily basis (DODT and USGS, 2011). Based on its FERC application, operation of the Magnolia LNG Liquefaction Project would require 170,707 gallons per day, which would be obtained from the Calcasieu Parish District No. 12 Water Works and from two new on-site groundwater wells. We were unable to quantify the groundwater withdrawals that would be required during operation of the other reasonably foreseeable projects listed in table 4.13.1-1; it is possible that several of these projects would have similar water requirements as the Lake Charles Liquefaction Project. The project is not located in an "Area of Groundwater Concern" or "Critical Area of Groundwater Concern," which are areas that could require groundwater withdrawal restrictions. As a result, while there would be localized minor effects, such as the lowering of the water table at the point of withdrawal, we do not expect there to be a significant cumulative impact on groundwater during the concurrent operation of these facilities.

Construction of the proposed work docks would include dredging about 26,000 cubic yards of material from 22.1 acres within the Industrial Canal/Turning Basin adjacent to the existing Trunkline LNG terminal. Lake Charles LNG's contribution to cumulative impacts from dredging would be smaller than those of other projects since the project would make use of the existing marine berths at the Trunkline LNG Terminal. Based on available information, the G2X and Magnolia LNG Liquefaction Projects may require dredging of about 863,000 cubic yards and 650,000 cubic yards, respectively, for development of their new marine berths.

If the proposed dredging for the Lake Charles Liquefaction Project in the Industrial Canal/Turning Basin were to occur at the same time as the dredging for G2X and Magnolia LNG Liquefaction Projects and/or concurrently with nearby COE maintenance dredging of the Calcasieu Ship Channel, the adverse impacts on water quality (e.g., increased turbidity, total suspended solids, release of nutrient-bound contaminants) in the project area could be exacerbated. However, dredging impacts tend to be localized (i.e., generally confined to the areas close to the dredging activity) and limited primarily to the time when the dredging is taking place (i.e., the effects cease soon after the dredging stops). Pile driving and sheet pile installation during in-water construction of the Lake Charles Liquefaction, Magnolia LNG Liquefaction, and G2X Projects, if these activities should occur concurrently for the three projects, could also cumulatively affect water quality; however, as with dredging, these impacts would be localized, short-term, and temporary.

Before any dredging or pile driving can occur, Lake Charles LNG and the proponents of the other projects would need to obtain Section 10 Rivers and Harbors Act/Section 404 Clean Water Act authorizations from the COE and corresponding Section 401 (Clean Water Act) Water Quality Certifications from the state. These authorizations would be contingent on the companies' use of best management practices to minimize effects on water quality and to ensure that state water quality standards are not violated. Additionally, the permits would require that the dredged material be tested before being disposed of in an approved offshore or onshore location. These measures would ensure that there are no long-term cumulative impacts on water quality as a result of foreseeable dredging and pile-driving activities in the Industrial Canal/Turning Basin.

Shoreline erosion is a concern along the Gulf Intracoastal Waterway and the Calcasieu Ship Channel. Erosion may be caused by ship traffic or by engineered structures, such as levees along beaches or rivers. Natural processes, such as tide-induced currents, sea level changes, wind waves, and hurricanes or other extreme storms, also contribute to shoreline erosion. If the Lake Charles Liquefaction, Cameron LNG Liquefaction, Magnolia LNG Liquefaction, and G2X Projects all receive the necessary authorizations and permits and are constructed concurrently or in close succession, there could be several years of increased barge traffic. The combined barge traffic of these projects would increase the potential for cumulative shoreline erosion impacts in the Gulf Intracoastal Waterway and the Calcasieu Ship Channel.

Construction of the proposed Mainline Connector and Mainline 200-3 Loop pipelines would require a total of 71 open-cut waterbody crossings, 56 of which are agricultural and roadside ditches. Impacts on water quality due to open-cut waterbody crossings can include short-term increases in sedimentation and turbidity, alteration or removal of in-stream and stream bank cover, and introduction of water pollutants from inadvertent equipment spills or leaks. Trunkline's use of the HDD crossing method would avoid direct impacts on 18 waterbodies, including all of the major waterbodies crossed by the pipelines. Although impacts on surface waters could occur during the HDD installation process (e.g., through an inadvertent release of drilling fluid), Trunkline would reduce the likelihood and potential impacts associated with such events by the implementation of its HDD Contingency Plan. Trunkline would minimize the potential for impacts on water quality during waterbody crossings through implementation of our Procedures and its SPAR and SPCC plans. Operation of the pipelines would not affect surface waters.

Due to the temporary, short-term, and localized nature of impacts associated with the waterbody crossings during construction of the Mainline Connector and Mainline 200-3 Loop pipelines and the distance of these pipelines from most of the other projects listed in table 4.13.1-1, we believe these activities would result in only a minor contribution to cumulative impacts on surface waters in the project area even if construction periods overlap. Moreover, the impacts of each of the projects identified near the Lake Charles Liquefaction Project on jurisdictional waters of the United States (e.g., wetlands and waterbodies) would be evaluated by the COE and permitted accordingly. Although stormwater runoff from construction activities near waterbodies upstream or downstream of the proposed construction right-of-way could result in impacts, we are not aware of any other substantial construction projects that would affect surface water quality near Trunkline's proposed waterbody crossings. As a result, the cumulative impact on surface water resources in these areas due to stormwater runoff would be minor.

In addition to the COE permit and section 401 water quality certification, the Lake Charles Liquefaction Project and other projects near the Lake Charles Liquefaction Project would be required to comply with the LDEQ LPDES regulations for discharge of pollutants in stormwater or point source discharges. Compliance by the proponents of the other projects with these regulations, implementation of FERC's Plan and Procedures and other project erosion and sediment control plans, and project-specific best management practices would minimize cumulative effects on surface water and groundwater quality.

We did not identify any other projects that would contribute to the cumulative impacts from hydrostatic test water withdrawal and discharge on water resources in the cumulative impact area for the proposed Non-Liquefaction Facilities. Therefore, we believe the cumulative impacts due to the withdrawal and discharge of hydrostatic test water for the Non-Liquefaction Facilities would be temporary and minor.

4.13.2.4 Wetlands

The cumulative impact area for wetlands was considered to be the areas adjacent to and near the proposed Lake Charles Liquefaction Project construction areas.

Construction of the Lake Charles Liquefaction Project liquefaction facility would result in the permanent loss of 215.4 acres of wetlands within the facility site and ACWs. The majority of the wetlands affected at the site are forested mosaic, forested, and scrub-shrub wetlands. Although this would represent a significant impact on wetlands in the immediate project area, Lake Charles LNG and Trunkline are working with a specialty contractor to develop a Compensatory Mitigation Plan to offset permanent impacts on wetlands. The plan is anticipated to include the use of approved mitigation banks as well as a single permittee-responsible mitigation site. The Compensatory Mitigation Plan would require review and approval by the COE, and would ensure no net loss of wetlands in the broader area.

Based on available information, construction of the other foreseeable projects in the vicinity of Lake Charles LNG's proposed liquefaction facility would also affect wetlands in the area, including the permanent loss of about 7.5 acres of predominantly emergent wetlands at the Magnolia LNG Liquefaction Project site, and impacts on about 4.0 acres of predominantly emergent wetlands at the Marine Center. A review of aerial photography and NWI wetland data indicates that construction of the G2X Energy Project also has the potential to affect emergent wetlands in the northern part of the site.

As noted previously, the proponents of each of the projects identified near the Lake Charles Liquefaction Project would need to obtain applicable permits from the COE. As part of the permitting process, each project would be required to develop and implement a mitigation plan to ensure that there is no net loss of waters of the United States and therefore no cumulative effects.

Construction of Trunkline's proposed Non-Liquefaction Facilities would affect a total of 32.4 acres of wetlands. The majority of these impacts would result from construction of the pipelines, and most of the impacts would be temporary because they would occur within temporary construction workspace that would be allowed to revert to preconstruction condition after construction is completed. Construction and operation of the aboveground facilities would permanently affect less than 1 acre of wetlands.

About 6.0 acres of wetlands would be within the permanent pipeline rights-of-way, where maintenance practices during operation would include periodic mowing and tree removal. As a result of these maintenance practices, 0.4 acre of forested wetlands would be converted to scrub-shrub or emergent wetlands. Trunkline would minimize impacts on wetlands by implementing the measures in our Plan and Procedures and its own best management practices during construction and operation of the Non-Liquefaction Facilities. Permanent impacts on wetlands resulting from construction and operation of the Non-Liquefaction Facilities would be addressed in the Compensatory Mitigation Plan mentioned above. We did not identify any other projects that would contribute significantly to wetland impacts in the cumulative impact area for the proposed Non-Liquefaction Facilities, and conclude that construction of the proposed Non-Liquefaction Facilities would have only a minor cumulative impact on wetlands.

4.13.2.5 Vegetation and Wildlife

The cumulative impact area for vegetation and wildlife was considered to be the area adjacent to and near the proposed Lake Charles Liquefaction Project construction areas.

A total of 568.2 acres of vegetation would be cleared during construction of the proposed Lake Charles Liquefaction Project liquefaction facility. Of this, about 245.4 acres would be permanently converted to industrial use within the operational footprint of the liquefaction facility, and 322.8 acres that would be cleared within the ACWs would be graveled or stabilized by seeding. The clearing of vegetation would reduce suitable cover, nesting, and foraging habitat for some wildlife species. The greatest contribution to cumulative impacts on wildlife habitat would result from the permanent loss of about 420.3 acres of forested uplands and forested wetlands. As noted previously, this effect would be partially offset (i.e., loss of forested wetlands) by Lake Charles LNG's implementation of compensatory mitigation. To minimize impacts on migratory birds that may use forested habitat in the project area, Lake Charles LNG would initiate clearing activities outside of the nesting season.

Construction and operation of other projects in the area would also result in the permanent conversion of nearby vegetated habitats to developed, industrial land. In addition to the emergent wetlands mentioned previously, development of the Magnolia LNG Liquefaction Project site would result in the permanent removal of about 108 acres of upland shrub and forest habitat in areas that were previously disturbed by activities associated with construction and maintenance of the Industrial Canal, including areas used for disposal of excavated and dredged material. Previous activities have resulted in the degradation of wildlife habitat, which has reduced the number and diversity of species inhabiting the area. The extent of clearing required at the about 200-acre G2X Energy Project site is not known. Based on desktop review, the site appears to consist primarily of open-land habitat and emergent wetlands. Impacts on wildlife from construction of the Lake Charles Liquefaction Project and the other nearby projects would include displacement, stress, and direct mortality of some individuals. To the extent that construction periods overlap, these impacts may be exacerbated.

Operation of the facilities would result in increased noise, lighting, and human activity that could disturb wildlife in the area. However, due to current industrial activities at the existing LNG terminal and the other industrial facilities in the project area, most wildlife in the area are acclimated to these conditions. Therefore, we expect cumulative impacts due to noise, light, and human activity during operation of the facilities to be negligible. Birds flying through the project area could also be affected by flaring at both the Lake Charles Liquefaction Project and Magnolia LNG Project liquefaction facilities. Startup flaring would be required during startup of the liquefaction facilities. During operation of the liquefaction facilities, use of the emergency flares would only occur occasionally. It is unlikely that the startup flares from the two facilities would be in use at the same time due to schedule variability. Upset conditions that would require the use of flares cannot be predicted; however, it is unlikely that upset conditions requiring flaring would occur at the same time at both facilities. The FWS has not raised flaring as an issue of concern in the area and we are not aware of any reported significant impacts of flaring on migratory birds in the project area. Therefore, we believe that the cumulative impacts on birds from flaring would be minimal.

Vegetation and wildlife habitat in the vicinity of the proposed Non-Liquefaction Facilities have been affected by past and ongoing agricultural and commercial forestry processes and construction and maintenance of existing roads, railroads, natural gas and oil pipelines, utility lines, and electrical transmission line rights-of-way. Construction and operation of the Non-Liquefaction Facilities would affect a total of 379.1 acres of vegetation. Of this total, 219.0 acres would be in temporary work areas and allowed to revert to preconstruction condition after construction is completed. About 104.8 acres would be within the permanent pipeline rights-of-way (including the Calcasieu River modification), and 55.3 acres would be within the new or modified aboveground facility footprints.

The majority of the habitat affected by the pipelines is agricultural and open land that would recover quickly after construction and continue to provide similar habitat during operations. The greatest impact on vegetation and wildlife habitat would result from the permanent conversion of forested habit to herbaceous cover in the permanent pipeline rights-of-way. Trunkline would minimize impacts on vegetation and wildlife habitat by collocating the Mainline 200-3 Loop with an existing pipeline and overlapping the construction area and permanent right-of-way with the existing maintained right-of-way, using the HDD method at several locations, refraining from maintaining the pipeline right-of-way between HDD exit and entrance points during operation, and implementing the FERC's Plan and Procedures. With the implementation of these measures and given the lack of other project activity in the vicinity of the Non-Liquefaction Facilities, cumulative impacts on vegetation and wildlife would be minimal.

4.13.2.6 Aquatic Resources

We considered the cumulative impact area for aquatic resources to be the about 1.5-mile-long Industrial Canal adjacent to the existing Trunkline LNG Terminal from the Turning Basin to where the canal joins the Calcasieu Ship Channel, and the proposed pipeline stream crossings.

Dredging and pile driving at the existing Trunkline LNG Terminal during construction of the construction docks would disturb the estuarine bed and potentially result in mortality of some benthic and aquatic organisms if present. If Lake Charles LNG's dredging and pile driving activities occur concurrently with those required for the Magnolia LNG Liquefaction and/or G2X Energy Projects, this impact would be exacerbated as a direct result of each of the projects' dredge activities and as sediments resettle following construction. However, these impacts would occur within an Industrial Canal and Turning Basin that is maintained (including periodic dredging) to support shipping for industrial activity. Additionally, benthos in soft bottom habitats recover rapidly through various reproductive and recolonization mechanisms. Impacts on estuarine fisheries, including those related to changes in benthic forage, should be temporary, with habitat use reverting to normal conditions following completion of construction. During project operations, Lake Charles LNG would not discharge process water into the Industrial Canal. Cumulative impacts would primarily be those associated with the transit and operation of vessels serving the various project facilities while in the Industrial Canal and Turning Basin. NOAA Fisheries has reviewed the Lake Charles Liquefaction Project and concurred that the proposed activities would have a *de minimis* effect on fisheries. It is assumed that NOAA Fisheries would issue similar opinions for work conducted by the other projects in the Industrial Canal and Turning Basin. Therefore, we conclude that cumulative impacts on aquatic resources affected by construction and operation of the proposed liquefaction facility would be minimal.

Potential impacts on fisheries resources resulting from construction of the proposed Non-Liquefaction Facility pipelines include sedimentation and turbidity, alteration or removal of in-stream and stream bank cover, water withdrawal during hydrostatic testing, and introduction of pollutants from inadvertent equipment spills or leaks. The aquatic impacts associated with the proposed Non-Liquefaction Facilities would be temporary and limited to the construction period. Trunkline's implementation of our Plan and Procedures would minimize these impacts. Water withdrawal and discharge for hydrostatic testing of the proposed pipelines would be conducted in compliance with the Procedures and applicable permits. As a result, cumulative impacts on aquatic resources associated with construction and operation of the proposed Non-Liquefaction Facility pipelines would not be significant.

4.13.2.7 Threatened and Endangered Species

The cumulative impact area for threatened and endangered species is the area adjacent to and near the proposed Lake Charles Liquefaction Project.

We identified 22 federally listed threatened and endangered species, 2 species proposed for federal listing under the ESA, and 2 species that are candidates for listing under the ESA that may occur within the parishes and/or counties affected by the Lake Charles Liquefaction Project. As discussed in section 4.7, we determined that the project would have no effect on 21 federally listed species, is not likely to cause the jeopardy of the 2 proposed species, and would not contribute to the trend toward federal listing for the 2 candidate species. Consequently, the project would not contribute to cumulative impacts on these species.

One federally listed species, the endangered red-cockaded woodpecker, was identified as potentially occurring in Allen, Beauregard, Calcasieu, and Grant Parishes, Louisiana. The only work proposed for the Lake Charles Liquefaction Project in Grant Parish is at the existing Pollock Compressor Station. The closest recorded occurrence of red-cockaded woodpecker is about 0.1 mile southwest of the Pollock Compressor Station within the Kisatchie National Forest. Trunkline would conduct the proposed work at the Pollock Compressor Station in accordance with its existing Blanket Clearance, which includes stipulations for work conducted adjacent to habitat containing cavity trees used by red-cockaded woodpeckers. The FWS has concurred that by adhering to the Blanket Clearance's stipulations, work at the Pollock Compressor Station is not likely to adversely affect the red-cockaded woodpecker. Suitable habitat for the red-cockaded woodpecker was not identified during the field surveys in Allen, Beauregard, and Calcasieu Parishes, and the FWS has confirmed that activities at the liquefaction facility site would have no effect on federally listed species. Therefore, we have determined that the project *may affect, but is not likely to adversely affect* the red-cockaded woodpecker.

Based on available information and review of aerial photography, the Magnolia LNG Project, the G2X Energy Project, and the Entergy substation and transmission line appear unlikely to affect suitable habitat for the red-cockaded woodpecker. In conclusion, we have determined that there would not be cumulative impacts on threatened or endangered species due to construction and operation of the proposed Lake Charles Liquefaction Project.

4.13.2.8 Land Use, Recreation, and Visual Resources

Land Use

The cumulative impact area for land use was considered to be the area adjacent to and in the vicinity of the proposed Lake Charles Liquefaction Project.

The existing Trunkline LNG Terminal site is dedicated to industrial use. Construction of the Lake Charles Liquefaction Project would impact industrial, wetland, forest, and open water land uses and convert them to industrial use. In addition, construction of the G2X Energy Project, Magnolia LNG Project, and the Marine Center would result in a cumulative increase in the conversion of a variety of land uses to industrial/commercial use in the cumulative impact area. However, the COE and LDEQ would require compensatory mitigation for wetland loss for the Lake Charles Liquefaction Project and the other projects that would result in a loss of jurisdictional wetlands. Because there are many areas of wetlands, forest, and open water in the project area, we believe that the Lake Charles Liquefaction Project would not result in a significant cumulative impact on land use.

Construction of the Non-Liquefaction Facility pipelines would impact wetlands, agriculture, forested, industrial, and open water land uses. Most of these impacts would be temporary and previous land uses would be restored following construction. We did not identify any other projects in the cumulative impact area for the Non-Liquefaction Facilities. Because the majority of land use effects would be temporary and the permanent and long-term forest land impacts would be small relative to the amount of forest land in the adjacent areas, the cumulative impact of the Non-Liquefaction Facilities on land use would not be significant.

Recreation

The cumulative impact area for recreational facilities was considered to be the area adjacent to and in the vicinity of the proposed Lake Charles Liquefaction Project. There are no recreational facilities located within 0.25 mile of the Lake Charles Liquefaction Project. Therefore, the project would not contribute to cumulative impacts on recreational facilities.

The cumulative impact area for recreational fishing and boating was considered to be the barge delivery routes within the Industrial Canal/Turning basin, Intracoastal Waterway, and the Calcasieu Ship Channel. Operation of the liquefaction facility would not require an increase in the number of LNG vessels currently authorized to call on the existing Trunkline LNG Terminal; therefore, the operation of the Lake Charles Liquefaction Project would not contribute to cumulative impacts on recreational fishing and boating. Nevertheless, as discussed in the *Marine Transportation* section below, operation of the existing and proposed or planned projects could substantially increase vessel traffic in the Calcasieu Ship Channel, which could affect the experience of recreational users.

Construction of the Liquefaction Facility and other planned projects may temporarily impact local recreational fishing and boating activities. During construction, barges delivering materials and equipment to the Trunkline LNG Terminal, and possibly the G2X Energy and Magnolia LNG Project docks, may impede or delay recreational boat traffic. During construction, Lake Charles LNG expects an average of five barge deliveries per day. The Magnolia LNG Project would expect less than two barge deliveries per month. Assuming similar barge deliveries are required for the G2X Energy Project, the Lake Charles Liquefaction Project would have the potential for the greatest impact on recreational fishing and boating activities. However, the cumulative impact of the three projects would be mitigated somewhat by the fact that recreational boating and fishing occurs more often on weekends and holidays and construction activities would likely be reduced during these peak times. Moreover, the cumulative impact of project vessel traffic during construction would be short term. As a result, we do not believe that the Lake Charles Liquefaction Project would result in a significant cumulative impact on recreational fishing and boating.

Visual Resources

The cumulative impact area for visual resources was considered to be the area within the viewsheds of the proposed Lake Charles Liquefaction Project facilities. Because of the height of the structures at the proposed liquefaction facility, the viewshed of the facility would extend for several miles in all directions. The viewshed for the proposed Non-Liquefaction Facilities is about 0.5 mile from the pipeline corridor and the aboveground facilities.

The visual character of the liquefaction facility would be similar to and consistent with the visual character of the adjacent existing LNG terminal, the ongoing industrial facilities and activities along the Calcasieu Ship Channel, and the many small oil and gas facilities near the Lake Charles Liquefaction Project site. Construction of the liquefaction facility would include three liquefaction trains, seven flares, mooring and breasting dolphins, and facility lighting. In addition, construction of the G2X Energy and Magnolia LNG Project would involve constructing similar facilities that would contribute to cumulative visual impacts. The flares associated with the Liquefaction Terminal would be 201 to 351 feet in height and the two flares associated with the Magnolia LNG Project would be 100 feet in height. The flares would operate during facility start up or upset conditions. If flaring were to occur at both facilities simultaneously, the temporary visual impact on observers would be exacerbated. However, it is unlikely that the startup flares from the two facilities would be in use at the same time due to schedule variability. Moreover, upset conditions that would require the use of flares cannot be predicted, but it is unlikely that upset conditions requiring flaring would occur at the same time at both facilities. Therefore, we do not believe that the proposed liquefaction facility would result in significant cumulative impact on visual resources.

The pipeline facilities proposed as part of the Lake Charles Liquefaction Project Non-Liquefaction Facilities would be in rural areas and would not be in close proximity to the other planned and proposed projects identified in table 4.13.1-1. As such, impacts resulting from the construction and operation of these facilities would not contribute significantly to cumulative visual impacts. Additionally, the visual impacts associated with construction of these facilities would be short term and minor as described in section 4.8.6. No additional impacts would occur during operation.

Aboveground facilities, such as the 203-A Compressor Station and new and expanded meter stations, would have additional visual impacts. However, the interconnections would be installed adjacent to existing aboveground natural gas facilities, and Compressor Station 203-A would not be in the viewshed of many observers. Moreover, we are recommending that Trunkline propose mitigation measures to minimize visual impacts of the Compressor Station 203-A on nearby residences. Therefore, the aboveground facilities would not contribute significantly to the cumulative impact on visual resources associated with the other past, present, and reasonably foreseeable projects.

4.13.2.9 Socioeconomics

Socioeconomic Conditions

We considered the cumulative impact area for socioeconomics to include Cameron, Calcasieu, Jefferson Davis, and Beauregard Parishes, where Lake Charles LNG and Trunkline would construct the majority of the proposed facilities and where most workers would be expected to reside during construction and operation of the project.

Construction of Lake Charles Liquefaction Project would generate a substantial number of jobs for a period of about 5 years starting in 2015. Construction of many other projects listed in table 4.13.1-1 would also occur during portions of that time period, including the major projects in the Lake Charles area. Simultaneous construction of those projects would require a large number of workers from the local labor pool. The cumulative effect would be a reduction in local and perhaps regional unemployment.

The abundance of jobs resulting from the Lake Charles Liquefaction Project would lead to an influx of non-local workers, which would impact transient housing in Calcasieu, Jefferson Davis, and Beauregard Parishes. As described in section 4.9.4, there is adequate vacant housing in these parishes to house these workers except during an about 9-month period when the peak workforce required to construct the liquefaction facility may be present. During that period, workers might need to find housing more distant from the project area. Similarly, the amount of available housing may not be sufficient if some of the other major projects listed above are constructed at the same time. Some of the housing constraints may be alleviated in part by worker housing facilities such as Pelican Lodge and Moss Lake Village to the extent that vacancies are available. Otherwise, the non-local workers unable to find acceptable housing in Calcasieu, Jefferson Davis, and Beauregard Parishes may need to find housing in adjacent Allen Parish. If peak construction workforce periods of many of the projects coincide, it is possible the available housing in Allen Parish could also be exceeded. As a result, some members of the workforce and others seeking transient housing may have to obtain housing in Texas or more distant parishes with longer commutes.

If several of the projects listed in table 4.13.1-1 are constructed at the same time, the combined construction workforces of these projects would increase the need for some public services, such as police, medical services, and schools. Construction of the liquefaction facility would result in little or no short-term impact on the availability of local community facilities and services such as police, fire, and medical because the non-local workforces would be small relative to the current population in Calcasieu Parish. The proposed liquefaction facility would not materially change the emergency response requirements from those associated with existing operations at the terminal. However, if construction of the other projects overlap with the proposed project, there is greater potential for cumulative impact on such services, particularly in Calcasieu Parish. If the medical and emergency services, or other public services, are adversely affected during construction, the project sponsors may mitigate the impact by providing funding for temporarily increasing the staff and equipment of the public services affected.

With construction of some of the major projects listed in table 4.13.1-1 lasting several years, it is likely that some construction workers would bring their families, including school-age children. That would increase the population in some schools in the parishes housing the workers with families. However, the children of these families would likely be spread across many school districts in the five parishes and the increases in children attending any particular school would likely be small. As a result, there would not likely be a significant cumulative impact on schools during the concurrent construction periods.

A large workforce for the simultaneously constructed projects would have a beneficial cumulative effect on revenues for the state and for Cameron, Calcasieu, Jefferson Davis, and Beauregard Parishes due to expenditures for services and materials for the projects, increased expenditures by local workers, and expenditures by the non-local workforce and any family members accompanying the non-local workers. The parishes would also receive a substantial increase in property taxes from the combined projects.

Marine Transportation

As previously described, construction of the major Lake Charles area projects would increase barge and support vessel traffic in the Gulf Intracoastal Waterway and the Calcasieu Channel. A simulation study conducted by Ausenco, described further below, included a construction traffic assessment based on assumed bulk carrier and barge traffic associated with construction of the Lake Charles Liquefaction Project. The study concluded that the construction-related marine traffic for the project would not affect existing users of the channel. Concurrent construction of the other projects and the Lake Charles Liquefaction Project would likely result in a cumulative impact on vessel traffic in the waterway, primarily by increasing congestion and vessel travel times. However, these impacts would be temporary and the extent of the impacts would depend on the frequency and number of deliveries being made for various projects at any given time during the respective construction periods.

Operation of the liquefaction facility would not require an increase in the number of LNG vessels currently authorized to call on the existing Trunkline LNG Terminal. Ausenco (2014) conducted a simulation study for nine proposed terminals in the general project area including the Waller Point LNG, Venture Global Calcasieu Pass, Gasfin LNG, Magnolia LNG Liquefaction, G2X Energy, Lake Charles Liquefaction, Lake Charles Clean Energy, IFG Holdings, and Sasol Projects, to evaluate the cumulative effect of these projects and the existing projects on marine vessel traffic. The study modeled two simulation cases– one with traffic to only the existing terminals and one with traffic to both the existing and proposed terminals – to observe the impact of the additional traffic from the proposed terminals on the operations of the existing Trunkline LNG Terminal. The study determined there could be a potential increase in vessel traffic in the Calcasieu Channel from 1,359 vessels to 2,543 vessels per year. The study found that in both cases the lost production and berth commitment were below the key performance indicator thresholds (1 percent and 85 percent respectively) to enable Lake Charles LNG to export their expected LNG quantities under either case. While this study addressed impacts of increased marine traffic on the Lake Charles Liquefaction Project, the results would likely apply to the other facilities in the area as well. Moreover, LNG vessel traffic associated with operation of the LNG facilities would be governed by Coast Guard requirements. Therefore, we believe that cumulative impacts on marine transportation would not be significant.

Land Transportation

We considered the cumulative impact area for land transportation to include Calcasieu, Jefferson Davis, and Beauregard Parishes. The greatest potential for cumulative impacts on vehicular traffic and roads during construction and operation of the Lake Charles Liquefaction Project is associated with the proposed liquefaction facility. Construction-related traffic associated with the Non-Liquefaction Facilities would result in only minor, temporary impacts on traffic, would be relatively short-term at any given location, and would not be in close proximity to other known large projects.

During construction of the liquefaction facility and the Lake Charles area projects, roadways in the area would experience a substantial increase in daily vehicle trips as a result of material and equipment deliveries and commuting of construction personnel to and from the project sites. Lake Charles LNG and Trunkline commissioned a traffic impact study to assess potential impacts of vehicular traffic associated with the project, including potential cumulative impacts that could result if construction of the proposed liquefaction facility overlaps with the construction of the G2X Energy and Magnolia LNG Projects. The study is based on current traffic conditions, projected traffic volumes, projected numbers of temporary and permanent workers, and assumptions (listed in the report) about where members of the workforce would reside during project construction and operation.

The traffic study concluded that construction and operation of the Lake Charles Liquefaction Project itself, if not constructed concurrently with other projects, would not be expected to affect the existing road network or exceed roadway capacity with the exception of Country Club Road, where road capacity could be exceeded along two segments during construction, and along one segment during operation. The Calcasieu Police Jury is engaging a consultant to design an extension of Ham Reid Road that, if constructed in time, might alleviate some of the potential capacity deficiencies identified on Country Club Road. However, the study determined that the cumulative impact from concurrent development of the Lake Charles Liquefaction Project, Magnolia LNG Project, and G2X Energy Project could include deficiencies in roadway capacities. The study indicates that Lake Charles LNG plans to specify shipping routes during construction between the facility site and interstate highway system to keep commercial traffic out of the more developed areas of Lake Charles. Lake Charles LNG has also indicated that they would avoid receiving large truck deliveries during peak traffic periods, and that they may consider bussing workers to and from the construction site. The study identifies several other mitigation strategies that might alleviate the cumulative impact of the three projects, including off-site parking, the use of shuttles, controlled shift times, coordination among the projects to reduce peak hour vehicular trips, traffic signal coordination/retiming, intersection and road improvements, and use of law enforcement to control traffic. Lake Charles LNG, Magnolia LNG, and G2X Energy are coordinating to further evaluate cumulative impacts of the three projects on area traffic and roadways. Moreover, we have recommended that Lake Charles LNG file a traffic management plan prior to construction for review and approval by the Director of OEP.

4.13.2.10 Cultural Resources

The cumulative impact area for cultural resources was considered to be the area within and near the proposed Lake Charles Liquefaction Project. Lake Charles LNG and Trunkline have consulted with the appropriate SHPOs and completed the necessary cultural resource surveys and reports. The SHPOs have concurred that construction of the project would not affect historic properties, and we also concur. Therefore, the project would not contribute to cumulative impacts on cultural resources.

4.13.2.11 Air Quality and Noise

Air Quality

Construction Cumulative Impacts

The cumulative impact area for air quality during construction of the proposed liquefaction facility, modifications to the existing LNG terminal, Compressor Station 203-A, and modifications to the Longview Compressor Station is the area adjacent to and near these proposed facility borders. The cumulative impact area for air quality during the operation of the proposed liquefaction facility and the existing LNG terminal is the PSD AOI of 6.2 miles (10 km). A similar PSD AOI exists for the proposed Compressor Station 203-A and Longview Compressor Station. Potential existing and proposed projects that could be expected to contribute to cumulative construction impacts on air quality include the Cameron LNG, Magnolia LNG, Leucidia, G2X, and Sasol projects. Because the various project facilities are located over a large geographic area, the cumulative air quality impacts of these construction projects would be minimal and temporary.

Construction of the Lake Charles Liquefaction Project would temporarily impact air quality due to emissions from the combustion engines used to power construction equipment, vehicle emissions traveling to and from the construction site, and from fugitive emission dust resulting from equipment movement on dirt roads and earth-disturbing activities. An analysis of the future projects in the vicinity (within 10 miles) of the proposed Lake Charles Liquefaction Project indicates that project construction may overlap with the construction period for the Magnolia LNG Liquefaction Project and, possibly the G2X Energy Project. The potential for cumulative construction emissions impacts would be greatest during site preparation when fugitive dust production would likely be at its peak. Emissions from equipment engines and vehicles operating concurrently for the different projects would also result in cumulative air quality impacts in the local area. Lake Charles LNG and Magnolia LNG would implement mitigation measures to minimize construction impacts on air quality such as applying water or dust control chemicals to minimize fugitive dust, and by complying with applicable EPA mobile source emission performance standards and using equipment manufactured to meet these standards. We assume that G2X would implement similar measures. Based on the temporary nature of construction and the implementation of appropriate mitigation measures, we believe that cumulative impacts on air quality due to construction of these facilities would be temporary and minor.

Operational Cumulative Impacts

The region in the vicinity of the proposed Lake Charles Liquefaction Project is currently in attainment with air quality standards, but increases in industrial point sources could affect local and regional air quality. Under federal and LDEQ regulations, the liquefaction facility is considered a major PSD emission source and would contribute to cumulative impacts on air quality within the cumulative impact area. Lake Charles LNG has supplied estimated operational emissions for the liquefaction facility, and conducted a dispersion modeling analysis (see section 4.11.1.3). This analysis included a PSD Screening Analysis, NAAQS Analysis, and PSD Increment Analysis. The PSD Screening Analysis included a Significance Analysis, the AOI Analysis, and the Preconstruction Monitoring Analysis. In case of the 1-hour NO_2 model, Lake Charles LNG modeled inventory sources within 10 kilometers (6.2 miles) of the facility. Lake Charles LNG has also determined that there would be no increase in ship and support vessel traffic for the proposed Lake Charles Liquefaction Project from what is currently authorized for the existing LNG terminal. Table 4.13.2-1 summarizes the Lake Charles Liquefaction Project emissions from LNG marine traffic and other project-related vessels. As required by EPA modeling guidelines, monitored background concentrations must be added to modeled impacts (liquefaction facility sources and an inventory of industrial emission sources surrounding the facility).

The background concentrations include emissions from non-industrial emissions sources such as marine vessels, vehicles, etc., and may also include industrial sources that are already accounted for in the inventory. Therefore, due to the transitory nature of these mobile sources and the large area covered, these associated mobile source emissions should not have a significant cumulative impact on air quality along the waterway.

Under all applicable analyses required by PSD regulations, the emission impacts including liquefaction facility point sources, an inventory of industrial sources surrounding the facility, and air quality background concentrations, were in compliance with modeling impact standards.

TABLE 4.13.2-1

Total Support Vessel Emissions

Vessel Types	NO_X (tpy)	SO_2 (tpy)	CO (tpy)	$PM_{10/2.5}$ (tpy)	VOC (tpy)
LNG Carriers					
Inbound berthing and unberthing	36	0.02	133	0.03	90
14 hours loading,10 hours hoteling	30	0.01	101	0.04	66
Outbound trips	49	0.01	183	0.02	124
Total LNG Carriers	**115**	**0.04**	**417**	**0.09**	**280**
Tugs					
Inbound, berthing	244	0.15	26	6.1	2
Standby	22	0.01	5	1.6	2
Unberthing, outbound support	67	0.04	7	1.7	1
Total Tugs	**333**	**0.02**	**38**	**9.4**	**5**
Total All Vessels	**448**	**0.24**	**455**	**9.49**	**285**

Trunkline has supplied facility emission estimates for Compressor Station 203-A and the Longview Compressor Station. Since Compressor Station 203-A is not a major PSD source, no air quality impact analysis modeling or PSD increment consumption analysis was required. In addition, the proposed modifications to the Longville Compressor Station would not result in the exceedance of any criteria pollutant SER, were also not subject to PSD modeling requirements. However, to assist us in preparing this EIS, Trunkline performed an air dispersion screening analysis using the AERSCREEN model to assess the impact of the proposed new facility emissions at Compressor Station 203-A and the emissions associated with the modifications at the Longville Compressor Station on the NAAQS. The AERSCREEN model results summarized in section 4.11.1.5 demonstrate that the proposed new Compressor Station 203-A and modifications to the Longville Compressor Station would not significantly impact the air quality in the surrounding area. As outlined in section 4.11.1.5, emissions from other facilities (Shaw Compressor Station, Mainline 100-3 and 200-1 Loop modifications, and metering stations along the main pipeline) would be minor or insignificant.

Projects that would potentially be constructed in the future, and are considered to be major sources of air emissions, would be required to conduct a PSD analysis. Should operation of a new project result in a significant impact on air quality, the LDEQ would enforce operational limitations or require emissions controls that ensure the facility's compliance with the SIP and attainment with the NAAQS. In addition, the Lake Charles Liquefaction Project facilities would be required to comply with LDEQ permit conditions during operation of the various facilities which would include emission control requirements to limit the emissions of certain criteria pollutants, HAPs, and/or GHGs.

Therefore, based on the cumulative modeling analysis and the required emission controls at the various Lake Charles Liquefaction Project facilities, we conclude that there would be no significant cumulative impact on air quality as a result of the operation of these facilities.

Climate Change

Climate change is the change in climate over time, whether due to natural variability or as a result of human activity, and cannot be represented by single annual events or individual anomalies. For example, a single large flood event or particularly hot summer are not indications of climate change, while a series of floods or warm years that statistically change the average precipitation or temperature over years or decades may indicate climate change.

The Intergovernmental Panel on Climate Change (IPCC) is the leading international, multi-governmental scientific body for the assessment of climate change. The United States is a member of the IPCC and participates in the IPCC working groups to develop reports. The leading U.S. scientific body on climate change is the U.S. Global Change Research Program (USGCRP). Thirteen federal departments and agencies participate in the USGCRP, which began as a presidential initiative in 1989 and was mandated by Congress in the Global Change Research Act of 1990.

The IPCC and USGCRP have recognized that:

- globally, GHGs have been accumulating in the atmosphere since the beginning of the industrial era (circa 1750);
- combustion of fossil fuels (coal, petroleum, and natural gas), combined with agriculture and clearing of forests is primarily responsible for this accumulation of GHG;
- these anthropogenic GHG emissions are the primary contributing factor to climate change; and
- impacts extend beyond atmospheric climate change alone, and include changes to water resources, transportation, agriculture, ecosystems, and human health.

Although climate change is a global phenomenon, this GHG emissions/climate change cumulative impact analysis focuses on the impacts of climate change in the Southeast region of the United States. The USGCRP (2014), NOAA (2011), and CCSP (2008) reports include the following impacts of climate change in the Southeast and Coastal regions:

- The region's climate is generally warm and wet, with mild and humid winters. Since 1970, average annual temperatures in the region have increased by about 2 °F. Winters, in particular, are getting warmer. The average number of freezing days has declined by 4 to 7 days per year since the mid-1970s.
- Average annual temperatures in the region are projected to increase by 4 to 9 °F by 2080.
- Most areas, with the exception of southern Florida, are getting wetter. Autumn precipitation has increased by 30 percent since 1901. The number of heavy downpours has increased in many parts of the region.
- Despite increases in fall precipitation, the area affected by moderate and severe drought, especially in the spring and summer, has increased since the mid-1970s.
- The coasts will likely experience stronger hurricanes and sea level rise. Storm surge could present problems for coastal communities and ecosystems.

- Many coastal areas in Texas and Louisiana are subsiding; local land elevation is sinking relative to sea level. Combined with global sea level rise, local subsidence will lead to a higher "relative" change in sea level at the local scale. Observed subsidence rates in the southeast are significant. For example, in Grand Isle, Louisiana and the plain of the Mississippi River delta, sea level is already rising at rates as high as 0.32 inches per year.

- Higher temperatures increase evaporation and water loss from plants. Projected increases in temperature will likely increase the frequency, duration, and intensity of droughts in the area.

- Projected changes in surface water runoff to the coast and groundwater recharge will likely allow saltwater to intrude and mix with shallow aquifers in some coastal areas of the Southeast, particularly in Florida and Louisiana.

- If the region increases groundwater pumping to offset water shortfalls, then aquifers will be further depleted. In the long term, the depletion of ground water supplies would place additional strain on surface water resources.

- Growth in demand will also likely strain water resources. The Southeast region is attracting people, investment, and industry. The population of Florida has more than doubled during the past 30 years. Growth rates in most other southeastern states were 45 to 75 percent over the same period. Decreased water availability will challenge future growth and the quality of life of residents in the region.

- Higher temperatures and more frequent heat waves will likely increase heat stress, respiratory illnesses, and heat-related deaths in the Southeast. High temperatures also correlate with poor air quality and pose a risk to people with respiratory problems. While the number of cold-related deaths is projected to decrease, net climate-related mortality will likely increase.

- Increased flooding and hurricanes could present extreme public health and emergency management challenges.

- The spread of some types of bacteria has been linked to warmer temperatures. For example, food poisoning from eating shellfish infected with *Vibrio parahaemolyticus* bacteria has increased by 41 percent from 1996 to 2006 in the United States. As temperatures increase, the frequency of these types of shellfish-borne disease outbreaks in coastal waters is likely to increase.

The GHG emissions associated with the construction and the operation of the Lake Charles Liquefaction Project are identified in the Air Quality Section above, and a GHG BACT analysis performed for the Liquefaction Facility and a summary is also included. Proposed GHG BACT for the Liquefaction Facility includes use of low carbon fuels, combustion equipment (turbines, thermal oxidizers, emergency back-up and firewater pump engines) designed as operational energy efficient in accordance with EPA GHG BACT standards, and a leak detection and repair (LDAR) program for monitoring piping and storage tank components to limit the impact of methane emissions. Proposed modifications to the Longview Compressor station include the replacement of the existing turbine with a more energy efficient turbine. Compression Station 203-A is not a PSD major source and therefore a GHG BACT analysis is not required for this facility. However, the installation of new turbines and internal combustion engines would also be designed for energy efficient operations.

There is no current methodology or policy guidance to determine how the Lake Charles Liquefaction Project's incremental contribution to GHGs would translate into physical effects on the global environment. The emissions would increase the atmospheric concentration of GHGs, in combination with past and future emissions from all other sources, and contribute incrementally to climate change that produces the impacts described above. However, it cannot be determined whether or not the Lake Charles Liquefaction Project's contribution to cumulative impacts on climate change would be significant.

Noise

We considered the cumulative impact area for noise to include the NSAs in the vicinity of the Lake Charles Liquefaction Project.

The greatest potential for cumulative noise impacts would be during construction from internal combustion engines and pile driving activities. The estimated noise generated from construction associated with the liquefaction facility would not exceed 55 dBA L_{dn} at the nearest NSAs. Although construction of the G2X Energy and Magnolia LNG Projects could overlap with the construction of the Lake Charles Liquefaction Project and contribute to noise levels in the area, these projects are located farther from the nearest NSA. As a result, we do not believe that construction of the liquefaction facility along with the G2X Energy and Magnolia LNG Projects would result in a significant noise impact on the nearest NSA.

The estimated operational noise level of the liquefaction facility at the nearest NSA (about 0.8 mile to the north/northeast) is 53.6 dBA L_{dn}, which is 2.5 dBA greater than the estimated ambient noise level. The threshold of perception of change in sound levels for human hearing is about 3 dB; therefore, the increase would be unnoticeable or barely noticeable at the nearest NSA. As a result, operational noise from the liquefaction facility would result in minor impacts on the NSA. Other projects near the liquefaction facility that could contribute to the cumulative noise impacts include the Magnolia LNG Project and the G2X Energy Project. The Magnolia LNG Project is located about 1,000 feet south of the liquefaction facility and farther from the NSAs associated with the liquefaction facility. Lake Charles LNG completed a noise assessment that evaluated the sound levels from the operation of the liquefaction facility and the Magnolia LNG Project on NSAs near each site. Based on the results of the study, the sound levels associated with operation of both facilities would not exceed 55 dBA L_{dn} at any of the existing NSAs. As a result, the Magnolia LNG Project would not be expected to contribute significantly to the noise levels at the liquefaction facility NSAs. The G2X Energy Project is located adjacent to the west of the liquefaction facility and, while not regulated by the FERC, would be subject to the Calcasieu Parish noise regulations found in the Calcasieu Parish Police Jury Code of Ordinances, Chapter 18, Article VIII. As a result, the G2X Energy facility would not be expected to contribute significantly to the noise levels at the NSAs during operations.

Noise associated with construction of the pipeline facilities, including aboveground facilities, would affect ambient noise levels at some nearby residences. The noise levels attributable to the construction equipment would attenuate quickly as the distance from the noise source increases and construction proceeds along the pipeline right-of-way. The duration of construction activities, and therefore noise impacts, at any one location would be temporary.

We did not identify any other projects that would contribute to operational noise impacts in the cumulative impact area for Compressor Station 203-A or the Longville Compressor Station.

4.13.2.12 Safety

We considered the cumulative impact area for the Lake Charles Liquefaction Project to be the area adjacent to and in the vicinity of the liquefaction facility site, and the cumulative impact area for the proposed pipeline facilities was considered to be within about 660 feet of the pipeline centerline**.** The cumulative impact area for emergency services includes the area in the general vicinity of the proposed Lake Charles Liquefaction Project and the other Lake Charles area projects listed in table 4.13.1-1.

Lake Charles LNG would mitigate impacts on public safety through the implementation of applicable federal, state, and local rules and regulations for the proposed Lake Charles Liquefaction Project as described in section 4.12. Those rules and regulations would ensure that the applicable design and engineering standards are implemented to protect the public and avoid or minimize the potential for accidents and failures. Because Lake Charles LNG has not requested an increase in the number of LNG carriers calling on the terminal, the Lake Charles Liquefaction Project would not add to the current public safety risk associated with vessel traffic in the Calcasieu Ship Channel or at berth in the Industrial Canal.

Emergency response time is a key aspect of public health and safety. Key emergency services are provided by the existing Trunkline LNG Terminal in Calcasieu Parish, and those services would expand to include the associated proposed liquefaction facility. In accordance with our regulations, Lake Charles LNG would prepare a comprehensive plan that identifies the cost sharing mechanisms for funding these emergency response costs. This plan would minimize the potential for a cumulative public safety impact associated with the project.

The Magnolia LNG Liquefaction Project, Cameron LNG Liquefaction Project, and other stand-alone LNG liquefaction projects listed in table 4.13.1-1, if authorized, constructed, and operated, each would also have to prepare and implement a similar comprehensive plan to provide emergency services. In addition, we anticipate that the other major projects in the Lake Charles area (e.g., the G2X Energy, IFG Port Holdings, Sasol, and Juniper GTL Projects) would include emergency services within their facilities, and have emergency response plans developed with the appropriate agencies. Emergency responses at any of those facilities could temporarily stress emergency services in the area, but we would not expect them to result in a long-term significant impact on those services. In the unlikely event of major emergencies at several of the facilities at the same time, there could be a short-term but significant cumulative impact on emergency services within Calcasieu and Cameron Parishes. That impact could be mitigated by assistance from emergency service providers from surrounding parishes.

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 SUMMARY OF THE ENVIRONMENTAL ANALYSIS

The conclusions and recommendations presented in this section are those of the FERC environmental staff. Our conclusions and recommendations were developed with input from the COE, Coast Guard, DOE, FWS, and DOT, as cooperating agencies. The federal cooperating agencies may adopt the EIS per 40 CFR 1506.13 if, after an independent review of the document, they conclude that their permitting requirements and/or regulatory responsibilities have been satisfied. However, these agencies would present their own conclusions and recommendations in their respective and applicable records of decision or determinations. Otherwise, they may elect to conduct their own supplemental environmental analysis, if necessary.

We determined that construction and operation of the Lake Charles Liquefaction Project would result in adverse environmental impacts. Most of these environmental impacts would be temporary or short term during construction and operation, but long-term and permanent environmental impacts on wetlands, vegetation, and land use would also occur as part of the project. This determination is based on a review of the information provided by Lake Charles LNG and Trunkline and further developed from data requests; field investigations; scoping; literature research; alternatives analysis; and contacts with federal, state, and local agencies as well as Indian tribes and individual members of the public. As part of our review, we developed specific mitigation measures that we determined would appropriately and reasonably reduce the environmental impacts resulting from construction and operation of the project. Therefore, we are recommending that our mitigation measures be attached as conditions to any authorization issued by the Commission. If the proposed project is constructed and operated in accordance with applicable laws and regulations, the mitigating measures discussed in this EIS, and our recommendations, most of the adverse environmental impacts (with the exception of impacts on upland forest as discussed below) would be reduced to less than significant levels. A summary of the anticipated impacts from the project and our conclusions regarding impacts are provided below by resource area.

5.1.1 Geology Resources

Construction and operation of the project would not affect active mining or nonfuel mineral resources during construction or operation. One active gas and condensate producing well is located within the proposed liquefaction facility site. Lake Charles LNG stated that they were discussing a buyout of the well with the well owner (i.e., Jordan Oil) and indicated that Jordan Oil would plug and abandon the well prior to the start of construction. We received comments from the royalty owners of the well expressing their interest in the disposition of the well and potential effects on their mineral rights. Therefore, we are recommending that Lake Charles LNG provide updates on its discussions with Jordan Oil and the royalty owners prior to the end of the draft EIS comment period.

In general, the potential for geologic hazards such as earthquakes, soil liquefaction, landslides, or a seismically generated tsunami or seiche to significantly affect construction or operation of the proposed project facilities is low. However, some hazards such as flooding and hurricanes could affect the project during operation. Lake Charles LNG and Trunkline would design and construct the aboveground facilities at the liquefaction facility and the compressor/meter stations at an elevation to minimize the potential impacts from flooding and hurricanes. Subsidence could occur in the project area, particularly at the liquefaction facility and ACWs, due to oil and gas extraction and groundwater withdrawal. Lake Charles LNG stated that monitoring can be done through periodic topographic surveying of the site, but did not commit to conduct such monitoring because it does not anticipate that any mitigation would be required based on the estimated subsidence rate. However, we find that periodic monitoring should be completed; therefore, we are recommending that, prior to the end of the draft EIS comment period, Lake

Charles LNG file a ground subsidence monitoring plan, including possible mitigation measures, for the liquefaction facility site.

The overall effect of the project on topography and geology would be minor. The primary impacts would be limited to construction activities and would include disturbance of slopes within the work areas. Such impacts resulting from grading and trenching along the pipeline rights-of-way would be temporary because Trunkline would restore these areas to preconstruction contours to the maximum extent practicable. However, impacts at the liquefaction facility and other aboveground facilities would be permanent where grading and filling is required to create a safe and stable land surface to support the facilities. In addition, the ACWs required for construction of the liquefaction facilities would not be restored to preconstruction contours following construction.

Because Compressor Station 203-A would be a large, new greenfield facility capable of producing 98,685 hp and would be located in an area underlain by clay or mud, Trunkline stated that it would be conducting geotechnical investigations of the site. Therefore, we are recommending that Trunkline file the results of the geotechnical investigation, and any resulting foundation and site improvement recommendations, prior to the end of the draft EIS comment period.

Utilization of the HDD method would eliminate surface impacts on existing geologic conditions between the HDD entry and exit points at the locations where this method is used. Trunkline has not yet conducted its planned geotechnical surveys for the proposed HDD crossings to evaluate the suitability of the geologic materials, but proposes to conduct these investigations within 1 year prior to construction of the proposed pipelines. Therefore, we are recommending that, prior to construction, Trunkline file the geotechnical investigations, which are necessary to evaluate the performance of the proposed HDD crossings.

The design of the liquefaction facility is currently at the FEED level of completion. Lake Charles LNG has proposed a feasible design and committed to conducting a significant amount of detailed design work for the project if it is authorized by the Commission. Information regarding the development of the final design would need to be reviewed by FERC staff in order to ensure that the final design addresses the requirements identified in the FEED. Therefore, we are recommending that Lake Charles LNG file site preparation drawings and specifications; LNG liquefaction facility structures and foundation design drawings and calculations; and quality control procedures to be used for civil/structural design and construction on a schedule to be identified in its Implementation Plan.

We do not anticipate that any blasting would be required for the construction of the project facilities. Based on the above discussion, in consideration of Trunkline's and Lake Charles LNG's proposed mitigation and design criteria, and based on our recommendations, we conclude that the project would not significantly impact or be impacted by geological conditions in the area.

5.1.2 Soils

Construction of the project could affect soil resources by increasing the potential for erosion, compaction, and rutting. Based on the soil properties reviewed, none of the soils in the Lake Charles Liquefaction Project area are considered highly susceptible to erosion by wind or water. Due to the fine textured soils and nearly level topography in the project area, no revegetation concerns were identified. However, the majority of the soils in the project area are prone to compaction. About 952.5 acres of soils affected by the project are designated as prime farmland. Of these soils, 300.7 acres would be permanently converted to urban land for operation of the liquefaction facility and Trunkline's aboveground facilities, and 276.3 acres of prime farmland in the ACWs would be permanently affected due to the deposition of fill. The remaining 375.5 acres of prime farmland soils would be restored to preconstruction conditions and are anticipated to retain their former productivity.

As agreed upon by the landowner, Lake Charles LNG would not restore the ACWs to preconstruction condition, but would stabilize the ACWs with gravel or herbaceous vegetation, and install additional temporary or permanent erosion control devices to prevent off-site erosion and sedimentation. To ensure that the ACWs are adequately stabilized and to ensure that runoff does not result in impacts on surrounding areas, we are recommending that, prior to construction, Lake Charles LNG file final design plans for the ACWs. The recommended plan should detail how each ACW would be stabilized after construction is complete, and any planned mitigation to address altered drainage patterns resulting from the modified elevation and clearing of these sites.

Contamination from spills or leaks of fuels, lubricants, and coolant from construction equipment could also adversely affect soils. Lake Charles LNG and Trunkline would employ the mitigation measures included in the SPAR Plan and project-specific SPCC Plans, which would specify cleanup procedures to minimize the potential for soil contamination from such spills or leaks. Lake Charles LNG and Trunkline have not updated the SPAR plan to include project-specific emergency contacts and local authorities. Additionally, the project-specific SPCC Plan(s) is not yet available because it would be prepared by the construction contractor(s). Therefore, we are recommending that Lake Charles LNG and Trunkline file copies of an updated SPAR Plan and the project-specific SPCC Plan(s) prior to construction.

One hazardous waste site is located at the Lake Charles Carbon Company facility just west of the liquefaction facility site. The results of soil sampling performed along the western boundary of the LNG terminal site indicated the presence, in a number of soil samples, of PAHs and PCBs above the LDEQ's industrial site standards. Excavated contaminated material would be managed in accordance with applicable regulations and in coordination with Alcoa (the current owner of the contaminated site). If previously unidentified contaminants are encountered during construction, Lake Charles LNG and Trunkline would follow the steps in their *Plan for Unanticipated Discovery of Contaminated Soils or Groundwater*, which specifies measures to ensure that contaminated material is managed in accordance with state and federal regulations.

Lake Charles LNG and Trunkline would implement the mitigation measures contained in the FERC Plan and Procedures and other project-specific plans to control erosion, enhance successful revegetation, and minimize any potential adverse impacts on soil resources. In addition, disturbed areas would be monitored following construction for the first and second (as necessary) growing seasons in upland areas and at least 3 years in wetlands to ensure successful restoration. With implementation of the proposed mitigation measures and project-specific plans, and with our additional recommendations, we conclude that impacts on soil resources would be adequately minimized.

5.1.3 Water Resources

The majority of the Lake Charles Liquefaction Project facilities are underlain by the Chicot aquifer, which is an EPA-designated sole-source aquifer. We do not anticipate any long-term or significant impacts on the aquifer due to construction or operation of the project. Some of the Non-Liquefaction Facilities are underlain by the Mississippi River Valley alluvial aquifer system, which is not designated as a sole-source aquifer.

There are eight active water wells within 150 feet of the project, including six domestic supply wells near or within the footprint of the proposed liquefaction facility and/or ACWs, one domestic supply well near the proposed contractor yard, and one rural public supply well within the footprint of the

Pollock Compressor Station. Lake Charles LNG and Trunkline propose to conduct pre- and post-construction monitoring of well yield and water quality for all water supply wells located within 150 feet of construction activities. If the project results in adverse impacts, Lake Charles LNG or Trunkline would provide a temporary source of water to those affected and repair or replace the affected water wells. To document any project impacts on water wells and verify that they are appropriately addressed, we are recommending that, within 30 days of placing facilities in service, Lake Charles LNG and Trunkline file a report identifying all public or private water supply wells/systems damaged by construction and how they were repaired. The report should also include a discussion of any other complaints concerning well yield or water quality and how each problem was resolved.

During construction and operation of the liquefaction facility, Lake Charles LNG would withdraw water for hydrostatic testing of new piping systems, construction personnel sanitation, and other general utility uses from two existing onsite wells and two proposed new wells on the liquefaction facility property. Lake Charles LNG estimates that about 45 million gallons of water would be withdrawn from the Chicot aquifer during construction at typical flow rates of 56 gpm and peak consumption of about 166 gpm. These withdrawal rates would be negligible relative to the more than 10 million gpm that are currently withdrawn from the Chicot aquifer. During operation of the facilities, potable water for employees, utility/service water, and process water would be supplied from the local municipal system and the two new wells on the liquefaction facility property. Lake Charles LNG would coordinate with the City of Lake Charles and other developers as needed to assure that the local water supply systems can provide adequate supply.

Water used during construction of the Non-Liquefaction Facilities (e.g., for hydrostatic testing, HDD drilling mud, and dust control) would be from both municipal and surface water sources. A water well would be installed at Compressor Station 203-A for non-potable water. Trunkline would not require any potable water sources at Compressor Station 203-A or the other Non-Liquefaction Facilities.

The installation of piles for the liquefaction facilities, which are anticipated to be driven to a depth of 70 feet, is not expected to have direct impacts on the underlying aquifer, which is about 200 feet below the surface. Other construction activities are not likely to significantly impact groundwater resources because the majority of construction would involve shallow, temporary, and localized excavation. Lake Charles LNG and Trunkline would use specialized construction techniques such as sheet piling and earthen berms to control surficial water flow and infiltration, and well pointing and/or pit-to-pit dewatering techniques to temporarily lower the water table in the immediate area during trenching and backfilling. Spills or leaks of hazardous materials (e.g., fuel, lubricants) from equipment working in the onshore areas could also result in adverse impacts on water resources. However, with the implementation of the measures in the FERC Plan and Procedures, SPAR Plan, SPCC Plan(s), impacts on groundwater resources from construction and spills/leaks would be minimized to the extent possible.

The Industrial Canal/Turning Basin has been designated as EFH and a Navigable Waterway under section 10 of the Rivers and Harbors Act. The primary impacts on water quality within this area would be associated with dredging and the associated suspension of sediments in the water column. Lake Charles LNG proposes to use a hydraulic dredge with a suction cutter head, which would minimize turbidity and water quality impacts. Additionally, any effects would be minor since they would be temporary and limited to the immediate area. Information in recent sampling plans prepared by Tetra Tech, Inc. on behalf of Alcoa indicates that sediments within the Industrial Canal/Turning Basin contain contaminants, but that the underlying clay is not affected. Lake Charles LNG would be required to implement the measures incorporated into the COE permit, including any special requirements/procedures for handling contaminated sediments. Lake Charles LNG has stated that a surface water and sediment sampling study is being conducted within the Industrial Canal/Turning Basin. In order to better identify potential impacts and appropriate mitigation measures associated with the disturbance of contaminated sediments, we are recommending Lake Charles LNG file the results of the sampling study prior to the end of the draft EIS comment period, as well as an interpretation of the results and any additional mitigation measures proposed.

Fifteen unnamed waterbodies are present within the liquefaction facility site. Fourteen of the waterbodies would be filled during construction of the liquefaction facility, and one perennial waterbody would be armored and realigned. Impacts on these surface waters would be mitigated through implementation of Lake Charles LNG's and Trunkline's final Compensatory Mitigation Plan. During construction, land disturbance and vegetation removal could increase stormwater discharges to surface waters at and adjacent to the liquefaction facility, resulting in a temporary increase in suspended sediment levels. Operation of the liquefaction facility would increase the amount of impervious surface area at the site, which would result in an increased volume of stormwater runoff. Stormwater would be managed in accordance with LDEQ and EPA requirements. Therefore, we conclude that impacts from stormwater runoff would not be significant.

During construction of the project, barges and support vessels would deliver large equipment and materials to the TCDs. This traffic may increase shoreline erosion and temporarily increase turbidity levels within the Industrial Canal/Turning Basin and along vessel transit routes. The Calcasieu Ship Channel was specifically created to provide deepwater access for maritime commerce. It is managed by the Port of Lake Charles, a deepwater seaport, and is maintained by regular dredging. As such, use of the channel by barges and support vessels to deliver materials during construction of the liquefaction facility would be consistent with the planned purpose and use of this active shipping channel, and associated impacts on water quality within the channel would be minor.

Lake Charles LNG is not proposing to change the frequency or size of LNG carriers that would call on the LNG terminal. However, operation of the LNG terminal as an export facility rather than an import facility would require that LNG carriers discharge ballast water (for LNG loading) rather than take on ballast water (for offloading of LNG). To ensure compliance with U.S. laws and regulations governing ballast water discharges, Lake Charles LNG would review applicable documentation that the visiting LNG carrier's operation is in accordance with the federal standards and practices. Therefore, we conclude that significant impacts on surface waters would not occur as a result of ballast water discharges.

A total of 106 waterbodies, including 18 perennial, 12 intermittent, 8 ephemeral, 4 open water (pond), and 64 agricultural ditches and canals would be crossed or otherwise affected (e.g., matted) by construction of the Non-Liquefaction Facilities. The Calcasieu River is designated as an Outstanding Natural Resource Water by LDEQ, a Louisiana Natural and Scenic River by LDWF, and a Navigable Waterway under section 10 of the Rivers and Harbors Act. The segment of the Calcasieu River crossed by the project, as well as Bayou Lacassine, is listed on the 303(d) list. None of the waterbodies impacted by the Non-Liquefaction Facilities are listed as National Wild and Scenic Rivers, designated as EFH, or contain federally or state-listed species.

Trunkline proposes to conduct six HDD operations that would avoid impacts on a total of 22 waterbodies, including the Calcasieu River, and East Bayou Lacassine. The remaining waterbodies would be crossed by the open-cut method. Trunkline provided site-specific plan and profile drawings for the proposed HDD crossings with its application; however, some of the HDD crossing designs were subsequently modified to reduce impacts on wetlands. Therefore, we are recommending that Trunkline file the final HDD plan and profile drawings prior to construction. Four drainage canals and one agricultural ditch would be permanently filled during construction of Compressor Station 203-A. To minimize surface water impacts, Trunkline would implement the construction and mitigation measures described in the FERC Procedures except where we have determined that Trunkline provided sufficient site-specific alternative measures. In addition, the use of the HDD method would eliminate or significantly reduce the potential for construction-related impacts because the HDD method avoids disturbance of the stream beds, banks, and associated riparian vegetation. Trunkline would finalize an HDD Contingency Plan with the selected contractor; therefore, we are recommending that the finalized plan be filed for review and approval by the Director of OEP.

Section V.B.2.A of our Procedures requires that extra work areas be located at least 50 feet away from the water's edge except where the adjacent upland consists of cultivated or rotated cropland or other disturbed land. Trunkline has proposed a large ATWS that encompasses a waterbody that runs along its existing right-of-way on the southeast side of the Calcasieu River. The location of this ATWS is driven by the HDD alignment and the need to tie the HDD segment into the existing pipeline. However, Trunkline has not provided sufficient justification for this proposed deviation or described how it would minimize impacts on the waterbody. In order for us to consider Trunkline's proposed deviation from the Procedures at this location, we are recommending that, prior to the end of the draft EIS comment period, Trunkline provide a more detailed description of this proposed ATWS, whether the workspace could be limited or shifted to avoid all or part of the waterbody, and how unavoidable impacts on the waterbody would be minimized.

With implementation of the HDD method, final Compensatory Mitigation Plan, site-specific SWPPPs, FERC Procedures, other project-specific plans, the additional mitigation measures included in the EIS, and our recommendation, we conclude that impacts on water resources would be adequately minimized.

5.1.4 Wetlands

Construction of the liquefaction facility would result in the permanent loss of 215.4 acres of wetlands. The wetlands located within the liquefaction facility site would be permanently filled and converted to upland industrial land. Wetlands within ACWs would be filled, elevated, and converted to industrial use for the 5-year construction period, and would not be restored following construction per the landowners' request. The majority of the wetlands affected would be forested wetlands or forested wetland mosaics (pimple-mounds). Lake Charles LNG would be required to mitigate wetland impacts associated with construction and operation of the project, and conversion of the ACW wetlands, as part of its project-specific Compensatory Mitigation Plan.

Construction of the Non-Liquefaction Facilities would affect a total of 38.9 acres of wetlands, the majority of which (36.6 acres) would be a result of pipeline construction, with the remainder being associated with construction and operation of six meter stations. Trunkline would minimize wetland impacts by collocating the 6.5-mile Mainline 200-3 Loop, placing temporary workspaces associated with the Calcasieu River HDD within the existing permanent easement for Mainline 200-1, and implementing the HDD method for installation of the pipelines beneath several wetlands. Additionally, Trunkline revised its plans for the Mainline Connector to reduce wetland impacts and reconfigured the layout of Compressor Station 203-A to avoid a wetland present within the southeast corner of the site.

Trunkline would reduce impacts on wetland areas by implementing the Procedures, except where it has justified alternative measures. In addition, Lake Charles LNG and Trunkline would be required to mitigate wetland impacts associated with construction and operation of the project as part of their project-specific Compensatory Mitigation Plan. Lake Charles LNG and Trunkline filed their section 404 permit application with the COE on August 6, 2014; however, the Compensatory Mitigation Plan was not included in the application as it was still in development. Therefore, we are recommending that Lake Charles LNG and Trunkline file a copy of the final Compensatory Mitigation Plan and documentation of COE approval of the plan prior to the end of the draft EIS comment period.

Our Procedures state that the width of the construction right-of-way should be limited to 75 feet or less in wetlands. Trunkline has proposed a right-of-way width of 100 feet in nine wetlands that would be crossed by the Mainline Connector. We have determined that these proposed deviations are reasonable for eight of the locations. However, to minimize impacts, we are recommending that Trunkline evaluate the feasibility of moving the Little Bayou HDD entry point to the northeast beyond the boundary of a forested wetland. Trunkline has also proposed alternative measures to our Procedures to place certain ATWS and aboveground facilities within wetlands. We conclude that the alternative measures are adequately justified at all except two of the proposed locations. In order for us to consider Trunkline's proposed deviations from the Procedures at these two locations, we are recommending that, prior to the end of the draft EIS comment period, Trunkline clarify the location of the proposed ATWS in forested wetland W-E-003 and provide additional justification for this ATWS. We are also recommending that Trunkline provide additional justification for the proposed ATWS depicted in wetland W-E-001 on the west side of the Calcasieu River between approximate MPs 194.6 and 194.7 of the Mainline 200-1 modifications.

With the implementation of the FERC Procedures, proposed mitigation measures discussed in this EIS, and our recommendations, we conclude that impacts on the majority of wetlands due to construction and operation of the Non-Liquefaction Facilities would be minor. While the construction of the liquefaction facility would result in the loss of a large portion of the forested wetlands in the immediate area, Lake Charles LNG would mitigate these impacts through the implementation of the project-specific Compensatory Mitigation Plan.

5.1.5 Vegetation

A total of 568.3 acres of vegetation would be cleared during construction of the liquefaction facility, including the ACWs. Of this, 245.4 acres would be permanently converted to industrial use for operation of the liquefaction facility. The 322.9 acres of vegetated areas within the ACWs would also be permanently affected because they would not be restored to preconstruction conditions. In total, construction and operation of the liquefaction facility, including the ACWs, would result in the loss or conversion of 261.7 acres of forested uplands, 158.6 acres of forested wetlands, 56.9 acres of non-forested wetlands, and 91.1 acres of herbaceous upland. Although impacts on herbaceous upland vegetation affected by the liquefaction facility would be permanent, similar vegetative communities occur within the surrounding area. Therefore, impacts on herbaceous upland vegetation communities would not be significant. Additional forested communities are located in the project vicinity, but construction of the project would result in the loss of a large portion of upland and wetland forested communities in the immediate area. Impacts on wetland vegetation would be mitigated to less than significant levels through the implementation of Lake Charles LNG's Compensatory Mitigation Plan. However, the construction and operation of the liquefaction facility and the permanent conversion of the ACWs would result in the unmitigated loss of 261.7 acres of upland forest.

Construction of the Non-Liquefaction Facilities would affect about 381.5 acres of vegetation, including 275.8 acres for the pipelines, and 105.7 acres for aboveground facilities and Mainline 200-1 modifications. Vegetation communities affected would include agricultural vegetation, pine plantation, forested wetland, non-forested wetland, herbaceous upland, and upland forest. The primary impacts on vegetation from construction of the Non-Liquefaction Facilities would be the cutting, clearing, and/or removal of existing vegetation within the construction work areas. Impacts resulting from operation of the facilities would include conversion of some forested or scrub-shrub vegetation to herbaceous vegetation due to maintenance of the pipeline rights-of-way, and conversion of vegetation within new or expanded aboveground facilities to non-vegetated industrial land. Impacts on agricultural, scrub-shrub, and herbaceous vegetation within the pipeline rights-of-way and ATWSs would be temporary and relatively short term because we would expect these areas to revegetate to a cover similar to preconstruction conditions within one to two growing seasons.

The project would affect two vegetation communities of special concern in Louisiana, including Bayhead Swamp and Bottomland Hardwood Forest. A total of 4.5 acres of Bayhead Swamp would be located within the pipeline easements; of this, 2.7 acres would be permanently converted to emergent wetland to facilitate pipeline inspections and maintenance, the remaining 1.8 acres would be allowed to naturally revegetate. Trunkline would minimize impacts on Bayhead Swamp communities by using the HDD method to install the pipelines beneath the potential communities adjacent to Bayou Lacassine and Arceneaux Bayou. Bottomland Hardwood Forest communities occupy a total of 29.6 acres within the liquefaction facility site, along the Mainline Connector, and at three meter stations. Of this, 22.8 acres would be permanently converted to industrial use, 1.7 acres would be converted to emergent wetland due to routine maintenance of the pipeline right-of-way, and the remaining 5.1 acres would be allowed to revegetate to pre-existing conditions.

To minimize impacts on vegetative communities during and after construction of the Non-Liquefaction Facilities, Trunkline would conduct much of the work within or adjacent to existing maintained rights-of-way and facility sites. Additionally, Trunkline would install erosion control measures and revegetate temporary workspaces in accordance with our Plan and Procedures, and would monitor disturbed areas until restoration and revegetation are successful. With the implementation of the proposed mitigation measures, we conclude that construction and operation of the Non-Liquefaction Facilities would not have a significant impact on vegetation communities in the project area.

Field surveys identified Chinese tallow, a noxious weed, within project areas associated with both the liquefaction facility and Non-Liquefaction Facilities. Additionally, two nuisance species, Chinese privet and Japanese climbing fern, were identified along the Mainline Connector route. As part of their post-construction monitoring programs, Lake Charles LNG and Trunkline would be required to examine the project area for the presence of invasive species within the project area. In addition, our Plan and Procedures require coordination with the appropriate land management and/or state agencies to prevent the introduction or spread of invasive species, noxious weeds, and soil pests. Lake Charles LNG and Trunkline have not proposed measures to be implemented during construction and operation of the project to control the spread of noxious weeds; therefore, we are recommending that they coordinate with the NRCS and LDWF to develop a project-specific noxious weed control plan to be filed with the FERC prior to construction.

5.1.6 Wildlife and Aquatic Resources

Wildlife

Wildlife species inhabiting the project area are characteristic of the habitats provided by the vegetation communities that occur in the vicinity of the project. The greatest impact on wildlife habitat would result from the permanent conversion of forested land within the liquefaction facility site and ACWs, which would result in a permanent reduction in forested habitat in the general vicinity of the liquefaction facility, where the surrounding area is largely composed of developed, open, and agricultural lands. Lake Charles LNG would provide compensatory mitigation for permanent impacts on about 158.6 acres of forested wetland that would be permanently converted to upland. Although the implementation of these and other proposed mitigation measures would lessen impacts on wildlife species, we have determined that construction and operation of the proposed liquefaction facility, and the permanent conversion of the ACWs, would have long-term impacts on wildlife species due to the loss of forested habitat.

Operation of the liquefaction facility would result in increased noise, lighting, and human activity that could disturb wildlife in the area. However, due to current industrial activities at the existing LNG terminal and other industrial facilities in the vicinity, most wildlife in the area are acclimated to the noise and artificial lighting associated with these activities. Therefore, we expect impacts due to noise, light, and human activity during operation of the liquefaction facility to be negligible. Birds could also be affected by flaring at the liquefaction terminal. Flaring would be required during startup of the liquefaction facility, which may require up to 1 month for each liquefaction train. During operation, use of the marine and emergency flares would only occur occasionally. The FWS has not raised flaring as an issue of concern in the area and we are not aware of any reported significant impacts of flaring on migratory birds in the project area. As a result, we find that the temporary flaring during construction and the occasional flaring during operation would not represent a significant impact on migratory birds passing through the area.

Construction of the Non-Liquefaction Facilities would affect 381.5 acres of vegetated wildlife habitat, the majority of which would be associated with construction of the proposed pipeline facilities and construction and operation of the new and expanded aboveground facilities. Although individuals of some wildlife species would be affected by construction and operation of the proposed pipelines and aboveground facilities, most impacts on wildlife would be short term and limited predominantly to the construction period. During operation of the proposed pipeline facilities, Trunkline would not conduct routine vegetation mowing or clearing over the full width of the permanent rights-of-way in uplands more frequently than every 3 years, and routine vegetation mowing or clearing would not occur during the majority of the migratory bird nesting season between April 15 and August 1 unless specifically approved in writing by the FWS. With the implementation of our Plan and Procedures, and due to the fact that abundant similar habitat is available for wildlife adjacent to the affected areas, we conclude that construction and operation of the Non-Liquefaction Facilities would not have a significant impact on local wildlife populations or habitat.

The vegetative communities in the project area provide potential habitat for migratory bird species, including songbirds, waterbirds, and raptors. Much of the vegetated land associated with the Non-Liquefaction Facilities is previously disturbed and/or currently maintained by mowing and other land management practices that reduce nesting habitat value. However, the undisturbed areas contain higher quality nesting habitat which would be more attractive to breeding bird species. The FWS commented that the liquefaction facility site, which is mostly mature mixed pine hardwoods, is expected to provide nesting habitat for bird species of concern. Lake Charles LNG's compensatory mitigation would offset some of this habitat loss. Additionally, to minimize impacts from vegetation clearing on migratory birds, the FWS recommended that no habitat alteration work be performed during the nesting period (March 1 to July 31). Lake Charles LNG and Trunkline stated that they would initiate clearing activities outside the nesting season. To further clarify this commitment, we are recommending that, prior to the end of the draft EIS comment period, Lake Charles LNG and Trunkline confirm that they would not conduct any clearing between March 1 and July 31 unless approved in writing by the FWS.

During coordination with Trunkline, the LDWF identified records of two colonial waterbird nesting areas (or rookeries) within 1 mile of proposed workspaces associated with the Mainline 200-3 Loop and the NGPL–Lakeside meter station. The LDWF stated that a field visit should be conducted no more than 2 weeks prior to commencing construction if construction would commence during nesting season. If the field visit identifies nesting colonies within 400 meters (700 meters for brown pelicans) of the project, a survey should be performed and further consultation with the LDWF should be conducted. The LDWF also provided specific distance and timing restrictions to be observed to minimize disturbance of colonial nesting birds depending on the species present. The FWS also recommended that Lake Charles LNG and Trunkline contact the FWS and LDWF if surveys identify undocumented rookeries during nesting season. No rookeries were identified within the project area during environmental field surveys conducted during 2012, 2013, and 2014. To minimize disturbance of colonial nesting birds, the FWS stated that activities within 1,000 feet of a rookery should be restricted to non-nesting season. Trunkline and Lake Charles LNG have stated that they would consult with the LDWF and FWS for guidance and recommendations in the event that an active rookery is observed within a distance expected to have a potential impact on the nesting species. To further clarify this commitment, we are recommending that, prior to the end of the draft EIS comment period, Lake Charles LNG and Trunkline confirm that if construction would commence during the nesting season for colonial waterbirds, they would conduct field visits and would consult with the FWS and LDWF in accordance with the LDWF recommendations.

With our recommendations and the implementation of the measures recommended by the FWS and LDWF, we conclude that impacts on migratory birds, including colonial waterbirds, would be avoided or minimized.

Aquatic Resources

All waterbodies within the project area support warmwater fisheries and, with the exception of the Industrial Canal/Turning Basin, which is estuarine, all waterbodies in the project area are freshwater. Of the waterbodies located within the liquefaction facility site, only the Industrial Canal/Turning Basin and the one perennial stream provide year-round habitat for aquatic resources. Potential impacts on aquatic resources during construction and operation of the liquefaction facility primarily include those associated with the two TCDs and berthing dock modifications. The proposed waterbody modifications and water withdrawals within the liquefaction facility area, ballast water exchanges, inadvertent spills, and barge traffic could also affect aquatic resources; however, with the implementation of the proposed mitigation measures, these impacts are expected to be minimal.

Construction of the two TCDs and berthing dock modifications would require dredging a 22.1-acre area in the Industrial Canal/Turning Basin, driving sheet piles, and installation of the docks' surface features and berthing structure modifications. Potential impacts on aquatic resources due to these activities include increased sedimentation, turbidity, and noise levels. These impacts can adversely affect fish eggs and juvenile fish survival, benthic community diversity and health, foraging success, and suitability of spawning habitat. Impacts on aquatic resources due to increased turbidity and suspended solid levels would vary by species. Most fish species are highly mobile and would be expected to leave the project area during in- and over-water activities. However, dredging would result in direct mortality of benthic organisms such as mollusks and crustaceans within the dredge footprint, and might also affect slower, less mobile benthic invertebrates. The aquatic resources present within the project area are likely accustomed to regular fluctuations in noise and turbidity levels from industrial activity and regular maintenance dredging within the existing Industrial Canal/Turning Basin. Following construction activities, aquatic resources would be expected to return to the newly dredged area, which would be similar to the existing habitat, but would have an increased water depth. Further, Lake Charles LNG would use a cutter head suction dredge, which would minimize resuspension of sediments and the resulting increases in turbidity and suspended sediment levels. Due to the small volume of materials being dredged (about 26,000 cubic yards), short duration of dredging activities (30 days), and limited deepening of the existing open water habitat, we have determined impacts on aquatic resources from dredging would be localized, temporary, and minor.

Sound waves from pile driving may result in injury or trauma to fish, sea turtles, and other animals with gas-filled cavities, such as swim bladders, lungs, sinuses, and hearing structures. In order to allow for an accurate analysis of potential impacts on aquatic resources during pile driving, we are recommending that Lake Charles LNG file a description of the proposed in-water pile installation process prior to the end of the draft EIS comment period including the number and type of pile driver(s), duration of in-water pile driving activities, anticipated peak and cumulative underwater sound pressure levels, and proposed measures to minimize impacts on aquatic resources in the vicinity of on-land and in-water pile driving activities.

Construction of the proposed pipeline facilities would require crossing 18 perennial streams and 4 ponds that provide suitable habitat for aquatic resources. As noted previously, Trunkline proposes to use the HDD method to cross several of these waterbodies, which would avoid or minimize impacts on fisheries, fish habitat, and other aquatic resources within and adjacent to waterbodies unless an inadvertent release of drilling mud were to occur. If an inadvertent release occurs, Trunkline would implement the measures outlined in its Horizontal Directional Drill Contingency Plan to minimize potential impacts on aquatic resources.

Use of the open-cut crossing method would result in temporary loss or modification of aquatic habitat, increase in sedimentation and turbidity levels, and alteration of riparian vegetative cover. The majority of fish present within the waterbody at the time of construction activities would likely be displaced to similar adjacent habitats up or down stream; however, stress, injury, or death of individual fish may occur. Increased suspended sediment and turbidity levels may also cause degradation of benthic and spawning habitat and decreased dissolved oxygen levels within and downstream of the crossing location. This temporary increase in suspended solids would decrease rapidly following the completion of instream activities. The clearing of riparian vegetation during construction may reduce shade, indirectly causing a temporary increase in water temperature in localized areas. Clearing would be adjacent to existing rights-of-way at the three open-cut perennial waterbody crossings along the Mainline 200-3 Loop, which would minimize changes in water temperature because much of the vegetation is already maintained in an herbaceous state. Operation of the pipeline facilities would not affect aquatic resources. Due to the relatively small number of crossings, limited construction workspace and duration, and implementation of the proposed mitigation measures, we anticipate that construction and operation of the Non-Liquefaction Facilities would have minimal and localized impacts on aquatic resources.

As a non-federal party assisting the FERC in meeting its obligations under the MSA, Lake Charles LNG coordinated with NOAA Fisheries' regarding potential project impacts on EFH. NOAA Fisheries concurred with the determination that the dock work and related activity in the vicinity of the Industrial Canal/Turning Basin would not result in significant adverse impact on EFH. Based on the largely temporary nature of project-related impacts and concurrence from NOAA Fisheries' Southeast Regional Office, we have determined that the project would not have a significant adverse impact on EFH. We are requesting that NOAA Fisheries consider the EIS as our EFH Assessment.

5.1.7 Threatened, Endangered, and Other Special Status Species

Based on input from the FWS and NOAA Fisheries, 22 federally listed threatened and endangered species, 2 species that are candidates for listing under the ESA, and 2 species proposed for listing under the ESA may occur within the parishes and/or counties affected by the project. In addition, critical habitat has been designated for the Louisiana black bear in Richland and West Carroll Parishes, Louisiana. The FWS confirmed that the proposed project activities within Trunkline's existing facilities and easements in Louisiana would be covered under Trunkline's existing Blanket Clearance (dated January 9, 2014). With certain conditions, the existing Blanket Clearance authorizes Trunkline to perform minor and routine pipeline construction and maintenance activities under the FERC's jurisdiction within the State of Louisiana.

We determined that the project would have no effect on 21 of the 22 federally listed species, is not likely to cause the jeopardy of the 2 proposed species, and would not contribute to the trend toward federal listing for the 2 candidate species. No designated critical habitat for the Louisiana black bear is within or adjacent to the project area. One federally listed endangered species, the red-cockaded woodpecker, has the potential to be located in the Kisatchie National Forest, 0.1 mile southwest of the Pollock Compressor Station. In a letter dated March 31, 2014, the FWS concurred that by adhering to the stipulations in Trunkline's Blanket Clearance for work at the Pollock Compressor Station, the project is not likely to adversely affect the red-cockaded woodpecker. Therefore, we have determined that the project *may affect, but is not likely to adversely affect* the red-cockaded woodpecker. However, because the Blanket Clearance only covers activities conducted in 2014, and to ensure that the stipulations do not materially change by the time the project goes to construction, we are recommending that, prior to construction, Trunkline file an updated Blanket Clearance or updated documentation from the FWS that the previous determinations of effect are still current.

As required by Section 7 of the ESA, we request that the FWS accept the information provided in this EIS as the BA for the project. Further, we request concurrence with our findings of effect for federally listed species. The project would have no effect on listed species under the jurisdiction of NOAA Fisheries; therefore, no formal section 7 consultation between the FERC and NOAA Fisheries is required.

Based on information obtained from the appropriate Louisiana, Mississippi, and Arkansas state agencies, seven state-listed threatened or endangered species and one candidate species are listed within the parishes/counties affected by the project. Six of the eight state-listed species are also federally listed or candidate species. The project is expected to have no impact on one of the two non-federally listed species (brown pelican) due to the absence of suitable habitat within the project area. The bald eagle is state-listed as endangered in Louisiana within several parishes crossed by the project; however, no bald eagles or bald eagle nests were identified during field surveys conducted in September 2012 and March through May 2013. Because no nesting sites were observed during field surveys, and the HDD method would be used to minimize potential impacts, we have determined the project would not significantly impact the bald eagle. In the event a bald eagle or its nest is identified within 660 feet of a project area prior to construction, Lake Charles LNG and Trunkline have agreed to notify the FWS and LDWF in accordance with the National Bald Eagle Management Guidelines.

5.1.8 Land Use, Recreation, and Visual Resources

Construction of the project would affect a total of 1,522.2 acres, after which about 453.5 acres of land (for new aboveground facilities and pipeline easements) would be permanently required for operation of the project, including 16.6 acres of the Mainline 200-3 Loop that would overlap an existing Trunkline pipeline easement, and 1.0 acre occupied by an existing mainline valve and access road that would be within the new Compressor Station 203-A facility boundary. Of the remaining 1,068.7 acres, about 743.5 acres would be allowed to revert to preconstruction land use type. The other 325.2 acres consist of the ACWs that would not be retained following construction, but would not be restored to preconstruction condition in accordance with landowner agreements.

The new liquefaction facility would be constructed on a 285.9-acre site located immediately adjacent to and north of the existing LNG terminal. The majority of the proposed liquefaction facility site is forest land, followed by open land, industrial/commercial land, and open water. Lake Charles LNG would convert the entire liquefaction facility site to industrial use. The ACWs required during construction are mainly composed of forest land and open land (including forested, scrub-shrub, and emergent wetlands), and industrial/commercial land. Lake Charles LNG currently leases 46 acres within the proposed liquefaction facility site from the Lake Charles Port Authority, and they plan to acquire 80 acres of land within the liquefaction facility site from Alcoa. The remainder of the land required for the liquefaction facility and ACWs would be leased from the Lake Charles Port Authority. All work at the existing LNG terminal would occur within the existing facility. Aside from the Lake Charles Port

Authority properties, no federal, state, or local agency owned or managed lands would be directly affected by the liquefaction facility.

Construction of the Non-Liquefaction Facilities would affect a total of about 737.1 acres of land and open water. In addition to the 250.8 acres of land that are already within the operational boundaries of existing Trunkline facilities to be modified or used temporarily for construction, operation of the new and modified Non-Liquefaction Facilities would require 150.1 acres of newly affected land. The lands necessary for construction and operation of the Non-Liquefaction Facilities would be composed of both land currently owned or leased by Trunkline and other private land.

The proposed Mainline Connector would be constructed on newly created right-of-way. The predominant land use types affected by construction of the pipeline, including the construction right-of-way and ATWS, would be agricultural, pine plantation, and forest land, followed by open and industrial/commercial land, residential land, and open water. The entire Mainline 200-3 Loop would be collocated with an existing Trunkline pipeline right-of-way; 25 feet of the permanent right-of-way would overlap the existing permanent easement. The predominant land use types affected by construction of the Mainline 200-3 Loop, including the construction right-of-way and ATWS, would be agricultural and open land, followed by forest, industrial/commercial land, pine plantation, and open water. Following construction of the Non-Liquefaction Facilities, Trunkline would follow the restoration and revegetation practices outlined in the FERC Plan and Procedures. Most lands affected by the Non-Liquefaction Facilities would be allowed to revert to their previous use, except for limited areas of the pipeline right-of-way that would be routinely maintained and land that is converted to industrial use for new or expanded aboveground facilities.

A single residence within the liquefaction facility site has been purchased by Lake Charles LNG; no other residential lands would be affected during construction or operation of the proposed liquefaction facility. No residential structures or buildings are located within 50 feet of any of the Non-Liquefaction Facilities. There are no planned residential or commercial developments within 0.25 mile of the project. However, four commercial/industrial facilities are planned within 1 mile of the proposed liquefaction facility. Certain non-jurisdictional facilities are also planned to provide utilities (i.e., electric power, water) to the Lake Charles Liquefaction Project.

Construction and operation of the liquefaction facility would result in minor, temporary impacts on recreational boating and fishing. Construction-related dust and noise could also be a nuisance to the recreational users of two nearby golf courses, but these impacts would be temporary, and Lake Charles LNG would implement mitigation measures to minimize them. Construction of the Non-Liquefaction Facilities could potentially be noticeable by users of the Lacassine NWR, which is about 0.4 mile from the NGPL–Lakeside Meter Station, or the Kisatchie National Forest, which is in proximity to the Pollock Compressor Station. However, construction at these locations would be temporary and would occur within or immediately adjacent to existing industrial facilities. We find that visitors to the NWR or the national forest would not be adversely affected. Trunkline's use of the HDD method for the Calcasieu River crossing would avoid direct surface impacts on this Louisiana Natural and Scenic River and its riparian area, and would eliminate the need for in-water work and any resultant disruption of boating. Additionally, Trunkline would implement the measures in the FERC Procedures and its HDD Contingency Plan to further minimize the extent and duration of construction disturbance on this waterbody. With implementation of these measures, we do not find that the natural and scenic characteristics of the river would be affected by the project.

Alcoa is currently working with the LDEQ regarding impacts on soil and sediment from historical uses of PCBs and other materials at the Alcoa facility east of the proposed liquefaction facility. Lake Charles LNG is working closely with Alcoa to determine what contaminants may be encountered during construction of the liquefaction facility. Lake Charles LNG would manage and dispose of impacted materials in accordance with applicable regulations and in coordination with Alcoa and the LDEQ. Should contaminated soils, sediments, or groundwater be encountered unexpectedly during construction, Lake Charles LNG would implement their Plan for Unanticipated Discovery of Contaminated Soils or Groundwater. In addition, Lake Charles LNG and Trunkline would implement their SPAR and SPCC Plans to minimize potential contamination of soil and water resources from spills or releases of fuel, other mechanical fluids, or other hazardous materials.

Construction activities at the proposed liquefaction facility, particularly at ACW A, might be visible from residences to the north; however, most of these residences would be visually shielded from the construction activity by forest land. Visual impacts would be more significant for the residences east of Big Lake Road where there is more open land and fewer forested buffers. Clearing and construction activities at ACW D would result in visual impacts on residences north of the ACW along West Lincoln Road. Visual impacts on residential areas south of the Industrial Canal along Airhart Road would be negligible due to distance and the presence of vegetation. There are no nearby residences west of the liquefaction facility site or the existing LNG terminal, but activities may be visible to recreationists using the Calcasieu Ship Channel. The impact on visual resources during construction would be due to the presence of workers and equipment for the approximately 5-year construction period, but the impacts resulting from operation of the facilities would be permanent. To minimize impacts on the surrounding visual landscape to the extent feasible, we are recommending that Lake Charles LNG file visual screening plans for ACWs A and D prior to the start of construction. Because the liquefaction facility would be constructed immediately adjacent to the existing terminal, views of the facility would be consistent with the existing industrial area. Additionally, implementation of visual screening plans, as recommended above, would minimize impacts. Overall, we conclude that visual impacts of the proposed liquefaction facility and LNG terminal modifications would generally be in character with the existing landscape.

In addition to the structures at the liquefaction facility, another potential source of visual impacts is the flare system that would be constructed as part of the project. When in use, the flares would be visible from varying distances. However, flares would only operate on a limited basis. The startup flare would be in use throughout the initial start-up period prior to beginning operation of each liquefaction train, and is expected to be used be up to 1 month for each train. The other flares would be used only on an emergency basis. Therefore, visual impacts resulting from the flares during operation of the facility would be temporary and infrequent.

During construction of the pipelines, visual impacts would result from the presence of personnel, large construction equipment, and vehicles, all of which could be visible in areas accessible to the public, such as roadways crossed by the route and nearby residences. However, no residences are located within 50 feet of the construction right-of-way and the pipeline routes do not cross densely populated areas. Visual impacts due to the presence of construction equipment and personnel would be temporary and short term; therefore, we conclude that those visual impacts would not be significant. The primary impact on visual resources during construction and operation of the pipelines would result from vegetation clearing in the construction rights-of-way and ATWS. Clearing of forest land within the construction right-of-way, and maintenance of the permanent right-of-way in an herbaceous or scrub-shrub state, would change the viewscape for viewers in the area. Trunkline would allow forest land in ATWSs to revert to preconstruction conditions, but it could take up to 50 years for forest vegetation to reach a mature stage, resulting in long-term visual impacts in those areas. The permanent visual impact would be most noticeable for the Mainline Connector, which would result in the creation of a new right-of-way. Operational impacts along the Mainline 200-3 Loop, where the new right-of-way would overlap an existing pipeline right-of-way, would be less evident. Once the disturbed areas are restored and revegetated in accordance with the FERC Plan and Procedures, operation of the pipeline would result in negligible impacts in open areas, where the permanent right-of-way would largely revert to preconstruction condition and use.

Construction at Trunkline's existing aboveground facilities would result in negligible, short-term visual impacts. Construction and operation of Compressor Station 203-A would occur within a rural area of Calcasieu Parish off of low-density, two-lane roads. Construction related impacts including the presence of equipment and workers would be temporary and limited to the construction period. The areas that would be cleared and graded predominantly consist of agricultural land, which would be converted to industrial/commercial land. During both construction and operation, Compressor Station 203-A would be visible to motorists passing through the immediate area, and the station would be visible to the few nearby residences. Therefore, we are recommending that, prior to the end of the draft EIS comment period, Trunkline provide proposed mitigation measures to minimize visual impacts of Compressor Station 203-A on nearby residences. The new and expanded meter stations would result in new, permanent impacts on visual resources. A fence would be erected around each of the new meter stations and the existing fencelines would be expanded at certain existing stations. However, the new and expanded meter stations would be in rural areas and would not affect any designated visual resources. Therefore, we conclude that these facilities would have a minimal impact on visual resources.

The proposed new Kinder Morgan-Lake Charles Meter Station and the existing NGPL–Lakeside Meter Station fall within the coastal zone boundary. In an August 27, 2014 letter, the LDNR Office of Coastal Management stated that the proposed work at the NGPL–Lakeside Meter Station would have no direct and significant impact on coastal waters and that the Kinder Morgan–Lake Charles Meter Station is exempt; therefore, neither facility would require a CUP.

5.1.9 Socioeconomics

Construction of the project would not have a significant adverse impact on local populations, employment, provision of community services, or property values. There would not be any disproportionately high or adverse environmental and human health impacts on low-income and minority populations from construction or operation of the project. One residence and one business would be displaced as a result of construction of the liquefaction facility; however, both have been purchased by Lake Charles LNG and the occupants have relocated. It is not anticipated that any residences or businesses would be displaced during construction or operation of the Non-Liquefaction Facilities.

Construction of the liquefaction facility would increase the local population for the 5-year construction period. The average workforce would be about 2,100 workers over the 5-year period. The peak construction workforce is anticipated to be about 5,600 workers, about 20 percent of which would be workers from the local area, requiring an estimated non-resident workforce of about 4,480 workers during the less than 9 months of peak construction. Assuming non-resident workers would be accompanied by family members and based on the average Calcasieu Parish household size, the peak construction non-resident workforce could result in an up to 5.9 percent temporary increase in the Calcasieu Parish population. The currently available transient housing in Calcasieu Parish may not be sufficient to accommodate the maximum peak non-resident workforce, which would result in temporary impacts on housing availability in the project area during peak construction. Outside of the time when the workforce peaks, the impact on transient housing would be minor. To ensure adequate available housing for non-resident workers, Lake Charles LNG has committed to requiring its contractor to develop a plan for addressing worker housing and monitoring availability of housing from the start of construction through the workforce peak. During operation of the liquefaction facility, an additional 176 permanent staff would be required, which would have a minor permanent impact on the local housing market.

Construction of the Non-Liquefaction Facilities would require a peak workforce of about 690 workers; however, nearly all of the workers are anticipated to be local hires. Based on the number of available rental housing units and hotels/motels in the vicinity of the Non-Liquefaction Facilities, adequate housing exists to accommodate non-resident workers and their families. Overall, construction of the proposed Non-Liquefaction Facilities would not result in significant impacts on transient housing in the area. Operation of the Non-Liquefaction Facilities would require eight new permanent employees who would relocate to the project area, which would have a negligible impact on the local housing market.

There would be a temporary increase in traffic levels due to the commuting of the construction workforce to the project area as well as the movement of construction vehicles and delivery of equipment and materials to the construction work area. Traffic is anticipated to increase substantially during construction of the liquefaction facility due to the presence of worker vehicles, construction vehicles, and trucks taking materials and equipment to and from the site. However, Lake Charles LNG would consider bussing of construction workers to and from the site using a remote parking location and expects truck deliveries to occur during off-peak traffic period. A majority of the large deliveries, including equipment and construction materials, are anticipated to be delivered via barge, reducing the number of truck trips to and from the liquefaction facility, the potential for damage to local roadways, and traffic congestion. To reduce potential cumulative impacts of the proposed project and other anticipated or recently completed developments in the project area that may create roadway capacity deficiencies, we are recommending that Lake Charles LNG file a traffic management plan that details specific measures that would be implemented to minimize impacts on traffic.

Construction of the Non-Liquefaction Facilities would result in minor, temporary impacts on traffic in the project area. Contractors may bus workers from common parking areas to the construction work areas, and Trunkline would encourage construction workers to leave their personal vehicles at the contractor yards and carpool to the construction areas when possible. Operation of the Non-Liquefaction Facilities would not result in any significant impacts on traffic or roadways within the project area.

A marine traffic study found that there was sufficient capacity in Calcasieu Channel for the increase in bulk carrier and barge traffic due to construction of the liquefaction facility, and the construction traffic would not impact existing users of Calcasieu Channel. Lake Charles LNG has not requested an increase in the number of LNG carriers that would call on the existing LNG terminal during operation of the liquefaction facility.

Construction of the project would result in positive impacts due to increases in construction jobs, payroll taxes, purchases made by the workforce, and expenses associated with the acquisition of material goods and equipment. Operation of the project would have a positive effect on the local governments' tax revenues due to the increase in property taxes that would be collected.

5.1.10 Cultural Resources

Cultural resources surveys have been completed where necessary for the liquefaction facility, ACWs, and Non-Liquefaction Facilities. No cultural resource surveys were required within the existing LNG terminal or the existing portions of the Non-Liquefaction Facilities in Louisiana per a May 2014 agreement with the Louisiana SHPO that no consultation would be necessary for construction or maintenance projects within existing rights-of-way, fenced aboveground facilities, or for use of existing access roads. The Louisiana, Mississippi, and Arkansas SHPOs, as well the FERC staff, agree that no historic properties would be affected by these facilities. Therefore, the process of complying with Section 106 of the NHPA has been completed for the project.

Lake Charles LNG, Trunkline, and FERC staff contacted several Native American tribes to identify properties of traditional, religious, or cultural importance that may be affected by the proposed project. In a June 20, 2014 letter, the Choctaw Nation of Oklahoma indicated they were unaware of any cultural or sacred sites within the immediate project area, and in an April 2, 2014 letter, the Coushatta Tribe of Louisiana concurred that no historic properties would be affected by the proposed project. Both tribes requested that they be notified if cultural resources or human remains are discovered during construction activities. In a response dated April 4, 2014, the Chitimacha Tribe of Louisiana noted that they had no concerns or comments regarding the project. None of the other Native American tribes contacted have provided comments to date.

5.1.11 Air Quality and Noise

Air pollutant emissions during construction of the project would result from the operation of construction vehicles, marine traffic, vehicles driven by construction workers commuting to and from project work sites, and the generation of fugitive dust during construction activities. Estimated emissions from the barges and bulk carriers that would deliver materials to the liquefaction facility site during construction were not yet available during preparation of the draft EIS. Therefore, we are recommending that Lake Charles LNG file the estimated emissions from these sources prior to the end of the draft EIS comment period. Air quality impacts due to construction would generally be temporary and localized, and are not expected to cause or contribute to a violation of applicable air quality standards. Lake Charles LNG and Trunkline would minimize emissions from gasoline and diesel engines by complying with applicable EPA mobile source emission performance standards and by using equipment manufactured to meet these standards. Fugitive dust emissions would be limited or mitigated, if necessary, by spraying water to dampen dry work surfaces and/or by the application of dust suppressants. In conclusion, and subject to analysis of the additional information requested for marine traffic emissions, we find that construction-related impacts on local air quality would not be significant.

Operation of the proposed liquefaction facility would result in long-term impacts on air quality. However, Lake Charles LNG would minimize these impacts by adhering to applicable federal and state regulations and installing BACT as described in its July 2014 revised Title V permit application to the LDEQ. Although operation of the proposed new Compressor Station 203-A and the modified Longville Compressor Station would also emit air pollutants, Trunkline's AERSCREEN model results demonstrate that the emissions from Compressor Station 203-A and from the modifications at the Longville Compressor Station would not significantly impact the air quality in the surrounding area. However, Trunkline's AERSCREEN analysis only included the proposed modifications, and not the existing facilities. Therefore, we are recommending that Trunkline provide an AERSCREEN modeling analysis for both the existing and proposed units at the Longville Compressor Station prior to construction. Trunkline would minimize potential impacts on air quality due to the operation of both compressor stations by adhering to applicable federal and state regulations described in its air permit applications.

Noise impacts associated with the construction of the liquefaction facility and modifications to the LNG terminal would primarily be attributed to the operation of construction equipment and pile driving activities. The increases in noise levels would be intermittent, would generally occur during daylight hours (although certain activities may need to be conducted at night to avoid construction schedule delays), and would vary over the course of the 5-year construction period. The noise modeling conducted by Lake Charles LNG found that the estimated noise impact at the nearest NSAs would be less than 55 dBA L_{dn}.

The most significant noise-generating activities during construction of the Non-Liquefaction facilities would be associated with Compressor Station 203-A, the Longville Compressor Station modifications, and HDD crossings. Trunkline conducted an acoustical analysis to identify the estimated noise impacts at the nearest NSAs during construction of Compressor Station 203-A and modifications to the Longville Compressor Station. The results indicate that the noise levels at the NSAs nearest to these compressor stations could exceed the 55-dBA threshold when construction equipment is operating simultaneously resulting in peak noise levels. However, construction would occur during daytime hours, would be temporary and localized, and would not cause a significant long-term impact on ambient noise levels at any of the identified NSAs.

Trunkline also conducted an acoustical assessment to estimate the sound contribution of the HDDs for NSAs within 0.5 mile of each HDD entry or exit point. The results of this assessment demonstrate that HDD noise is estimated to exceed a 55-dBA noise level (L_{dn}) and/or result in a greater than 10 dBA increase over ambient conditions at the Indian Bayou Channel at eight NSAs. Trunkline would implement applicable noise mitigation measures to bring HDD noise levels into compliance with the FERC guideline. To ensure that HDD-related noise does not exceed the FERC guidelines, we are recommending that Trunkline file in its weekly construction status reports information for the Indian Bayou Canal HDD entry and exit points, including noise measurements from the nearest NSA, obtained at the start of drilling operations, the noise mitigation that Trunkline implemented at the start of drilling operations, and any additional mitigation measures Trunkline would implement if the initial noise measurements exceeded the FERC guidelines. Noise associated with construction of the other pipeline facilities would be short term and temporary at any one location because of the assembly-line method of pipeline construction. Because Trunkline would primarily limit construction to daytime hours and implement noise mitigation measures at HDD sites, we conclude that construction noise would not have a significant impact on landowners and residents near the Non-Liquefaction Facilities.

Operation of the liquefaction facility would produce noise on a continuous basis throughout the lifetime of the facility. The modeling results indicate that, with the incorporation of proposed noise-mitigation measures, the noise from operation of the liquefaction facility would not exceed the 55-dBA threshold at any of the NSAs. To ensure that NSAs are not adversely impacted by the phased operation of the liquefaction facility, we are recommending that Lake Charles LNG file a full-load noise survey no later than 60 days after each liquefaction train is put in service for the first and second liquefaction trains, and if noise levels attributable to operation of the liquefaction facility exceed the FERC guideline, that Lake Charles LNG reduce the facility's noise contribution to result in a noise level that is no higher than the FERC guideline. We are also recommending that Lake Charles LNG file a full-load noise survey no later than 60 days after placing the liquefaction facility in service, or, if a full load noise survey is not possible, that they provide an interim survey at the maximum possible load and provide the full load survey within 6 months. If the noise levels attributable to operation of the liquefaction facility exceed the FERC guideline at the nearest NSA, Lake Charles LNG should file a report on what changes are needed and install noise controls to meet the level within 1 year of service. In addition, both recommendations include having Lake Charles LNG confirm compliance by filing a second noise survey no later than 60 days after installing the additional noise controls. Therefore, we conclude that operational noise from the expanded terminal would result in minor impacts on the nearest NSA.

Although not part of day-to-day operations, Lake Charles LNG would use flares during startup procedures and, if necessary, during emergency situations. In order to evaluation the impacts of noise during flaring events, we are recommending that Lake Charles LNG provide noise estimates for flaring activities prior to the end of the draft EIS comment period, including supporting calculations and assumptions, and a description of how often flaring would occur and Lake Charles LNG's landowner notification procedures.

The primary noise impacts associated with the operation of the Non-Liquefaction Facilities would be attributable to proposed Compressor Station 203-A and the proposed compressor unit replacement at the Longville Compressor Station. The modeling analyses conducted for the compressor stations indicate that with the incorporation of the proposed mitigation measures, operational noise at Compressor Station 203-A would not exceed the 55-dBA L_{dn} noise threshold at any of the nearby NSAs. The noise contribution from the proposed compressor unit replacement itself at the Longville Compressor Station would not exceed the 55-dBA L_{dn} noise threshold at any of the nearby NSAs; however, the noise levels from the existing equipment, which were placed in service before the Commission adopted the current noise standards, are above an L_{dn} of 55 dBA at three of the four nearby NSAs. To ensure that noise levels resulting from Compressor Station 203-1 would be below the FERC guideline, and to ensure that there is no perceptible increase in noise levels resulting from the modification of the Longville Compressor Station, we are recommending that Trunkline file noise surveys during full load no later than 60 days after placing Compressor Station 203-A, and the new compressor unit at the Longville Compressor Station, into service. If a full power load condition noise survey is not possible, Trunkline should file an interim survey at the maximum possible power load within 60 days of placing the station/new compressor unit into service and file the full power load survey within 6 months. If the noise attributable to operation of all equipment at Compressor Station 203-A under interim or full power load conditions exceeds the FERC guideline at any nearby NSA, or if the noise attributable to the operation of the modified Longville Compressor Station at full or interim power load conditions exceeds predicted noise levels at any nearby NSAs, Trunkline should file a report on what changes are needed, install additional noise controls to meet that level within 1 year of the in-service date; and confirm compliance with this requirement by filing a second full power load noise survey no later than 60 days after it installs the additional noise controls..

Based on the analyses conducted, mitigation measures proposed, and with our additional recommendations, we conclude that the project would not result in significant air or noise impacts on residents and the surrounding communities during construction and operation of the project**.**

5.1.12 Safety

We evaluated the safety of the proposed liquefaction facility and LNG terminal modifications, including assessments of hazards, preliminary engineering design, siting, emergency response, and security systems. Based on our technical review of the preliminary engineering design, we conclude that, with the incorporation of our recommendations, the FEED presented by Lake Charles LNG would include acceptable layers of protection or safeguards to reduce the risk of a potentially hazardous scenario from developing into an event that could impact the off-site public.

As a cooperating agency, the DOT assisted FERC staff in evaluating whether Lake Charles LNG's proposed design would meet the DOT siting requirements. In a September 19, 2014 letter to FERC staff, the DOT stated that it had no objection to Lake Charles LNG's methodology for determining the single accidental leakage sources for candidate design spills to be used in establishing the Part 193 siting requirements for the proposed liquefaction facilities. Additionally, on January 30, 2015, the DOT indicated that it has no objection to Lake Charles LNG's use of the proposed vacuum insulated piping in the methodology for determining single accidental leakage sources. We conclude that the siting of the proposed project would not have a significant impact on public safety.

In accordance with 33 CFR 127, the Coast Guard has reviewed the proposed liquefaction facilities. In a letter dated March 5, 2012, the Coast Guard stated that the existing WSA and LOR are adequate for the service associated with the proposed modifications because the proposed modifications for the liquefaction facilities would lie outside of the Marine Transfer Area and because Lake Charles LNG is not proposing to increase the size or frequency of LNG carrier traffic at the Trunkline LNG Terminal. As required by 33 CFR 105 and 127, Lake Charles LNG would amend the Operations Manual, Emergency Manual, and Facility Security Plan to capture changes to the operations associated with the project and would submit these documents to the Coast Guard prior to operation of the facility as an export terminal.

We identify specific recommendations to be addressed by Lake Charles LNG prior to initial site preparation, prior to construction of final design, prior to commissioning, prior to introduction of hazardous fluids, prior to commencement of service, and throughout the life of the proposed facilities. In addition to the final design review, we would conduct inspections during construction and operation of the facility to ensure that the installed design is consistent with the safety and operability characteristics of the FEED, and that the facility is operated and maintained in accordance with the filed design throughout the life of the facility.

Trunkline would design, construct, operate, and maintain the proposed Non-Liquefaction Facilities in accordance with the DOT Minimum Federal Safety Standards in 49 CFR 192. These regulations, which are intended to protect the public and to prevent natural gas facility accidents and failures, include specifications for material selection and qualification, minimum design requirements, and protection of pipelines from corrosion. We conclude that the proposed Non-Liquefaction Facilities would incrementally increase the risk of a pipeline accident; however Trunkline's compliance with the DOT's safety standards will ensure that Trunkline's construction and operation of the facilities would not have a significant impact on public safety.

5.1.13 Cumulative Impacts

Three types of projects (past, present, and reasonably foreseeable projects) could potentially contribute to a cumulative impact when considered with the proposed project. Such projects in the Lake Charles Liquefaction Project area include existing LNG terminals and future liquefaction projects, oil and gas facilities, other industrial facilities, utility and transportation projects, commercial and residential developments, and government facilities/activities. Our assessment considered the impacts of the proposed project combined with the impacts of the other projects on resources within all or part of the same area and time.

We provide a detailed discussion about potential cumulative impacts by resource in section 4.13. We conclude that, for most resources, the project's contribution to cumulative impacts on resources affected by the project would not be significant, and that the potential cumulative impacts of the Lake Charles Liquefaction Project and the other projects considered would be minor or insignificant.

The construction period for the Lake Charles Liquefaction Project would likely coincide with at least some of the other major Lake Charles area projects. A large workforce for the simultaneously constructed projects would have a beneficial cumulative effect on revenues for the state and for Cameron, Calcasieu, Jefferson Davis, and Beauregard Parishes due to expenditures for services and materials for the projects, increased expenditures by local workers, and expenditures by the non-local workforce and any family members accompanying the non-local workers. The parishes would also receive a substantial increase in property taxes from the projects.

Based on the size of some of the projects and the large number of construction workers required, the qualified construction workers in the local labor force would likely be exceeded by the available jobs. Therefore, there would be an influx of non-local workers to fill the gap. This would potentially impact transient housing in Calcasieu, Jefferson Davis, and Beauregard Parishes, where the amount of available housing may not be sufficient if some of the other major projects are constructed at the same time. Non-local workers unable to find acceptable housing in Calcasieu, Jefferson Davis, and Beauregard Parishes may need to find housing in adjacent Allen Parish. If peak construction workforce periods of many of the projects coincide, it is possible the available housing in Allen Parish could also be exceeded. As a result, some members of the workforce and others seeking transient housing may be forced to obtain housing in more distant parishes with longer commutes.

The combined construction workforces of these projects would also potentially increase the need for some public services, such as police, medical services, and schools. If the medical and emergency services, or other public services, are adversely affected during construction, the project sponsors may mitigate the impact by providing funding for temporarily increasing the staff and equipment of the public services affected. Emergency response time is a key aspect of public health and safety. In accordance with FERC regulations, Lake Charles LNG would prepare a comprehensive plan that identifies the cost sharing mechanisms for funding these emergency response costs. This plan would minimize the potential for a cumulative public safety impact associated with the project. Any or all of the other stand-alone LNG liquefaction projects (e.g., Magnolia LNG Project), if authorized, constructed, and operated, would also have to prepare and implement a similar comprehensive plan to provide emergency services. In addition, we anticipate that the other major projects in the Lake Charles area (the LCCE Gasification Project, the Lake Charles CCS Project, the IFG Port Holdings export, the Sasol Projects, and the G2X Energy Natural Gas-to-Gasoline Plant) would include emergency services within their facilities, and have emergency response plans developed with the appropriate agencies. Emergency responses at any of those facilities may temporarily stress emergency services in the area, but we would not expect them to result in a long-term significant impact on those services. In the unlikely event of major emergencies at several of the facilities at the same time, there could be a short term but significant cumulative impact on emergency services within Beauregard, Jefferson Davis, and Calcasieu Parishes. That impact could be mitigated by assistance from emergency service providers from surrounding parishes.

Cumulative traffic impacts from concurrent development of the Lake Charles Liquefaction Project, Magnolia LNG Project, and G2X Energy Project could include deficiencies in roadway capacities. A traffic study indicates that Lake Charles LNG plans to specify shipping routes during construction between the facility site and interstate highway system that would keep commercial traffic out of the more developed areas of Lake Charles. Lake Charles LNG has also indicated that it would avoid receiving large truck deliveries during peak traffic periods, and that it may consider bussing workers to and from the construction site. The study identifies several other mitigation strategies that might alleviate the cumulative impact of the three projects, including off-site parking, the use of shuttles, controlled shift times, coordination among the projects to reduce peak hour vehicular trips, traffic signal coordination/retiming, intersection and road improvements, and use of law enforcement to control traffic. Lake Charles LNG, Magnolia LNG, and G2X Energy are coordinating to further evaluate cumulative impacts of the three projects on area traffic and roadways. Additionally, we have recommended that Lake Charles LNG file a traffic management plan prior to construction.

Based on the cumulative modeling analysis and the required emission controls at the various Lake Charles Liquefaction Project facilities, we conclude that there would be no significant cumulative impact on air quality as a result of the operation of these facilities. There is no current methodology or policy guidance to determine how the Lake Charles Liquefaction Project's incremental contribution to GHGs would translate into physical effects on the global environment. The emissions would increase the atmospheric concentration of GHGs, in combination with past and future emissions from all other sources, and contribute incrementally to climate change that produces the impacts described above. However, it cannot be determined whether or not the Lake Charles Liquefaction Project's contribution to cumulative impacts on climate change would be significant.

The greatest potential for cumulative noise impacts would be during construction from internal combustion engines and pile driving activities associated with construction of the proposed liquefaction facility. The estimated noise generated from construction associated with the liquefaction facility would not exceed 55 dBA L_{dn} at the nearest NSAs. Although construction of the G2X Energy and Magnolia LNG Projects could overlap with the construction of the Lake Charles Liquefaction Project and contribute to noise levels in the area, these projects are located farther from the nearest NSA. As a result, we do not find that construction of the liquefaction facility along with the G2X Energy and Magnolia LNG Projects would result in a significant noise impact on the nearest NSA.

5.1.14 Alternatives

As alternatives to the proposed action, we evaluated the No-Action Alternative, system alternatives for the proposed liquefaction facility and Trunkline's proposed pipelines, alternatives sites for the liquefaction facility, alternative configurations for the liquefaction facility, alternative pipeline routes, alternative aboveground facility sites for the Non-Liquefaction Facilities, and alternative power sources for the liquefaction facility and Compressor Station 203-A. While the No-Action Alternative would eliminate the short- and long-term environmental impacts identified in the EIS, the stated objectives of the proposed action would not be met.

We evaluated system alternatives for the liquefaction facility, including 6 operating LNG import terminals with approved, proposed, or planned expansions to provide liquefaction capabilities, and 15 approved, proposed, or planned stand-alone (greenfield) liquefaction projects along the Gulf Coast in the southern United States. All of these were eliminated from further consideration as viable alternatives for reasons that include insufficient capacity to meet Lake Charles LNG's customer commitments without constructing facilities beyond those currently approved, planned, or proposed; incompatible timeframes with in-service dates that would not meet Lake Charles LNG's customer commitments; and environmental impacts that were considered comparable to or greater than those of the proposed project.

We evaluated three system alternatives to Trunkline's proposed pipelines. To serve as a viable system alternative to Trunkline's proposed pipelines, the system would have to transport all or a part of the volume of natural gas required for liquefaction at proposed new facility and cause significantly less impact on the environment than the proposed pipeline expansion. All three systems were eliminated from further consideration because they would require construction of additional pipeline looping or greenfield construction to provide the 2.6 Bcf/d required by the Lake Charles Liquefaction Project and/or the alternative would not provide significant environmental advantage over the proposed project.

We evaluated five sites for the liquefaction facility, including the proposed site and four alternatives. The sites were selected based on proximity to the existing LNG terminal and property considerations (e.g., parcel size and contiguity, current ownership, potential availability). Various environmental criteria were applied for site prioritization and selection when compared to the proposed site, including potential impacts on threatened, endangered, and protected species and wetlands; proximity to residential areas; land use and zoning; and road access. The alternatives analysis concluded that the currently proposed site represents the preferred site for the proposed liquefaction facility because it is sufficiently sized to allow optimal facility layout design and contiguity with the existing LNG terminal, avoids the need for off-site LNG piping, and is geographically well separated from area residences. While the proposed site does contain wetlands and forested cover, the loss of habitat diversity and function resulting from facility development would be generally comparable with that anticipated at the other sites, with the advantage that no estuarine wetlands would be affected.

We did not find any alternative configurations for the liquefaction facility that would meet the design and configuration requirements of 49 CFR 193 and other industry or engineering standards while at the same time avoiding or reducing the impacts associated with the proposed terminal configuration. The proposed location for the liquefaction trains and pretreatment units, for which most of the modeling for thermal exclusion and vapor dispersion zones was focused, represents the area on site that is farthest from publicly accessible land and closest to the existing LNG terminal, thereby minimizing the length of interconnecting LNG transfer piping. While other locations for the liquefaction trains and pretreatment units may satisfy regulatory siting requirements equally, these two factors confer a significant advantage for the currently proposed layout.

As part of our analysis of alternative terminal configurations, we considered whether Lake Charles LNG's planned permanent conversion of all land to industrial use is necessary across the entire liquefaction facility site. According to Lake Charles LNG, the perimeter of the site cannot be reduced or adjusted and still meet operational noise and vapor dispersion requirements. Within this perimeter, Lake Charles LNG's grading plan calls for the import of suitable fill material and a significant elevation increase across the whole site to meet safety requirements, within both the operational footprint of plant infrastructure and adjacent construction workspaces. The increased elevation would facilitate maneuverability, staging, fabrication, etc. during construction and would reduce the threat of flooding during both construction and operation.

We have analyzed the regional setting of Trunkline's proposed Mainline Connector pipeline route and have determined that a different route (which would likely be longer) between other points of interconnection would not offer any environmental advantage. Also, the proposed pipeline interconnection between MLV 203-A and MLV 303-A is an integral part of a wider system plan involving the construction of the proposed new aboveground facilities and modifications to existing aboveground facilities. We did not identify any environmental concerns that indicate a need to identify and evaluate alternative routes for the Mainline Connector.

The Mainline 200-3 Loop would be collocated with an existing pipeline, precluding the need for an alternatives analysis beyond determining the side of the existing pipeline on which to collocate. The entire loop segment parallels the existing pipeline on the western/southern side. Collocation on the northern/eastern side was ruled out because construction would require crossing two existing pipelines and would create a conflict with the Tennessee Kaplan Meter Station at the northern terminus. The proposed right-of-way for the Mainline 200-3 Loop would partially overlap the previously disturbed right-of-way of the existing Mainline 200-3 pipeline, minimizing environmental impacts.

We evaluated one potential site alternative for Compressor Station 203-A: alternative site CSA-1. Although a ditch located in the southeast portion of the proposed site would be permanently filled, the environmental impact would be significantly less than that associated with the riparian woodland removal and stream rerouting that would be required at CSA-1. CSA-1 is also in a more densely populated area, with about 59 residences located within 0.5 mile, the closet being 145 feet away. Based on the above comparison between the two sites, we conclude that CSA-1 would not be environmentally preferable to the proposed location.

Feasible alternatives for the bidirectional piping modifications and the compression upgrade proposed at four existing compressor stations do not exist and, given that construction would take place within the fencelines of the existing facilities, environmental impacts would be minimized. Therefore, the need to consider alternatives for these facilities was not warranted or feasible.

Alternative sites for the LCLNG Export Meter Station are all within either the existing LNG terminal or the liquefaction facility site. Since these two areas are either fully developed or would be fully developed under the proposed action, there is no net difference in anticipated environmental impacts between alternative site locations. The other four new meter stations are located at existing Trunkline pipeline crossings with Gulf Crossing, Midcontinent Express, Kinder Morgan, and Columbia Gulf Transmission. By necessity of system function and design, the proposed meter stations must be located at or in the immediate vicinity of the intersections between Trunkline and these other suppliers; therefore, materially different alternative sites were not identified for evaluation. The potential impacts of construction and operation of the meter stations would be minimal and we determined that no alternative sites would provide a significant environmental advantage over the proposed sites. Because the modifications to the existing meter stations would take place at existing facilities, there are no feasible alternatives for these project components. In addition, the locations of the remaining Non-Liquefaction Facilities, including the Mainline 100-3 Modifications and the Mainline 200-1 Modifications, would be located at existing facilities and, as such, there are no feasible alternatives to these locations.

The use of electrically driven motors as an alternative to gas-fired turbines at the proposed liquefaction facility was evaluated during pre-FEED and ruled out due to the excessive amount of electrical power required. To use electric-powered motors, power would either have to be generated on site or imported from the municipal power grid, neither of which would be a feasible alternative supply source.

Trunkline performed a review of electric motor-driven compressors at Compressor Station 203-A. The results indicated that the electric load for this design would be of a magnitude serviceable only by a high-voltage transmission system for which the nearest potential interconnect is more than 2 miles away. Due to the required capital cost for the electric system expansion and the ongoing cost of electricity for facility operation, Trunkline eliminated this option from initial consideration. However, Trunkline requested that Entergy (service provider) provide a high-level feasibility of service analysis. We are recommending that Trunkline file the feasibility of an electric-motor driven alternative analysis based on Entergy's feasibility results.

5.2 FERC STAFF'S RECOMMENDED MITIGATION

If the Commission authorizes the Lake Charles Liquefaction Project, we are recommending that the following measures be included as specific conditions in the Commission's Order. We believe that these measures would further mitigate the environmental impacts associated with the construction and operation of the proposed project.

1. Lake Charles LNG and Trunkline shall follow the construction procedures and mitigation measures described in their applications and supplements (including responses to staff data requests) and as identified in the EIS, unless modified by the Order. Lake Charles LNG and Trunkline must:

    a. request any modification to these procedures, measures, or conditions in a filing with the Secretary;

    b. justify each modification relative to site-specific conditions;

    c. explain how that modification provides an equal or greater level of environmental protection than the original measure; and

    d. receive approval in writing from the Director of OEP **before using that modification**.

2. For LNG facilities, the Director of OEP has delegated authority to take all steps necessary to ensure the protection of life, health, property, and the environment during construction and operation of the project. This authority shall include:

    a. stop-work authority and authority to cease operation; and

    b. the design and implementation of any additional measures deemed necessary to assure continued compliance with the intent of the conditions of the Order.

3. For pipeline facilities, the Director of OEP has delegated authority to take whatever steps are necessary to ensure the protection of all environmental resources during construction and operation of the project. This authority shall allow:

   a. the modification of conditions of the Order; and

   b. the design and implementation of any additional measures deemed necessary (including stop-work authority) to assure continued compliance with the intent of the environmental conditions as well as the avoidance or mitigation of adverse environmental impact resulting from construction and operation of the project.

4. **Prior to any construction**, Lake Charles LNG and Trunkline each shall file affirmative statements with the Secretary, certified by senior company officials, that all company personnel, EIs, and contractor personnel will be informed of the EIs' authority and have been or will be trained on the implementation of the environmental mitigation measures appropriate to their jobs **before** becoming involved with construction and restoration activities for the project.

5. The authorized facility locations shall be as shown in the EIS, as supplemented by filed alignment sheets. **As soon as they are available and before the start of construction**, Lake Charles LNG and Trunkline shall file with the Secretary any revised detailed survey alignment maps/sheets at a scale not smaller than 1:6,000 with station positions for all facilities approved by the Order. All requests for modifications of environmental conditions of the Order or site-specific clearances must be written and must reference locations designated on these alignment maps/sheets.

   Trunkline's exercise of eminent domain authority granted under NGA section 7(h) in any condemnation proceedings related to the Order must be consistent with these authorized facilities and locations. Trunkline's right of eminent domain granted under NGA section 7(h) does not authorize it to increase the size of its natural gas pipeline or facilities to accommodate future needs or to acquire a right-of-way for a pipeline to transport a commodity other than natural gas.

6. Lake Charles LNG and Trunkline shall file with the Secretary detailed alignment maps/sheets and aerial photographs at a scale not smaller than 1:6,000 identifying all route realignments or facility relocations, and staging areas, pipe storage yards, new access roads, and other areas that would be used or disturbed and have not been previously identified in filings with the Secretary. Approval for each of these areas must be explicitly requested in writing. For each area, the request must include a description of the existing land use/cover type, documentation of landowner approval, whether any cultural resources or federally listed threatened or endangered species would be affected, and whether any other environmentally sensitive areas are within or abutting the area. All areas shall be clearly identified on the maps/sheets/aerial photographs. All areas must be approved in writing by the Director of OEP **before construction in or near that area**.

   This requirement does not apply to extra workspace allowed by the FERC Plan and/or minor field realignments per landowner needs and requirements that do not affect other landowners or sensitive environmental areas such as wetlands.

   Examples of alterations requiring approval include all route realignments and facility location changes resulting from:

   a. implementation of cultural resources mitigation measures;

   b. implementation of endangered, threatened, or special concern species mitigation measures;

c. recommendations by state regulatory authorities; and

d. agreements with individual landowners that affect other landowners or could affect sensitive environmental areas.

7. **Within 60 days of the acceptance of the Order and before construction begins**, Lake Charles LNG and Trunkline shall file Implementation Plans with the Secretary for review and written approval by the Director of OEP. Lake Charles LNG and Trunkline must file revisions to the plans as schedules change. The plans shall identify:

   a. how Lake Charles LNG and Trunkline will implement the construction procedures and mitigation measures described in its application and supplements (including responses to staff data requests), identified in the EIS, and required by the Order;

   b. how Lake Charles LNG and Trunkline will incorporate these requirements into the contract bid documents, construction contracts (especially penalty clauses and specifications), and construction drawings so that the mitigation required at each site is clear to onsite construction and inspection personnel;

   c. the number of EIs assigned per spread and/or facility, and how Lake Charles LNG and Trunkline will ensure that sufficient personnel are available to implement the environmental mitigation;

   d. company personnel, including EIs and contractors, who will receive copies of the appropriate material;

   e. the location and dates of the environmental compliance training and instructions Lake Charles LNG and Trunkline will give to all personnel involved with construction and restoration (initial and refresher training as the project progresses and personnel changes), with the opportunity for OEP staff to participate in the training session(s);

   f. the company personnel (if known) and specific portion of Lake Charles LNG’s and Trunkline's organizations having responsibility for compliance;

   g. the procedures (including use of contract penalties) Lake Charles LNG and Trunkline will follow if noncompliance occurs; and

   h. for each discrete facility, a Gantt or PERT chart (or similar project scheduling diagram), and dates for:

      i. the completion of all required surveys and reports;
      ii. the environmental compliance training of onsite personnel;
      iii. the start of construction; and
      iv. the start and completion of restoration.

8. Lake Charles LNG and Trunkline shall employ a team of EIs, including at least one EI for the liquefaction facility/LNG terminal modifications, and one or more EIs per pipeline spread. The EIs shall be:

   a. responsible for monitoring and ensuring compliance with all mitigation measures required by the Order and other grants, permits, certificates, or other authorizing documents;

   b. responsible for evaluating the construction contractor's implementation of the environmental mitigation measures required in the contract (see condition 7 above) and any other authorizing document;

   c. empowered to order correction of acts that violate the environmental conditions of the Order, and any other authorizing document;

   d. a full-time position, separate from all other activity inspectors;

   e. responsible for documenting compliance with the environmental conditions of the Order, as well as any environmental conditions/permit requirements imposed by other federal, state, or local agencies; and

   f. responsible for maintaining status reports.

9. Beginning with the filing of the Implementation Plans, Lake Charles LNG and Trunkline shall file updated status reports with the Secretary on a **monthly** basis for the liquefaction facility/LNG terminal modifications and a **weekly** basis for the Non-Liquefaction Facilities until all construction and restoration activities are complete. On request, these status reports will also be provided to other federal and state agencies with permitting responsibilities. Status reports shall include:

   a. an update on Lake Charles LNG's and Trunkline's efforts to obtain the necessary federal authorizations;

   b. the current construction status of the liquefaction facility/LNG terminal modifications and Non-Liquefaction Facilities, work planned for the following reporting period, and any schedule changes for stream crossings or work in other environmentally sensitive areas;

   c. a listing of all problems encountered and each instance of noncompliance observed by the EIs during the reporting period (both for the conditions imposed by the Commission and any environmental conditions/permit requirements imposed by other federal, state, or local agencies);

   d. a description of the corrective actions implemented in response to all instances of noncompliance, and their cost;

   e. the effectiveness of all corrective actions implemented;

   f. a description of any landowner/resident complaints that may relate to compliance with the requirements of the Order, and the measures taken to satisfy their concerns; and

g. copies of any correspondence received by Lake Charles LNG and Trunkline from other federal, state, or local permitting agencies concerning instances of noncompliance, and Lake Charles LNG's and/or Trunkline's response.

10. **Prior to receiving written authorization from the Director of OEP to commence construction of any project facilities**, Lake Charles LNG and Trunkline shall file with the Secretary documentation that they have received all applicable authorizations required under federal law (or evidence of waiver thereof).

11. Lake Charles LNG must receive written authorization from the Director of OEP **prior to introducing hazardous fluids into the liquefaction facilities**. Instrumentation and controls, hazard detection, hazard control, and security components/systems necessary for the safe introduction of such fluids shall be installed and functional.

12. Lake Charles LNG and Trunkline must each receive written authorization from the Director of OEP **before placing into service** the liquefaction facility/LNG terminal modifications and the Non-Liquefaction Facilities. Such authorization will only be granted following a determination that the facilities have been constructed in accordance with FERC approval and applicable standards, can be expected to operate safely as designed, and the rehabilitation and restoration of the right-of-way and other areas affected by the project are proceeding satisfactorily.

13. **Within 30 days of placing the authorized facilities in service**, Lake Charles LNG and Trunkline each shall file an affirmative statement with the Secretary, certified by a senior company official:

    a. that the facilities have been constructed in compliance with all applicable conditions, and that continuing activities will be consistent with all applicable conditions; or

    b. identifying which of the conditions of the Order Lake Charles LNG and Trunkline have complied with or will comply with. This statement shall also identify any areas affected by the project where compliance measures were not properly implemented, if not previously identified in filed status reports, and the reason for noncompliance.

14. **Prior to the end of the draft EIS comment period**, Trunkline shall file with the Secretary the feasibility of Entergy's electric transmission service analysis for Compressor Station 203-A and a full alternative analysis of electric motor-driven compressor units for this station. *(Section 3.7.2)*

15. **Prior to the end of the draft EIS comment period**, Lake Charles LNG shall file with the Secretary updates on:

    a. its discussions with Jordan Oil and the outcome of these discussions with respect to the buyout and closure of the active well within the liquefaction facility site and, if applicable, drilling of a new well; and

    b. its communications regarding the mineral rights concerns raised by Margaret Kuttner, John Bergstedt, and Tom Bergstedt. *(Section 4.1.2)*

16. **Prior to the end of the draft EIS comment period**, Lake Charles LNG shall file a ground subsidence monitoring plan with the Secretary, including possible mitigation measures to be implemented at the liquefaction facility site. *(Section 4.1.3.3)*

17. Lake Charles LNG shall file with the Secretary the following information, stamped and sealed by the professional engineer-of-record:

    a. site preparation drawings and specifications;

    b. LNG liquefaction facility structures and foundation design drawings and calculations; and

    c. quality control procedures to be used for civil/structural design and construction.

    In addition, Lake Charles LNG shall file, **in its Implementation Plan**, the schedule for producing this information. *(Section 4.1.4.1)*

18. **Prior to the end of the draft EIS comment period**, Trunkline shall file with the Secretary the following information, stamped and sealed by the professional engineer-of-record:

    a. the results of the geotechnical investigation Trunkline conducted at the Compressor Station 203-A site evaluating the existing site conditions; and

    b. any resulting foundation and site improvement recommendations. *(Section 4.1.4.2)*

19. **Prior to construction**, Trunkline shall file with the Secretary the geotechnical investigations, stamped and sealed by the professional engineer-of-record, which are necessary to evaluate the suitability of the proposed HDD crossings. *(Section 4.1.5)*

20. **Prior to construction**, Lake Charles LNG shall file with the Secretary, for review and written approval by the Director of OEP, final design plans for the ACWs that detail how each ACW would be stabilized after construction is complete to prevent off-site erosion impacts on the surrounding areas, and any planned mitigation to address altered drainage patterns resulting from the modified elevation and clearing of these sites. *(Section 4.2.3)*

21. **Prior to construction**, Lake Charles LNG and Trunkline shall file with the Secretary an updated SPAR Plan that includes project-specific emergency contacts and local authorities, and the project-specific SPCC Plan(s) for review and written approval by the Director of OEP. *(Section 4.2.3)*

22. **Within 30 days of placing facilities in service,** Lake Charles LNG and Trunkline shall file with the Secretary a report identifying all public or private water supply wells/systems damaged by construction and how they were repaired. The report shall also include a discussion of any other complaints concerning well yield or water quality and how each problem was resolved. *(Section 4.3.1.4)*

23. **Prior to the end of the draft EIS comment period**, Lake Charles LNG shall file with the Secretary the results of the contaminated sediment sampling study for the Industrial Canal/Turning Basin, as well as an interpretation of the results that includes but is not limited to a summary of the findings; the fate of contaminated sediment disturbed during construction; any potential impacts not previously identified that could result from the resuspension of contaminated sediments, disposal, and dewatering of dredged material; and any additional mitigation measures proposed. *(Section 4.3.2.2)*

24. **Prior to construction**, Trunkline shall file with the Secretary copies of the final HDD plan and profile drawings for review and written approval by the Director of OEP. *(Section 4.3.2.2)*

25. **Prior to construction**, Trunkline shall file its final HDD Contingency Plan with the Secretary for review and written approval by the Director of OEP. *(Section 4.3.2.2)*

26. **Prior to the end of the draft EIS comment period**, Trunkline shall file with the Secretary a detailed description of the proposed ATWS affecting a waterbody associated with the Calcasieu River crossing (waterbody W-C-CA-621), whether Trunkline could limit the workspace or shift it to avoid all or part of the waterbody, and how Trunkline will minimize unavoidable impacts on the waterbody. *(Section 4.3.2.2)*

27. **Prior to the end of the draft EIS comment period**, Trunkline shall evaluate the feasibility of moving the Little Bayou HDD entry point to the northeast beyond the boundary of forested wetland W-AT-15 and file with the Secretary either revised alignment sheets to reflect this change or justification as to why this adjustment is not feasible. *(Section 4.4.3.2)*

28. **Prior to the end of the draft EIS comment period**, Trunkline shall file with the Secretary maps or figures that clarify the location of the proposed ATWS in forested wetland W-E-003 on the Mainline 200-1 modifications and provide additional justification for this ATWS. Trunkline shall also provide additional justification for the proposed ATWS depicted in wetland W-E-001 on the west side of the Calcasieu River between approximate MPs 194.6 and 194.7 on the Mainline 200-1 modifications. *(Section 4.4.3.2)*

29. Lake Charles LNG and Trunkline shall continue to consult with the COE to finalize the Compensatory Mitigation Plan and, **prior to the end of the draft EIS comment period**, file with the Secretary a copy of the final Compensatory Mitigation Plan and documentation of COE approval of the plan. *(Section 4.4.4)*

30. **Prior to construction**, Lake Charles LNG and Trunkline shall coordinate with the NRCS and LDWF to develop a project-specific noxious weed control plan. The plan shall be filed with the Secretary for review and approval by the Director of OEP. *(Section 4.5.3)*

31. **Prior to the end of the draft EIS comment period**, Lake Charles LNG and Trunkline shall confirm that they would not conduct any clearing during the migratory bird nesting period between March 1 and July 31 unless approved in writing by the FWS. *(Section 4.6.1.3)*

32. **Prior to the end of the draft EIS comment period**, Lake Charles LNG and Trunkline shall confirm in a filing with the Secretary that if construction will commence during the nesting season for colonial waterbirds, they will conduct field visits within 2 weeks prior to starting construction and will consult with the FWS and LDWF if nesting colonies are found within 400 meters (700 meters for brown pelicans) of the construction areas. *(Section 4.6.1.3)*

33. **Prior to the end of the draft EIS comment period**, Lake Charles LNG shall file with the Secretary a description of the proposed in-water pile installation process, including the number and type of pile driver(s) (e.g., impact or vibratory hammer), duration of in-water pile driving activities, anticipated peak and cumulative underwater sound pressure levels, and measures proposed to minimize impacts on aquatic resources in the vicinity of on-land and in-water pile driving activities. *(Section 4.6.2.1)*

34. **Prior to construction**, Trunkline shall file with the Secretary an updated Blanket Clearance regarding federally listed species under the ESA and/or, if an updated Blanket Clearance is not issued or the stipulations of the Blanket Clearance change, updated documentation from the FWS

that the previous determinations of effect are still current. Trunkline shall not begin construction activities **until**:

a. the staff completes any consultation with the FWS, if required; and

b. Trunkline has received written notification from the Director of OEP that construction or use of mitigation may begin. (Section 4.7.1)

35. **Prior to construction**, Lake Charles LNG shall file with the Secretary, for review and written approval of the Director of OEP, visual screening plans for ACWs A and D. At a minimum, each plan shall include the retention of a forested buffer of sufficient width to provide an effective visual screen between the liquefaction facilities or ACW and the nearest residences located to the east (for ACW A) and to the north (for ACW D). *(Section 4.8.6.1)*

36. **Prior to the end of the draft EIS comment period**, Trunkline shall file with the Secretary a plan to minimize visual impacts of Compressor Station 203-A on nearby residences. *(Section 4.8.6.2)*

37. **Prior to construction**, Lake Charles LNG shall file with the Secretary, for review and written approval by the Director of OEP, a traffic management plan that details specific measures that will be implemented to minimize impacts on traffic. The traffic management plan shall identify off-site vehicle parking areas, alternative worker transportation methods, traffic control measures, infrastructure improvement, traffic control personnel, and construction and delivery areas. *(Section 4.9.6.1)*

38. **Prior to the end of the draft EIS comment period**, Lake Charles LNG shall file with the Secretary the estimated emissions from the barges and bulk carriers that would deliver materials to the liquefaction facility site during construction. *(Section 4.11.1.4)*

39. **Prior to construction**, Trunkline shall file with the Secretary an AERSCREEN modeling analysis for the *existing and proposed units* at the Longville Compressor Station demonstrating that the emissions of criteria pollutants from the full facility will not result in local exceedance of the NAAQS; state ambient air quality standards; or cause or contribute to violations of the NAAQS. *(Section 4.11.1.5)*

40. Trunkline shall file **in the weekly construction status reports** the following for the Indian Bayou Canal HDD entry and exit points:

a. the noise measurements from the nearest NSA, obtained at the start of drilling operations;

b. the noise mitigation that Trunkline implemented at the start of drilling operations; and

c. any additional mitigation measures that Trunkline will implement if the initial noise measurements exceeded an L_{dn} of 55 dBA at the nearest NSA and/or increased noise more than 10 dBA over ambient conditions. *(Section 4.11.2.3)*

41. Lake Charles LNG shall file a full load noise survey with the Secretary for the liquefaction facility **no later than 60 days** after each liquefaction train is placed into service for the first and second liquefaction train. If the noise attributable to the operation of the equipment at the liquefaction facility exceeds an L_{dn} of 55 dBA at the nearest NSA, Lake Charles LNG shall reduce operation of the liquefaction facilities or install additional noise controls until a noise level below an L_{dn} of 55 dBA at the nearest NSA is achieved. Lake Charles LNG shall confirm

compliance with the above requirement by filing a second noise survey with the Secretary **no later than 60 days** after it installs the additional noise controls. *(Section 4.11.2.4)*

42. Lake Charles LNG shall file a noise survey with the Secretary **no later than 60 days** after placing the entire liquefaction facility into service. If a full load noise survey is not possible, Lake Charles LNG shall provide an interim survey at the maximum possible load and provide the full load survey **within 6 months**. If the noise attributable to the operation of all of the equipment at the liquefaction facility under interim or full load conditions exceeds an L_{dn} of 55 dBA at the nearest NSA, Lake Charles LNG shall file a report on what changes are needed and shall install the additional noise controls to meet the level **within 1 year** of the in-service date. Lake Charles LNG shall confirm compliance with the above requirement by filing a second noise survey with the Secretary **no later than 60 days** after it installs the additional noise controls. *(Section 4.11.2.4)*

43. **Prior to the end of the draft EIS comment period,** Lake Charles LNG shall file with the Secretary noise estimates for flaring activities at the liquefaction facility and modified LNG terminal. This analysis shall include supporting calculations and assumptions, and a description of how often flaring would occur and Lake Charles LNG's landowner notification procedures. *(Section 4.11.2.4)*

44. Trunkline shall file a noise survey for Compressor Station 203-A **no later than 60 days** after placing the station into service. If a full power load condition noise survey is not possible, Trunkline shall file an interim survey at the maximum possible power load **within 60 days** of placing the station into service and file the full power load survey **within 6 months**. If the noise attributable to operation of all equipment at the station under interim or full power load conditions exceeds a L_{dn} of 55 dBA at any nearby NSA, Trunkline shall:

    a. file a report with the Secretary, for review and written approval by the Director of OEP, on what changes are needed;

    b. install additional noise controls to meet that level **within 1 year** of the in-service date; and

    c. confirm compliance with this requirement by filing a second full power load noise survey with the Secretary for review and written approval by the Director of OEP **no later than 60 days** after it installs the additional noise controls. *(Section 4.11.2.4)*

45. Trunkline shall conduct noise surveys at the Longville Compressor Station to verify that the noise from all the equipment operated at full power load does not exceed the predicted noise levels above an L_{dn} of 55 dBA at any nearby NSAs. The results of the noise surveys shall be filed with the Secretary **<u>no later than 60 days</u>** after placing the new compressor unit in service. If a full load condition noise survey is not possible, Trunkline shall provide an interim survey at the maximum possible horsepower load **<u>within 60 days</u>** of placing the new compressor unit into service and provide the full load survey **<u>within 6 months</u>**. If the noise attributable to the operation of the modified compressor station at full or interim power load conditions exceeds predicted noise levels at any nearby NSAs, Trunkline shall file a report on what changes are needed and shall install the additional noise controls to meet the level **<u>within 1 year</u>** of the in-service date. Trunkline shall confirm compliance with this requirement by filing a second noise survey with the Secretary **<u>no later than 60 days</u>** after it installs the additional noise controls. *(Section 4.11.2.4)*:

Recommendations 46 through 97 shall apply to the Lake Charles Liquefaction Project LNG facilities. Information pertaining to these specific recommendations shall be filed with the Secretary for review and written approval by the Director of OEP either: **prior to initial site preparation; prior to construction of final design; prior to commissioning; prior to introduction of hazardous fluids; or prior to commencement of service**, as indicated by each specific condition. Specific engineering, vulnerability, or detailed design information meeting the criteria specified in Order No. 683 (Docket No. RM06-24-000), including security information, shall be submitted as critical energy infrastructure information (CEII) pursuant to 18 CFR 388.112. See Critical Energy Infrastructure Information, Order No. 683, 71 Fed. Reg. 58,273 (October 3, 2006), FERC Stats. & Regs. ¶31,228 (2006). Information pertaining to items such as: offsite emergency response; procedures for public notification and evacuation; and construction and operating reporting requirements, would be subject to public disclosure. All information shall be filed **a minimum of 30 days** before approval to proceed is requested. *(Section 4.12.3).*

46. **Prior to initial site preparation**, Lake Charles LNG shall provide procedures for controlling access during construction. *(Section 4.12.3)*

47. **Prior to initial site preparation**, Lake Charles LNG shall file the quality assurance and quality control procedures for construction activities. *(Section 4.12.3)*

48. **Prior to initial site preparation**, Lake Charles LNG shall file a plot plan of the final design showing all major equipment, structures, buildings, and impoundment systems. *(Section 4.12.3)*

49. **Prior to initial site preparation**, Lake Charles LNG shall file the updated ERP to include the Liquefaction Facilities as well as instructions to handle on-site refrigerant and NGL-related emergencies. *(Section 4.12.6)*

50. **Prior to initial site preparation**, Lake Charles LNG shall file an ERP that includes a Cost-Sharing Plan identifying the mechanisms for funding all project-specific security/emergency management costs that would be imposed on state and local agencies. In addition to the funding of direct transit-related security/emergency management costs, this comprehensive plan shall include funding mechanisms for the capital costs associated with any necessary security/emergency management equipment and personnel base. *(Section 4.12.6)*

51. The **final design** shall include information/revisions pertaining to Lake Charles LNG's response to the Engineering Information Requests identified in table 4.12.3-1 of the EIS. *(Section 4.12.3)*

52. The **final design** shall include change logs that list and explain any changes made from the FEED provided in Lake Charles LNG's application and filings. A list of all changes with an explanation for the design alteration shall be provided and all changes shall be clearly indicated on all diagrams and drawings. *(Section 4.12.3)*

53. The **final design** shall provide up-to-date Process Flow Diagrams with heat and material balances and P&ID, which include the following information:

    a. equipment tag number, name, size, duty, capacity, and design conditions;

    b. equipment insulation type and thickness;

    c. valve high pressure side and internal and external vent locations;

    d. piping with line number, piping class specification, size, and insulation type and thickness;

e. piping specification breaks and insulation limits;

f. all control and manual valves numbered;

g. relief valves with size and set points; and

h. drawing revision number and date. *(Section 4.12.3)*

54. The **final design** shall provide P&IDs, specifications, and procedures that clearly show and specify the tie-in details required to safely connect the project to the existing facility. *(Section 4.12.3)*

55. The **final design** shall provide an up-to-date complete equipment list, process and mechanical data sheets, and specifications. *(Section 4.12.3)*

56. The **final design** shall provide complete drawings and a list of the hazard detection equipment. The drawings shall clearly show the location and elevation of all detection equipment. The list shall include the instrument tag number, type and location, alarm indication locations, and shutdown functions of the hazard detection equipment. *(Section 4.12.3)*

57. The **final design** shall provide complete plan drawings and a list of the fixed and wheeled dry-chemical, hand-held fire extinguishers, and other hazard control equipment. Drawings shall clearly show the location by tag number of all fixed, wheeled, and hand-held extinguishers. The list shall include the equipment tag number, type, capacity, equipment covered, discharge rate, and automatic and manual remote signals initiating discharge of the units. *(Section 4.12.3)*

58. The **final design** shall provide facility plans and drawings that show the location of the firewater and foam systems. Drawings shall clearly show: firewater and foam piping; post indicator valves; and the location, and area covered by, each monitor, hydrant, deluge system, foam system, water-mist system, and sprinkler. The drawings shall also include P&IDs of the firewater and foam system. *(Section 4.12.3)*

59. The **final design** shall include an updated fire protection evaluation of the proposed facilities carried out in accordance with the requirements of NFPA 59A 2001, chapter 9.1.2 as required by 49 CFR Part 193. The evaluation shall consider the need for clean agent fire suppression in the new switchgears and motor control centers. A copy of the evaluation, a list of recommendations and supporting justifications, and actions taken on the recommendations shall be filed. *(Section 4.12.3)*

60. The **final design** shall specify that for hazardous fluids, piping and piping nipples 2 inches or less in diameter are to be no less than schedule 160 for carbon steel and no less than schedule 80 for stainless steel, or are designed to withstand external loads, including vibrational loads in the vicinity of rotating equipment and live loads of operators in areas accessible by operators. *(Section 4.12.3)*

61. The **final design** shall provide an air gap or vent installed downstream of process seals or isolations installed at the interface between a flammable fluid system and an electrical conduit or wiring system. Each air gap shall vent to a safe location and be equipped with a leak detection device that: shall continuously monitor for the presence of a flammable fluid; shall alarm the hazardous condition; and shall shutdown the appropriate systems. *(Section 4.12.3)*

62. The **final design** shall provide electrical area classification drawings. *(Section 4.12.3)*

63. The **final design** shall provide spill containment system drawings with dimensions and slopes of curbing, trenches, and impoundments. *(Section 4.12.3)*

64. The **final design** of the hazard detectors shall account for the calibration gas when determining the LFL set points for methane, propane, ethane, and condensate. *(Section 4.12.3)*

65. The **final design** shall include a hazard and operability review of the completed design prior to issuing the P&IDs for construction. A copy of the review, a list of recommendations, and actions taken on the recommendations, shall be filed. *(Section 4.12.3)*

66. The **final design** shall include the cause-and-effect matrices for the process instrumentation, fire and gas detection system, and ESD system. The cause-and-effect matrices shall include alarms and shutdown functions, details of the voting and shutdown logic, and setpoints. *(Section 4.12.3)*

67. The **final design** shall include a drawing showing the location of the ESD buttons. ESD buttons shall be easily accessible, conspicuously labeled, and located in an area which would be accessible during an emergency. *(Section 4.12.3)*

68. The **final design** shall include a plan for clean-out, dry-out, purging, and tightness testing. This plan shall address the requirements of the American Gas Association's Purging Principles and Practice required by 49 CFR 193, and shall provide justification if not using an inert or non-flammable gas for cleanout, dry-out, purging, and tightness testing. *(Section 4.12.3)*

69. The **final design** shall include the sizing basis and capacity for the final design of pressure and vacuum relief valves for major process equipment, vessels, and storage tanks. *(Section 4.12.3)*

70. The **final design** shall provide the procedures for pressure/leak tests which address the requirements of ASME VIII and ASME B31.3, as required by 49 CFR 193. *(Section 4.12.3)*

71. The **final design** shall include a structural evaluation of each LNG storage tank that accounts for the modifications to the tanks, internal pump columns, and piping systems. The evaluation shall include the following:

    a. modification details;

    b. structural design loading and acceptance criteria used to evaluate the structural integrity of the LNG storage tanks, internal pump columns, piping and associated supports;

    c. effects of the modifications on the tanks' structural design; and

    d. review and approval by the tank manufacturer to verify the structural integrity of the tank is adequate to support the modifications and proposed operating conditions and other design loadings. *(Section 4.12.3)*

72. The **final design** of the thermal relief valve PSV-880 discharge shall not be directed downstream of ESD valve ESDV-510. *(Section 4.12.3)*

73. The **final design** shall specify that the design pressure of the Hot Oil Expansion Drum, A801-F, shall be consistent with the design pressure of the hot oil system. *(Section 4.12.3)*

74. The **final design** of the inlet and discharge piping to/from PSV-060A/B on the Rich Amine Flash Drum shall be stainless steel and shall discharge to the low pressure flare header to be consistent with the flare pressure design philosophy. *(Section 4.12.3)*

75. The **final design** shall include a piping specification that applies to the design conditions of the regeneration piping systems associated with the dehydrators. *(Section 4.12.3)*

76. The **final design** of the discharge from pressure controlled vents PV-144 and PV-124 on the mixed refrigerant system shall be directed to the low pressure cold flare header. *(Section 4.12.3)*

77. The **final design** shall include a full evaluation and justification for the exclusion of suction drums for the medium pressure and high pressure stages of the medium and high pressure mixed refrigerant compressors. The evaluation shall include consideration for settle out condensation under all conditions. *(Section 4.12.3)*

78. The **final design** of the firewater pump testing system shall include flow and pressure transmitters that connect to the distributed control system. The P&IDs shall show the test piping from the discharge of each pump connecting to a common header upstream of the flow and pressure transmitters. *(Section 4.12.3)*

79. The **final design** shall provide details of the heating element for the Flare Knockout Drums and the method of insertion and removal. *(Section 4.12.3)*

80. The **final design** shall evaluate the installation of a forward pressure control valve with flow reset, rather than a flow control valve (i.e., FV-82127), on the regeneration stream to the Ethane Treatment Beds. *(Section 4.12.3)*

81. The **final design** shall demonstrate that the design pressure of the Propane Transfer Pump, 8202-J, and the set pressure of the discharge relief valve PSV-82087 would be consistent with the propane transfer pump shutoff pressure conditions. *(Section 4.12.3)*

82. The **final design** shall provide procedures for how to prevent the flare system from overloading due to excessive intentional and inadvertent venting from the blowdown valves. *(Section 4.12.3)*

83. The **final design** of the refrigerant storage system shall allow the isolation of individual pressure relief valves while providing full relief capacity, during pressure relief valve maintenance or testing. *(Section 4.12.3)*

84. Lake Charles LNG shall certify that the **final design** is consistent with the information provided to DOT as described in the design spill determination letter dated September 19, 2014 (Accession Number 20140919-4005). In the event that any modifications to the design alters the candidate design spills on which the Title 49 CFR Part 193 siting analysis was based, Lake Charles LNG shall consult with DOT on any actions necessary to comply with Part 193. *(Section 4.12.5.2)*

85. The **final design** shall include the details of how the vacuum insulated piping account for mechanical stress and thermal movements of the outer piping under cryogenic conditions. *(Section 4.12.5.3)*

86. The **final design** shall include the procedures to maintain and inspect the vapor barriers provided to meet the siting provisions of 49 CFR § 193.2059. *(Section 4.12.5.3)*

87. **Prior to commissioning**, procedures shall be developed for providing the facility with fire water coverage during such times as the fire water system would be out of service, in particular for removing and flushing brackish water from the system. *(Section 4.12.3)*

88. **Prior to commissioning**, Lake Charles LNG shall file plans and detailed procedures for: testing the integrity of onsite mechanical installation; functional tests; introduction of hazardous fluids; operational tests; and placing the equipment into service. *(Section 4.12.3)*

89. **Prior to commissioning**, Lake Charles LNG shall provide a detailed schedule for commissioning through equipment startup. The schedule shall include milestones for all procedures and tests to be completed: prior to introduction of hazardous fluids; and during commissioning and startup. Lake Charles LNG shall file documentation certifying that each of these milestones has been completed before authorization to commence the next phase of commissioning and startup would be issued. *(Section 4.12.3)*

90. **Prior to commissioning**, Lake Charles LNG shall tag all equipment, instrumentation, and valves in the field, including drain valves, vent valves, main valves, and car-sealed or locked valves. *(Section 4.12.3)*

91. **Prior to commissioning**, Lake Charles LNG shall file a tabulated list and drawings of the proposed hand-held fire extinguishers. The list shall include the equipment tag number, extinguishing agent type, capacity, number, and location. The drawings shall show the extinguishing agent type, capacity, and tag number of all hand-held fire extinguishers. *(Section 4.12.3)*

92. **Prior to commissioning**, Lake Charles LNG shall file updates addressing the liquefaction facilities in the operation and maintenance procedures and manuals, as well as safety procedures. *(Section 4.12.3)*

93. **Prior to commissioning**, Lake Charles LNG shall maintain a detailed training log to demonstrate that operating staff has completed the required training. *(Section 4.12.3)*

94. **Prior to introduction of hazardous fluids**, Lake Charles LNG shall complete a firewater pump acceptance test and firewater monitor and hydrant coverage test. The actual coverage area from each monitor and hydrant shall be shown on facility plot plan(s). *(Section 4.12.3)*

95. **Prior to introduction of hazardous fluids**, Lake Charles LNG shall complete all pertinent tests (Factory Acceptance Tests, Site Acceptance Tests, Site Integration Tests) associated with the Distributed Control System and the Safety Instrumented System that demonstrates full functionality and operability of the system. *(Section 4.12.3)*

96. **Prior to commencement of service**, Lake Charles LNG shall label piping with fluid service and direction of flow in the field in addition to the pipe labeling requirements of NFPA 59A. *(Section 4.12.3)*

97. **Prior to commencement of service**, progress on the construction of the proposed systems shall be reported in **monthly** reports filed with the Secretary. Details shall include a summary of activities, problems encountered, contractor non-conformance/deficiency logs, remedial actions taken, and current project schedule. Problems of significant magnitude shall be reported to the FERC **within 24 hours**. *(Section 4.12.3)*

In addition, recommendations 98 through 100 shall apply throughout the life of the LNG facility:

98. The facility shall be subject to regular FERC staff technical reviews and site inspections on at least an **annual basis** or more frequently as circumstances indicate. Prior to each FERC staff technical review and site inspection, Lake Charles LNG shall respond to a specific data request, including information relating to possible design and operating conditions that may have been

imposed by other agencies or organizations. Up-to-date detailed P&IDs reflecting facility modifications and provision of other pertinent information not included in the semi-annual reports described below, including facility events that have taken place since the previously submitted semi-annual report, shall be submitted. *(Section 4.12.3)*

99. Semi-annual operational reports shall be filed with the Secretary to identify changes in facility design and operating conditions, abnormal operating experiences, activities (including ship arrivals, quantity and composition of imported and exported LNG, liquefied and vaporized quantities, boil-off/flash gas, etc.), plant modifications, including future plans and progress thereof. Abnormalities shall include, but not be limited to: unloading/loading/shipping problems, potential hazardous conditions from off-site vessels, storage tank stratification or rollover, geysering, storage tank pressure excursions, cold spots on the storage tanks, storage tank vibrations and/or vibrations in associated cryogenic piping, storage tank settlement, significant equipment or instrumentation malfunctions or failures, non-scheduled maintenance or repair (and reasons therefore), relative movement of storage tank inner vessels, hazardous fluids releases, fires involving hazardous fluids and/or from other sources, negative pressure (vacuum) within a storage tank and higher than predicted boil-off rates. Adverse weather conditions and the effect on the facility also shall be reported. Reports shall be submitted **within 45 days after each period ending June 30 and December 31**. In addition to the above items, a section entitled "Significant Plant Modifications Proposed for the Next 12 Months (dates)" also shall be included in the semi-annual operational reports. Such information would provide FERC staff with early notice of anticipated future construction/maintenance projects at the LNG facility. *(Section 4.12.3)*

100. Significant non-scheduled events, including safety-related incidents (e.g., LNG, condensate, refrigerant, or natural gas releases, fires, explosions, mechanical failures, unusual over pressurization, and major injuries) and security-related incidents (e.g., attempts to enter site, suspicious activities) shall be reported to FERC staff. In the event an abnormality is of significant magnitude to threaten public or employee safety, cause significant property damage, or interrupt service, notification shall be made **immediately**, without unduly interfering with any necessary or appropriate emergency repair, alarm, or other emergency procedure. In all instances, notification shall be made to FERC staff **within 24 hours**. This notification practice shall be incorporated into the LNG facility's emergency plan. Examples of reportable hazardous fluids related incidents include:

    a. fire;

    b. explosion;

    c. estimated property damage of $50,000 or more;

    d. death or personal injury necessitating in-patient hospitalization;

    e. release of hazardous fluids for five minutes or more;

    f. unintended movement or abnormal loading by environmental causes, such as an earthquake, landslide, or flood, that impairs the serviceability, structural integrity, or reliability of an LNG facility that contains, controls, or processes hazardous fluids;

    g. any crack or other material defect that impairs the structural integrity or reliability of an LNG facility that contains, controls, or processes hazardous fluids;

h. any malfunction or operating error that causes the pressure of a pipeline or LNG facility that contains or processes hazardous fluids to rise above its MAOP (or working pressure for LNG facilities) plus the build-up allowed for operation of pressure limiting or control devices;

i. a leak in an LNG facility that contains or processes hazardous fluids that constitutes an emergency;

j. inner tank leakage, ineffective insulation, or frost heave that impairs the structural integrity of an LNG storage tank;

k. any safety-related condition that could lead to an imminent hazard and cause (either directly or indirectly by remedial action of the operator), for purposes other than abandonment, a 20 percent reduction in operating pressure or shutdown of operation of a pipeline or an LNG facility that contains or processes hazardous fluids;

l. safety-related incidents to hazardous fluids vessels occurring at or en route to and from the LNG facility; or

m. an event that is significant in the judgment of the operator and/or management even though it did not meet the above criteria or the guidelines set forth in an LNG facility's incident management plan.

In the event of an incident, the Director of OEP has delegated authority to take whatever steps are necessary to ensure operational reliability and to protect human life, health, property or the environment, including authority to direct the LNG facility to cease operations. Following the initial company notification, FERC staff would determine the need for a separate follow-up report or follow-up in the upcoming semi-annual operational report. All company follow-up reports shall include investigation results and recommendations to minimize a reoccurrence of the incident. *(Section 4.12.3)*

APPENDIX A

DISTRIBUTION LIST

APPENDIX A
DISTRIBUTION LIST

Federal Government Agencies

Council on Environmental Quality, Associate Director for National Environmental Policy Act Oversight, DC

Council on Environmental Quality, Senior Counsel, DC

U.S. Army Corps of Engineers, New Orleans District, James W. Little, Jr., LA

U.S. Army Corps of Engineers, New Orleans District, Ronnie Duke, LA

U.S. Coast Guard, Lt. Commander R.C. Compher, P.E., LA

U.S. Coast Guard, Lt. Julio "Tony" Moré, LA

U.S. Customs and Border Protection Dept. of Homeland Security, Christopher Oh, DC

U.S. Department of Energy, John Anderson, DC

U.S. Department of Energy, Office of Fossil Energy (FE-7), James. J. Ward, DC

U.S. Department of Energy, Office of General Counsel (GC-51), Ed LeDuc, DC

U.S. Department of Energy, Office of General Counsel (GC-51), Stephen Smith, DC

U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration, Kenneth Lee, DC

U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration, Joseph Sieve, DC

U.S. Environmental Protection Agency, Region 6, Michael Jansky, TX

U.S. Fish and Wildlife Service, Pat Carter, VA

U.S. Fish and Wildlife Service, Jeff Weller, LA

U.S. Fish and Wildlife Service, Joshua Marceaux, LA

U.S. Fish and Wildlife Service, Southeast Region 4, Patti Holland, LA

U.S. Forest Service – Ecosystem Management Coordination, Joe Carbone, DC

U.S. Geological Survey, Esther Eng, VA

Federal Senators and Representatives

U.S. House of Representatives, Representative, Charles W. Boustany, M.D., DC

U.S. House of Representatives, Representative, John C. Fleming, M.D., DC

U.S. Senate, Senator, David Vitter, DC

U.S. Senate, Senator, Lisa Murkowski, DC

State Senators and Representatives

Louisiana House of Representatives, District 36, State Representative, District 36, Chuck Kleckley, LA

Louisiana State Senate, District 25, State Senator, District 25, Dan "Blade" Morrish, LA

Louisiana State Senate, District 27, State Senator, District 27, Ronnie Johns, LA

State Government Agencies

Louisiana Department of Environmental Quality – Air Permits, Tegan Treadaway, LA

Louisiana Department of Environmental Quality – Water Quality Certifications, Jamie Phillippe, LA

Louisiana Department of Environmental Quality – Water Quality Division, Melvin (Mitch) Mitchell, LA

Louisiana Department of Environmental Quality, Sam Phillips, LA

Louisiana Department of Natural Resources, Office of Coastal Management, Sharon McCarthy, LA

Louisiana Department of Natural Resources, Scott Angelle, LA

Louisiana Department of Wildlife and Fisheries, Dave Butler, LA

Louisiana Farm and Livestock Co., Inc., Robert O. Gayle, LA

Louisiana State Historic Preservation Office, Rachel Watson, LA

Mississippi Department of Archives and History, Historic Preservation Division, J. Wood, MS

APPENDIX A
DISTRIBUTION LIST (cont'd)

State Government Agencies (cont'd)

Mississippi Department of Environmental Quality, Trudy Fisher, MS

Mississippi Department of Wildlife, Fisheries, and Parks, MS

Local Government Agencies

Calcasieu Parish, Office of Homeland Security and Emergency Preparedness (OHSEP), Director OHSEP, Dick Gremillion, LA

Calcasieu Parish, Sheriff, Tony Mancuso, LA

City of Lake Charles, Mayor, Randy Roach, LA

Fire Protection District No. 2, Fire Protection District No. 2, LA

Lake Charles Harbor and Terminal District, Lake Charles Harbor and Terminal District, LA

Native American Groups

Alabama Coushatta Tribe of Texas, Chief, Oscola Clayton Sylestine, TX

Caddo Nation, Tribal Historic Preservation Officer, Robert Cast, OK

Chitimacha Tribe of Louisiana, Chairman, John Paul Darden, LA

Chitimacha Tribe of Louisiana, Cultural Director, Kimberly Walden, LA

Choctaw Nation of Oklahoma, Chief, Gregory Pyle, OK

Choctaw Nation of Oklahoma, Tribal Historic Preservation Officer, Ian Thompson, OK

Coushatta Tribe of Louisiana, Chief, Kevin Sickey, LA

Coushatta Tribe of Louisiana, Cultural Preservation Officer, Linda Langley, LA

Mississippi Band of Choctaw Indians, Chief, Phyllis J. Anderson, MS

Mississippi Band of Choctaw Indians, Tribal Archaeologist and Historic Preservation Officer, Kenneth Carleton, MS

Tunica-Biloxi Tribe of Louisiana, Chairman, Earl J. Barbry, Sr., LA

Libraries

Grant Parish Library, LA

Richland Parish Library, LA

West Carroll Parish Library, LA

Media

Eunice News, LA

Rayne Acadian Tribune, LA

Richland Beacon-News, LA

Southwest Daily News, LA

Companies and Organizations

Abear – Nunez Farms LLC, LA

Abraham Five, Jonathan R. Abraham, LA

Alcoa Carbon Products, Steven Thompson, LA

Alvin M Bordelon Trust, et ux., LA

Alvin R and Mary S Haggart Revocable Trust, WI

Amelia S. Beard Estate, GA

Andean Chemical LTD, TX

AT&T Mobility, LLC, MO

Balance Timberland – Fund B,

Bio-Eco Green Energy Solutions, LLC, WA

C.A. Mewis and Anita H. Mewis Trust, TX

Christine Marie Hartwell, LA

Clyde Watson Jr and Bank One Trust Company NA, TX

Corbello Investors LP, LA

David G Hughey Living Trust, c/o Matthew Hughey, MS

Diamond Development Inc., LA

First Baptist Church of Longville, LA

First Church of Christ, LA

George B. Franklin & Son, Inc., LA

Gulf South Pipeline, TX

Harwood Land, LP, AR

HGPC, LLC, LA

APPENDIX A
DISTRIBUTION LIST (cont'd)

Companies and Organizations (cont'd)

Jiwani Properties, Inc., LA

JWG, LLC, TX

Kinder Canal Co, LA

Lacassane Co, Inc., LA

Lakeport Wildlife and Timber Co., LLC, MS

Lewis Farm Properties, LLC, MS

Longville Church of Christ, Inc., LA

Mallett Family Properties LLC, LA

McKinley Augustine Farm, Inc., LA

Meriwether Louisiana Land and Timber LLC, LA

Natural Resource Group, LLC, MN

NCI/Presidential Towers, VA

North American Land Co., Inc., LA

North American Land Company LLC, LA

Ogletree Timber Company, LTD, TX

PBA Properties LLC, et al., LA

Plauche-Shaddock Farms, LA

Prairie Investment, LLC, LA

Prairie Land Company, LA

PWK Timberland Corporation, LA

R2K, LLC, LA

Ray and Cynthia B Harrington Revocable Living Trust, LA

Rayonier Gulf Timberlands, LLC, FL

Reynolds Metal Company Alcoa Inc., PA

Richard Ledoux Farms, LLC, LA

Roger Dale Boudreaux Estate, et al., LA

Rosa Heyd Corbello Family Trust, LA

Roy J. Jr. and Sylvia Sue Dugas Revocable Living Trust, LA

Sabine Uplift Mineral Corporation, LA

Secundus Corporation, TX

Serpent Bayou Recreational Properties, LA

Shope Endeavors, LLC, LA

Soaring Eagle Enterprises, LLC, LA

Stream Companies, Bruce Kirkpatrick, LA

Stream Companies, David Richard, LA

Stream Companies, Dean Roberts, LA

Stream Family Limited Partnership, LA

Sweet Lake Land and Oil Company LLC, LA

TCR Holdings, LLC, LA

Temple-Holdings LLC, LA

Texas Conference Association of Seventh-Day, Jeanette M. Gaudet, Walter E. McNabb, Richard R. McNabb, Sherry M. Snider, LA

The Balanced Timberland Fund B, GA

The Fred B and Ruth B Foundation, LA

The Sweet Lake Land and Oil Co., LLC, LA

Tobe Chretien, Estate, TX

Tower Land Company, LLC, LA

Trunkline LNG Company, TX

Trunkline LNG, Stephen Veatch, TX

Whitehead Family Revocable Living Trust, TX

Woodbrook, Inc., LA

Individuals

Aaron Steven Justelien, LA

Adeline D. Savoy, LA

Adolf Ramon Robledo, et ux., LA

Adrian Scott Voyght, et ux., LA

Alan Pierce Booth, LA

Albert Hayes, LA

Alfred Paul Douglas, LA

Alice Mae Lorraine Nunez, LA

Allen Charles, LA

Alvin Joseph Miller, et ux., LA

Alvin Perkins, Jr., LA

Alvin Ricky Ogea, et ux., LA

Angela Dawn Foreman Cooper, LA

Anita H. Mewis, TX

Anita Midkiff, et al., LA

Annabelle Hebert Denison, LA

Anne Alexander, MS

Anthony Moreaux, TX

APPENDIX A
DISTRIBUTION LIST (cont'd)

Individuals (cont'd)

Anthony Valentine Frederick, et ux., LA

Anthony Zaunbrecher, LA

Arlene Orphy, LA

Arnold James Burke, LA

Arnold Keith Harrell, LA

Artis Dugas, TX

Audrey Joyce, LA

Azena Corbello, LA

Barabara Jean Stevenson Levine, MD

Bea Schwarze, LA

Benny Ray Stracener, LA

Billy Dewbre, TX

Bobbi B. Nunez, LA

Bobby Ray Marcantel, LA

Bonnie Ann Trahan, LA

Bonnie Rose Bowman Barbery, LA

Bradley Edward Foreman, et ux., LA

Brandel Johnson, LA

Brenda E. Bell Roberts, TX

Brenda J. Dugas, LA

Brent Joshua Duga, LA

Brian Lynn Boenig, LA

Bridget H. Schultz, LA

Bryan Anthony Keller, LA

Burnell Nunez, Jr., LA

Calvin Coleman, LA

Carl Bernard Labiche, LA

Carla Sue Smith, LA

Carol Hauser, LA

Carol Louise Bodin, LA

Carol R. Bebee, LA

Carrie Mae Hillard Slaughter, LA

Carroll Jo Barham, LA

Catherine R. Hard Hicks, LA

Charles Ronald Rayon, LA

Charles Roy Soileau, et ux., LA

Chester Joseph McFarlain, LA

Christon N. Nelson, et al., LA

Christopher Joseph Habetz, et al., LA

Clifford Kershaw, LA

Cody Lane Booth, LA

Conrad W. King, LA

Curtis Bennett, LA

Curtis James Parker, et ux., LA

Curtis James Primeaux, LA

Dan Deason, LA

Dana Ray Henry, LA

Daniel A.J. Fruge, et al., LA

Daniel Henry Stanley, et ux., LA

David Kiley Gibson, et ux., LA

David M. Airhart, LA

David P. Lindsay, LA

David Paul Brown, LA

Debra Kay Wilds, LA

Dennis Wayne Nelson, LA

Dewey Derouen, LA

Dickie James Fournerat, et ux., LA

Dixie Diane Nelson, LA

Dominic J. Doucet, LA

Donald LeBlanc, LA

Donna Lynn Ezell, LA

Donovan Lee Elliott, et ux., LA

Dorothy Clooney Kerr, TX

Douglas J. David, et al., LA

Douglas Ray Nunez, et ux., LA

D'Ryan C. Green, LA

Duncan Miller, Jr., LA

Earnest F. Clooney, Jr., LA

Edna Declouette Arceneaux, et vir, LA

Effie Gatewood, AR

Elizabeth Hymes Beissel, TX

Ellen Gwen Cannon, LA

Elwin Faulk, Jr., LA

Emmett Powell, LA

Estelle L. O'Meara Estate, LA

Esther Lynn Lambert, LA

Eve Derouen Estate, LA

Faye Guilliams Haggart Quedodeaux, LA

Felix Joseph Thibodeaux Jr., et ux., LA

Felix Joseph Thibodeaux, et ux., LA

Firdous Jamal Abbasi, LA

Forrest LeBlanc, LA

Francis L. Benoit Estate, LA

Frank James Fontenot, et ux., LA

Fred G. Denison, LA

Gary L. Crosby, LA

Gary Matthews, et ux., LA

Gaynell T. Verrett, LA

Gene Cradeur, et ux., LA

Geneva D. Prudhomme, LA

George Brown, LA

Individuals (cont'd)

Geraldine M. Marcantel, LA

Glen Roy Navarre, LA

Gloria L. Richard, LA

Gregory Lee Celetine, LA

Gretchen McCown, LA

Harold Harrington Jr., LA

Harris Dale O'Blanc, LA

Helen Netherland, LA

Herbert Fuselier, LA

Herman Ashford, Sr., LA

Huey R. Brooks, et ux., LA

Irving Freeman, Sr., LA

Jack S. Lasha Sr., et ux., LA

Jackie John Credeur, LA

James John Becnel, et ux., FL

James Kennedy, LA

James Langley, LA

James Nelson Desjardine, LA

James Netherland, LA

James P. Hymes, TX

James Patrick Poullard, et ux., LA

James Ray Clooney, III, TX

James Russell Gross, LA

James S. Pelican, LA

James Thomas Jr. Lambert, LA

Jane B. Arrington, LA

Janice Mary Veillon Monroe, LA

Janie Ann Elliott, LA

Jean Claude Theriot, TX

Jeffery G. Fuller, et ux., LA

Jeffery W. Lebert, et al., LA

Jennifer Suzanne Roy Lantz, et vir, LA

Jeremy Dewitt Gaskin, et al., LA

Jeremy N. Gwatney, LA

Jeremy Touchet, LA

Jesse Deville, LA

Jimmy Louis Gwatney Jr., et ux., LA

Jimmy Mullins, LA

Jockquernetta P. Jackson, LA

Joe K. Powell, Sr., LA

John Bergstedt, LA

John Brent Meaux, LA

John Bush Robinette, LA

John D. Nunez, et ux., LA

John Denison, LA

John Frederick Denison, et ux., LA

John H. Williams, LA

John Ladoux, LA

John LeBlanc, Jr., TX

John R. Higgins, LA

John R. Denison, LA

John Russell Denison, et al., LA

John Steven Newman, et ux., LA

John Taylor, Sr., TX

Johnnie Bennett, LA

Johnny B. Arrington, LA

Johnny Brooks Arrington Jr., et ux., LA

Jonathan D. Hardy, LA

Jose N. Diaz Jr., LA

Joseph G. Lambert, et ux., LA

Joseph Pierce Roberts, et ux., LA

Joseph Trent Hall, LA

Karen Ardoin, LA

Karen Corbello Jongbloed, LA

Karen Elizabeth Hoyt Faulk, LA

Katherine Bell Garrison Brewer, LA

Kathleen Fournerat Fontenot, et vir, LA

Kathleen R. Stevens, LA

Kelsey Roy Richard, LA

Kenneth Gerald Merchant, LA

Kenneth Lane Simien, et ux., LA

Keri L. Airhart, LA

Kevin Marshall, LA

Kimberly Watters, LA

Kristy Dawn Hebert, LA

Kristy Lynn Hoffpauir, LA

Kyle W. Coleman, LA

Larry Allen Manuel, LA

Larry F. Guidry, LA

Larry J. Guidry, LA

Larry Wayne Aymond, LA

Laura Alexander Landrum, MS

Laurie Ellis, LA

Lawrence Anthony Thibodeaux, et ux., LA

Ledia LeBlanc, LA

Lee Baggett, LA

Lee Roy Clark, LA

Leland Lloyd Jackson, LA

Leon Edward Larce, et ux., LA

Leroy Thomas Bertrand, LA

Lesley A. Gardiner Moreaux, TX

Linda Berchey, LA

<u>Individuals (cont'd)</u>

Linda F. Guidry, LA
Linda J. Guidry, LA
Linda Marie Sonnier, LA
Lisa Pellerin, LA
Lorena Bellard, LA
Lori Lacy Levingston, LA
Louis Hudson, et al., TX
Lula M. Fuselier, LA
Lynda Ann P. Dugas, LA
Lynette Lewis, et al., LA
Mack Joyce, LA
Margaret Deville, LA
Margaret Kuttner, LA
Margie Johnson, LA
Margie Miller, LA
Marilyn Breaux, LA
Mark Kevin Self, LA
Mark Leslie Roy, et ux., LA
Mark Wayne Foreman, et ux., LA
Mary Ann Elliot, LA
Mary Maynor, LA
Marylin D. Pelican, LA
Matthew James Church, LA
Matthew Martin, LA
Melvin Troy Jones, et ux., LA
Merrilee H. Batty, LA
Michael D. Moreaux, LA
Michael David Moreaux, LA
Michael Gordon Irving, et ux., LA
Michael Jade Conner, et ux., LA
Michael McKinley Butler, LA
Michael T. Tezeno, et ux., LA
Michael Wayne Monceaux, et ux., LA
Michael William Wilds, LA
Michelle Lee Hebert, LA
Mike Edward Marcantel, LA
Mike Jongbloed, LA
Milton Wayne Self, et ux., LA
Mohammad Akram, LA
Molly Suzanne Frank Bond, et vir, LA
Nadio Cristiani, LA
Nancy Cooper, LA
Nancy Miller Vidrine, LA
Nanette Clooney Edwards, TX
Natalie Burnett, LA
Nathan R. Fontenot, et al., LA
Nedia L. Sonnier, LA
Nola B. Prudhomme, LA
Norma Carroll Morin Voilleque, TX
Norma Puckett, LA
Olin Lacy, Jr., LA
Osmay Woolridge, LA
Patricia Ann Mullins, LA
Patricia Cobb Preston, LA
Patricia Faye Burke, LA
Patrick Ardoin, LA
Patrick Carl Aguillard, et al., LA
Patrick Labruyer, Jr., LA
Paul Gerard Bushnell, et ux., LA
Pauline L. Poole, LA
Phyllis Bennett, LA
Phyllis Davis, LA
Priscilla Ardoin LeBlanc, et al., LA
Priscilla Ardoin, LA
Rachiel Burnett, LA
Ralph Wilbert Foreman, et ux., LA
Randall Anderson, LA
Randall Dale Mott, et ux., LA
Randall Lane Guillory, et ux., LA
Randell L. Miller, LA
Randy Joseph Soileau, et ux., LA
Randy Paul Booth, LA
Rhonda M. Dewbre, TX
Richard Dean Ford, et ux., LA
Richard Farmer, MS
Richard H. Evans Jr., LA
Richard J. Breaux, LA
Richard James Magnuson, et ux., LA
Richard S. Nunez, LA
Ricky J. Faulk, LA
Ricky Lee Church, et ux., LA
Robert Bertrand, LA
Robert Carnahan, Jr., LA
Robert Fontenot, LA
Robert Hamilton Denison, et ux., LA
Robert M. Webre, LA
Rodeny Dwayne Buckley, LA
Rollin Ellis, LA
Ronald G. Nunez, Sr., LA
Rosa Clampton, TN

Individuals (cont'd)

Russell Clinton Denison, LA

Samuel Fontenot, LA

Sandra Marie Robinette, LA

Sandra Miller, LA

Sarah Lou Ezell, LA

Scott Jospeh Haggart, et al., LA

Scotty Blain Huval, et ux., LA

Shannon Crosley, ND

Shannon Ellis Ezell, et ux., LA

Sharon Kay Denison Broussard, LA

Sharon Marie Booth, LA

Sherry H. Fontenot, et al., LA

Shirley F. Goss, TX

Shirley June Magnuson, LA

Silas P. Booth, LA

South Beauregard Water System, Inc., LA

Steve J. Orgeron, Sr., LA

Steven Lee Barg, Jr., LA

Stuart Benjamin Guillory, LA

Susie Ann O'Blanc, LA

Sylvia Bertrand, LA

Tammy Lynn Dugas Davis, LA

Thomas Anderson, LA

Thomas Bergstedt, LA

Thomas Gregory Kramer, LA

Thomas H. Shields III, et al., LA

Thomas John Gaspard, et ux., LA

Thomas Switzer, III, LA

Thomas Switzer, Jr., LA

Timothy Dean Maple Sr., et ux., LA

Toni Johnson, LA

Tremayne Picou, LA

Trent Joseph Hall, LA

W. R. Long, LA

Walter Philbert Mallet, et al., LA

Wayne W. Thibodeaux, LA

Wendi Carol Dugas Conner, LA

Wendi Dugas Conner, LA

William D. Brown, LA

William J. Ross, LA

William James Ross, et al., TX

William M. Benoit, et al., MS

William Matthew Stevens, LA

Willie Leo Bowman Jr., et ux., LA

Willis Nelson Desjardine, LA

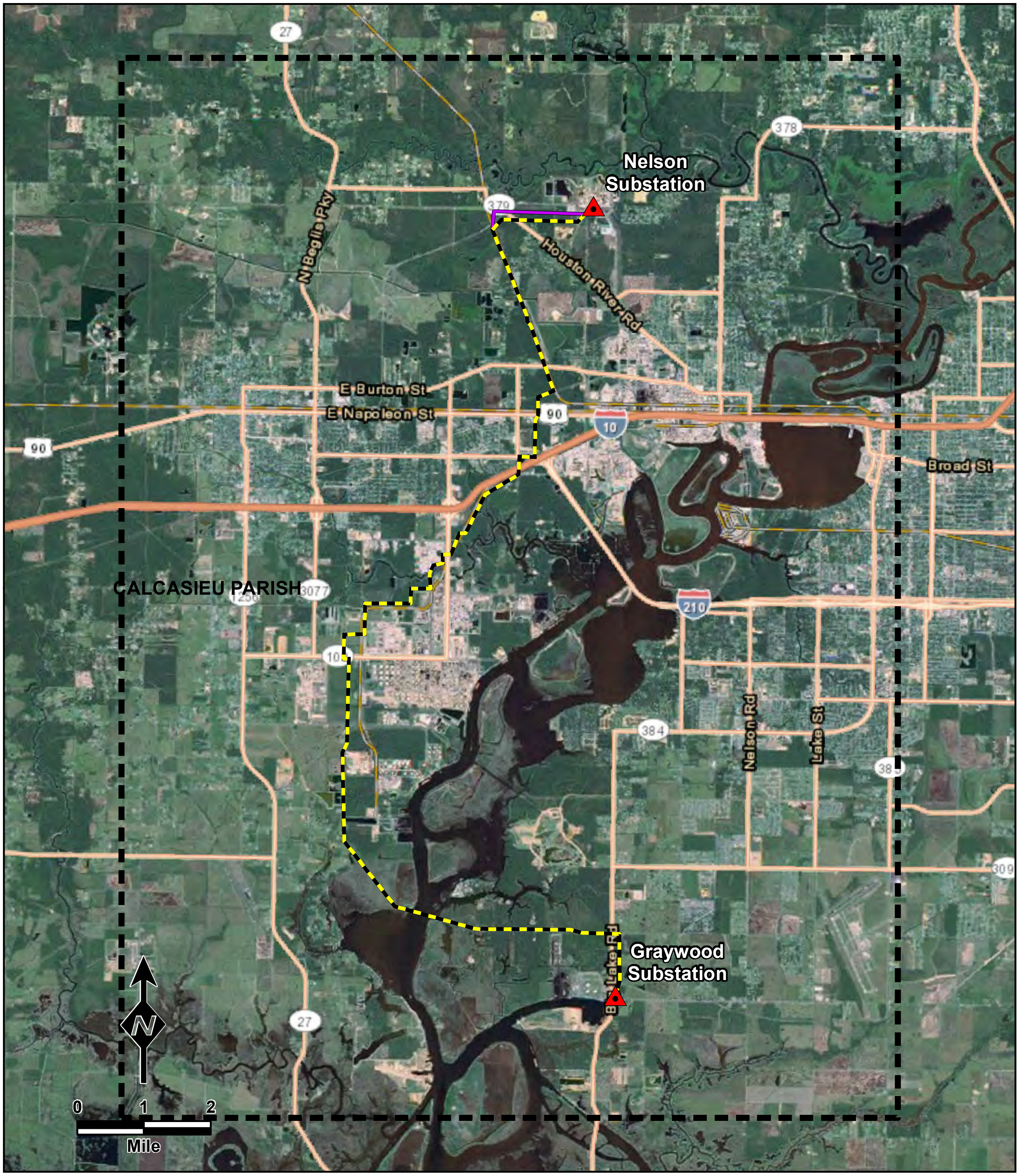
Wilmer Pinder, LA

Windborne Sonnier, LA

Yvonne F. Bebee, LA

APPENDIX B

NON-JURISDICTIONAL FACILITIES MAPS



Legend

- Preferred Route
- Alternate Route D-L
- Substations
- Study_Area

Sources: LDOTD, Bing, LCLP, TRC

Lake Charles Liquefaction Project

Appendix B

230kV TPINSS

Nelson Substation Route

Page 1 of 9

Legend

- Structures to be Replaced
- Existing Line
- 69kV Line (future)
- TPINSS Substation (future)
- Graywood Substation

Sources: LDOTD, Bing, LCLP, TRC

Lake Charles Liquefaction Project

Appendix B

230kV TPINSS

Substation (future)

Page 2 of 9

Legend

- Pole Locations
- Proposed Permanent Easement
- Temporary Workspace
- Access Road

Sources: LDOTD, Bing, LCLP, TRC

Lake Charles Liquefaction Project

Appendix B

Meter Station Power Station Poles

LCLNG Export Meter Station

Page 3 of 9

Legend

- Pole Locations
- Proposed Permanent Easement
- Temporary Workspace
- Access Road

Sources: LDOTD, Bing, LCLP, TRC

Lake Charles Liquefaction Project

Appendix B

Meter Station Power Station Poles

Kinder Morgan - Lake Charles

Page 4 of 9

Legend

- Pole Locations
- Proposed Permanent Easement
- Temporary Workspace
- Access Road

Sources: LDOTD, Bing, LCLP, TRC

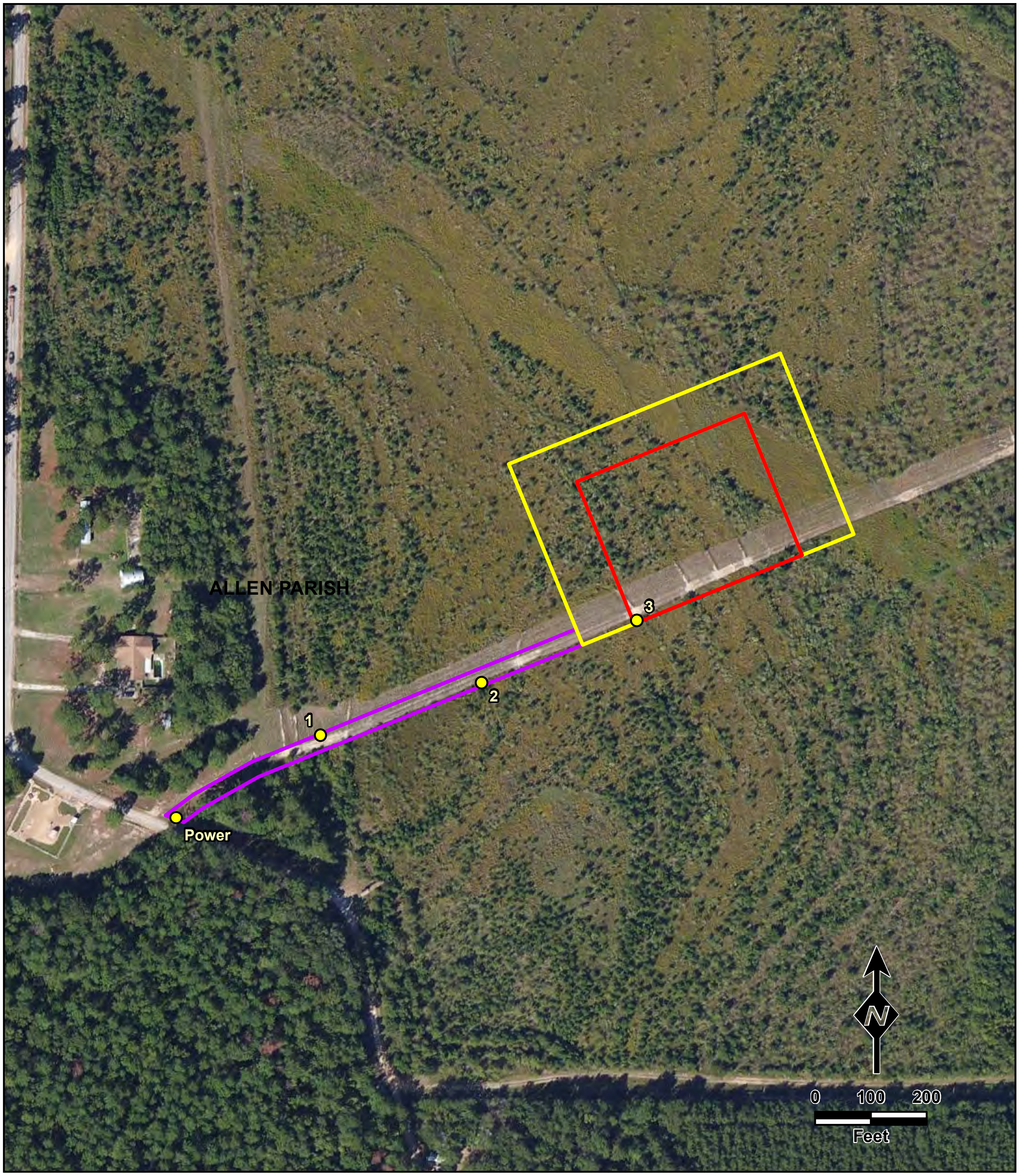
Lake Charles Liquefaction Project

Appendix B

Meter Station Power Station Poles

Columbia Gulf - Eagan

Page 5 of 9



Legend

- Pole Locations
- Proposed Permanent Easement
- Temporary Workspace
- Access Road

Sources: LDOTD, Bing, LCLP, TRC

Lake Charles Liquefaction Project

Appendix B

Meter Station Power Station Poles

TETCO - Allen

Legend

- Pole Locations
- Proposed Permanent Easement
- Temporary Workspace
- Access Road

Sources: LDOTD, Bing, LCLP, TRC

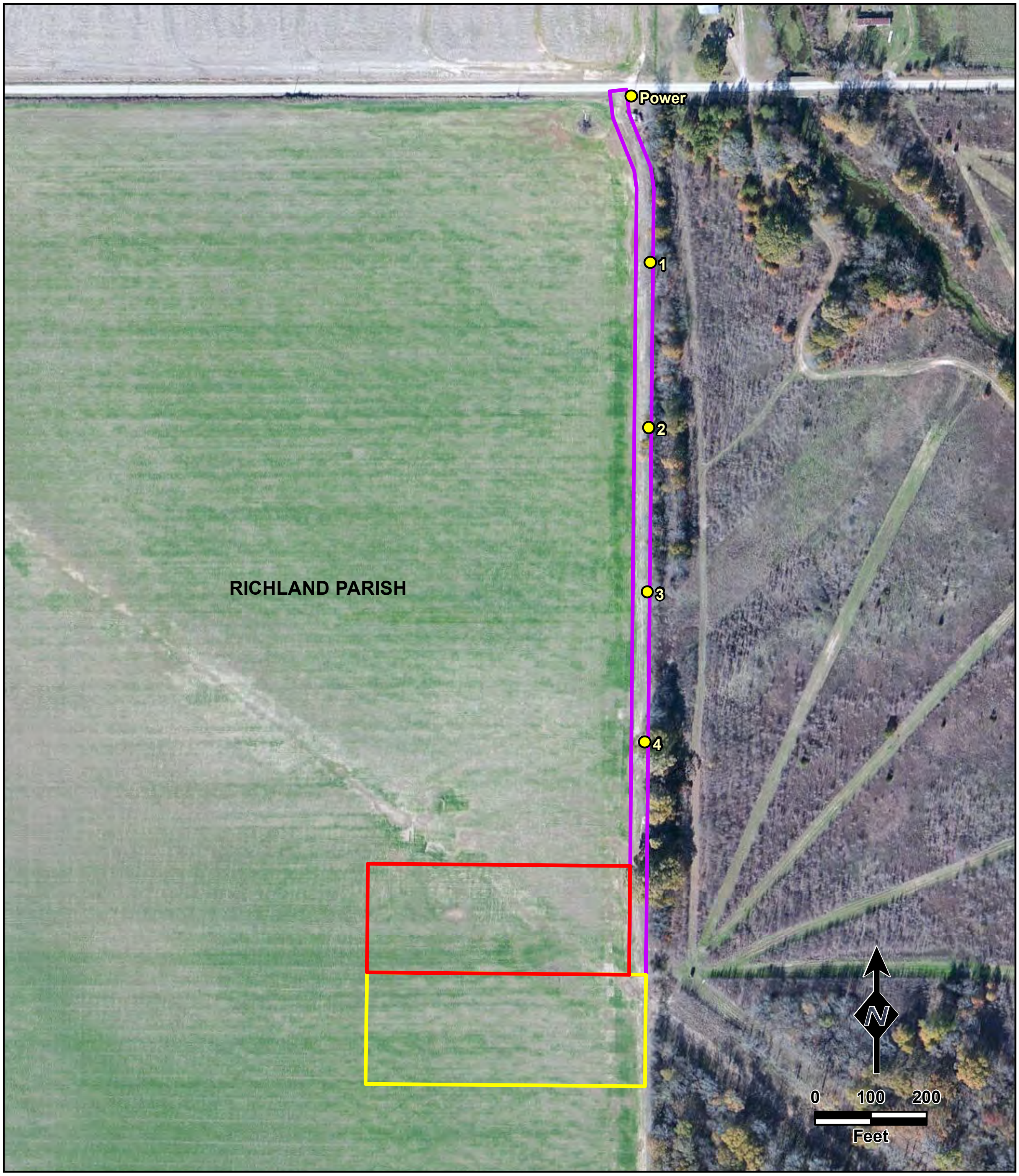
Lake Charles Liquefaction Project

Appendix B

Meter Station Power Station Poles

Gulf Crossing - Perryville

Page 7 of 9



Legend

- Pole Locations
- Proposed Permanent Easement
- Temporary Workspace
- Access Road

Sources: LDOTD, Bing, LCLP, TRC

Lake Charles Liquefaction Project

Appendix B

Meter Station Power Station Poles

MEP - Perryville

Page 8 of 9

Legend

- Active Oil Well Location
- Permanent Easement
- Additional Construction Workspace

Sources: LDOTD, Bing, TLNG, TRC

Lake Charles Liquefaction Project

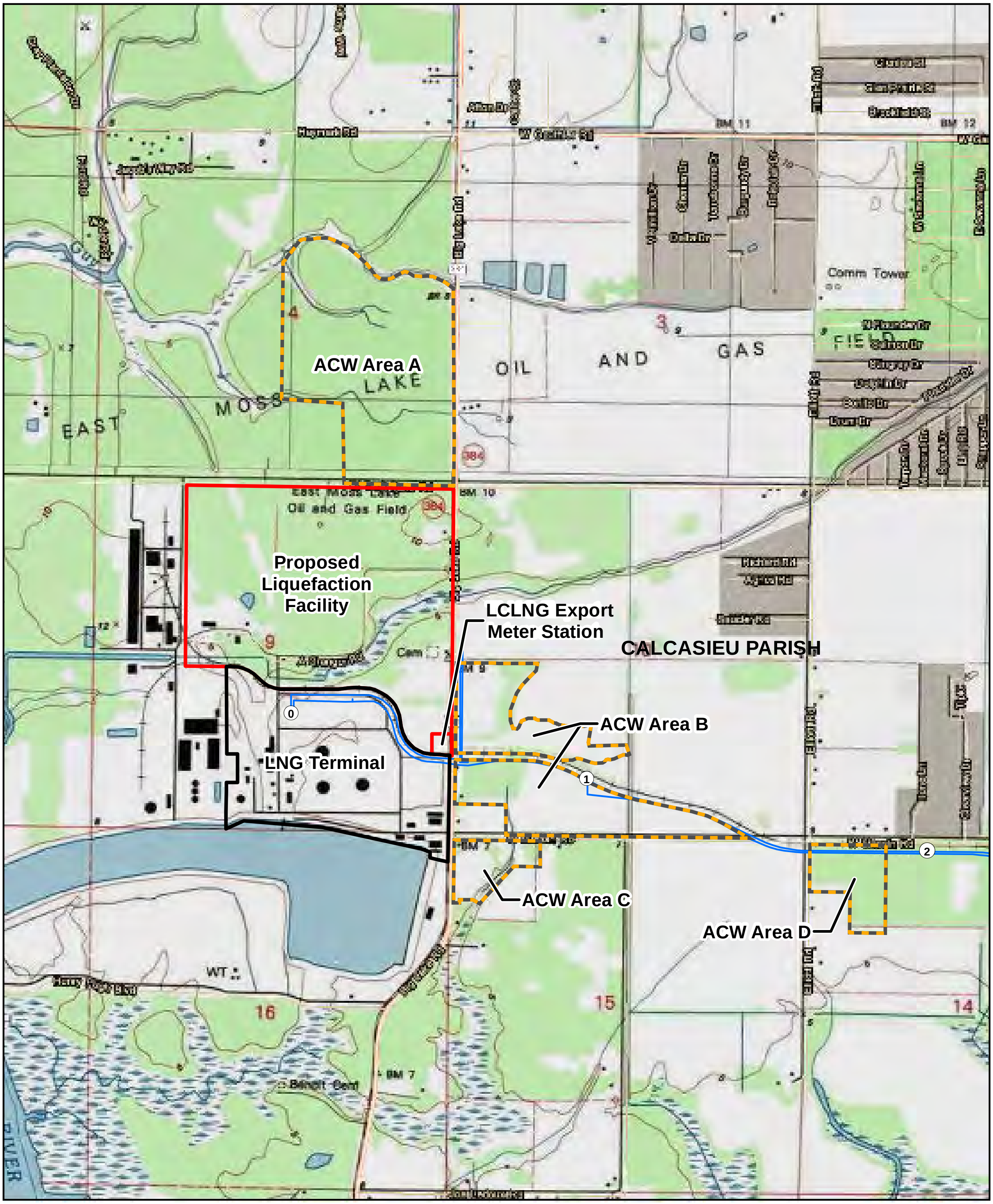
Louisiana

Appendix B
Active Oil Well to be
Plugged & Abandoned

Page 9 of 9

APPENDIX C

PROJECT FACILITIES MAPS



Legend

- Existing Facility
- Proposed Permanent Easement
- Temporary Workspace
- Additional Temporary Workspace
- Proposed Mainline 200-3 Loop
- Proposed Mainline Connector
- Additional Construction Workspace
- HDD - Permanent Easement
- Access Road
- Contractor Yard
- Existing TGC Pipelines
- (10) Mile Post

0 1,000 2,000
Feet

Sources: USGS, LDOTD, Tiger, LCLP, TRC

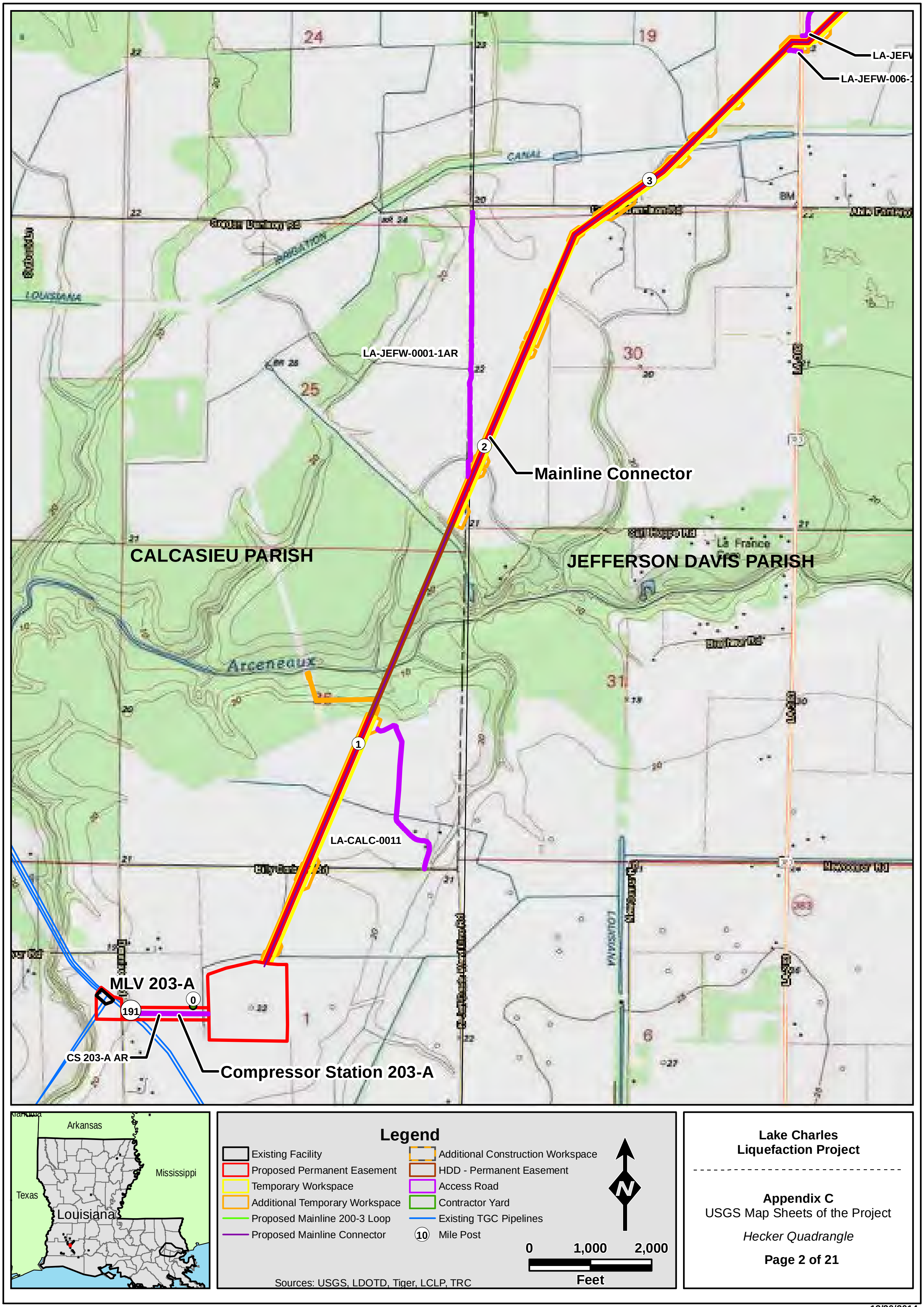
Lake Charles Liquefaction Project

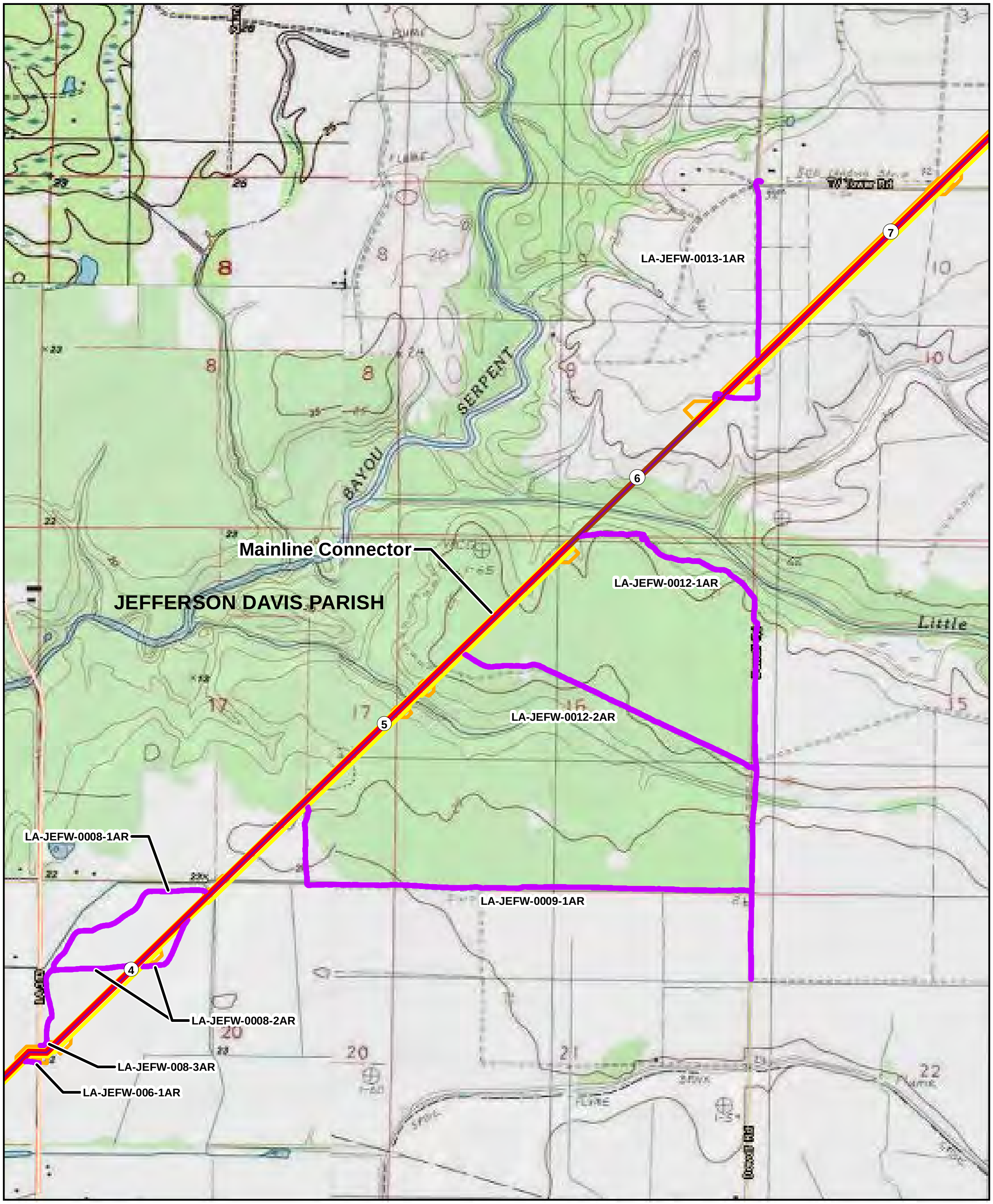
Appendix C
USGS Map Sheets of the Project

Moss Lake Quadrangle

Page 1 of 21

12/30/2014


LA-JEFW
LA-JEFW-006-1
LA-JEFW-0001-1AR
Mainline Connector
CALCASIEU PARISH
JEFFERSON DAVIS PARISH
Arceneaux
LA-CALC-0011
MLV 203-A
CS 203-A AR
Compressor Station 203-A
CANAL
Arkansas
Mississippi
Texas
Louisiana
Legend
Existing Facility
Proposed Permanent Easement
Temporary Workspace
Additional Temporary Workspace
Proposed Mainline 200-3 Loop
Proposed Mainline Connector
Additional Construction Workspace
HDD - Permanent Easement
Access Road
Contractor Yard
Existing TGC Pipelines
Mile Post
0 1,000 2,000
Feet
Sources: USGS, LDOTD, Tiger, LCLP, TRC
Lake Charles Liquefaction Project
Appendix C
USGS Map Sheets of the Project
Hecker Quadrangle
Page 2 of 21
12/30/2014



Legend

- Existing Facility
- Proposed Permanent Easement
- Temporary Workspace
- Additional Temporary Workspace
- Proposed Mainline 200-3 Loop
- Proposed Mainline Connector
- Additional Construction Workspace
- HDD - Permanent Easement
- Access Road
- Contractor Yard
- Existing TGC Pipelines
- (10) Mile Post

N

0 1,000 2,000
Feet

Sources: USGS, LDOTD, Tiger, LCLP, TRC

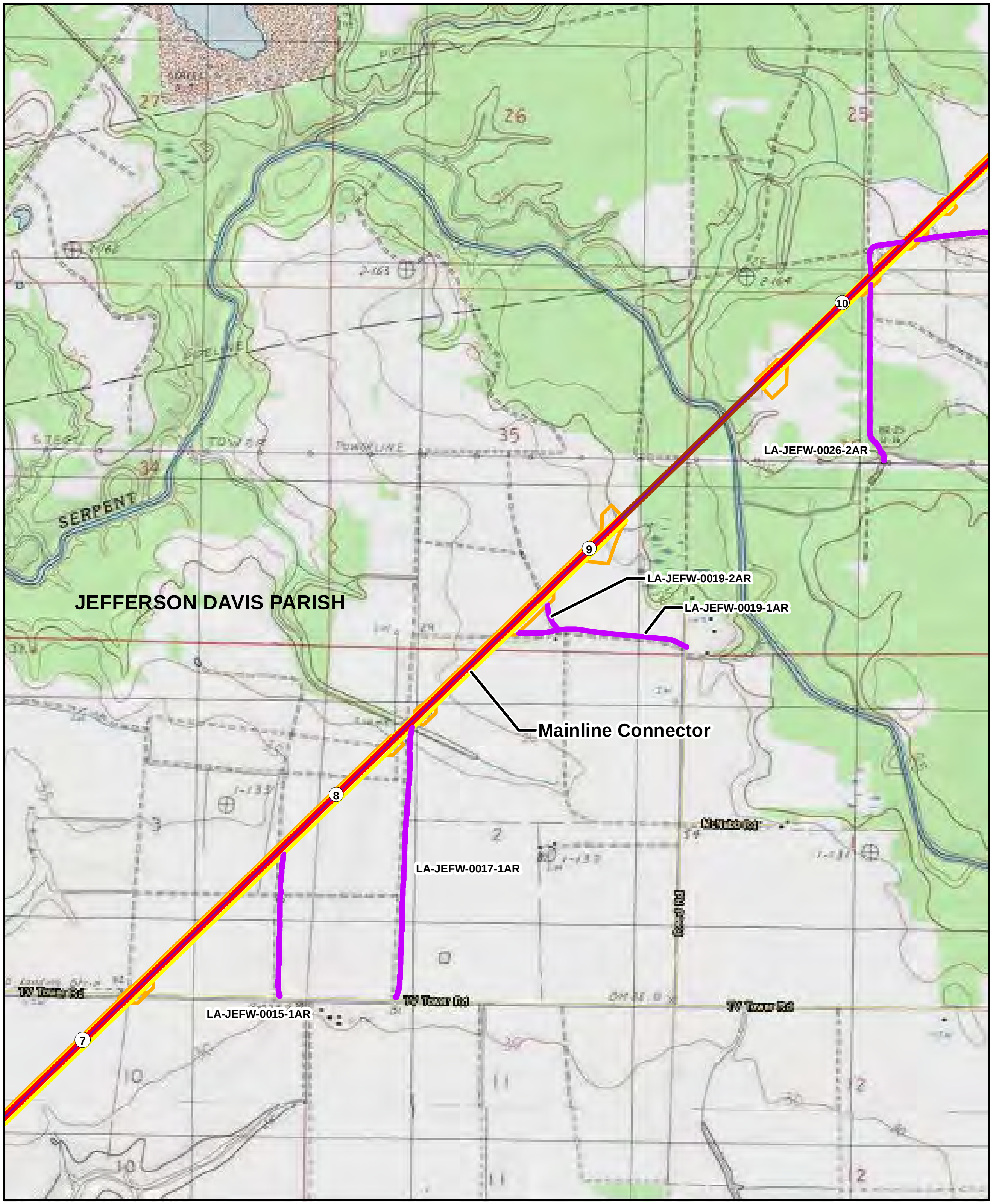
Lake Charles Liquefaction Project

Appendix C
USGS Map Sheets of the Project

Fenton Quadrangle

Page 3 of 21

12/30/2014



Legend

- Existing Facility
- Proposed Permanent Easement
- Temporary Workspace
- Additional Temporary Workspace
- Proposed Mainline 200-3 Loop
- Proposed Mainline Connector
- Additional Construction Workspace
- HDD - Permanent Easement
- Access Road
- Contractor Yard
- Existing TGC Pipelines
- 10 Mile Post

0 1,000 2,000
Feet

Sources: USGS, LDOTD, Tiger, LCLP, TRC

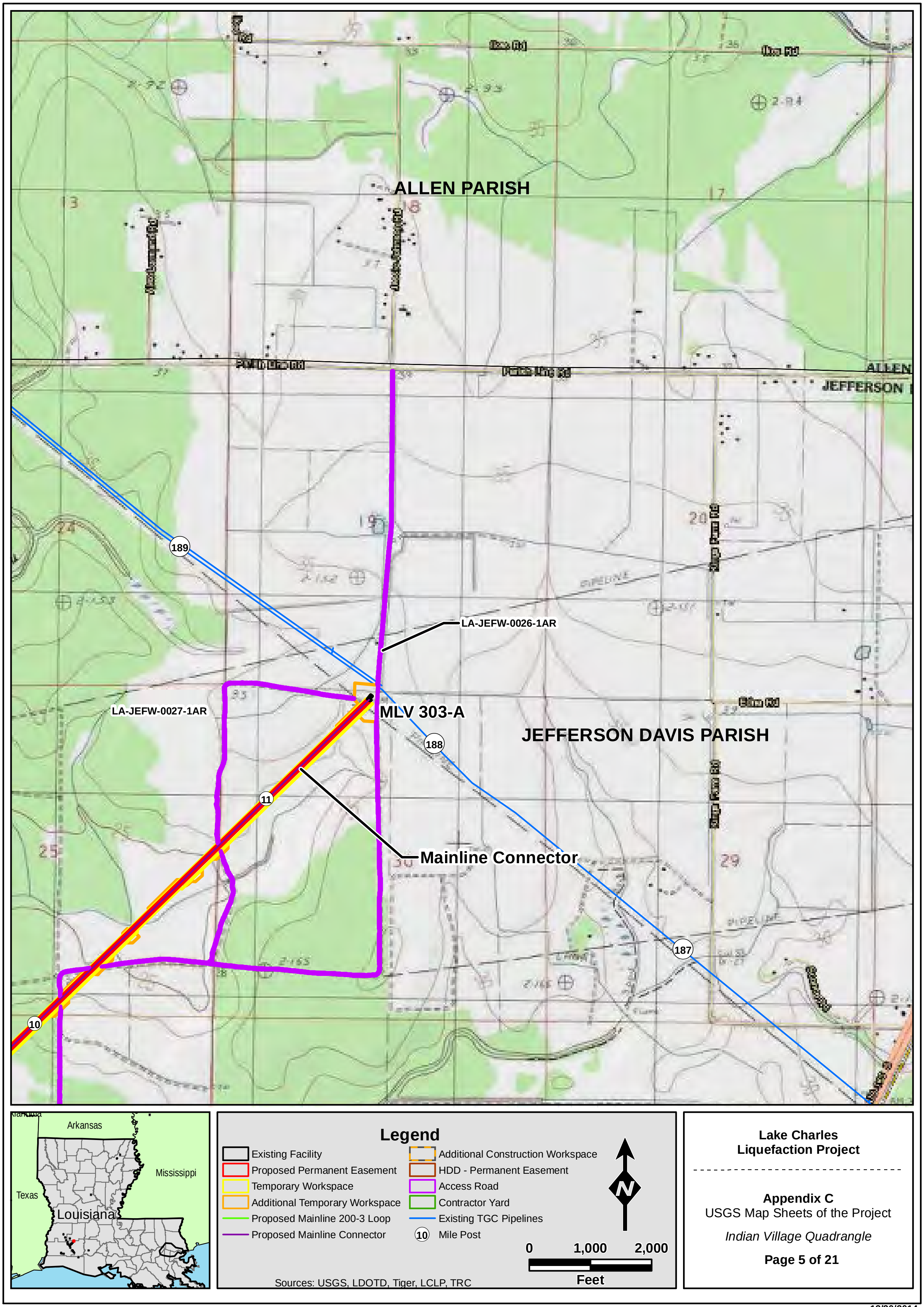
Lake Charles Liquefaction Project

Appendix C
USGS Map Sheets of the Project

Indian Village Quadrangle

Page 4 of 21

12/30/2014


ALLEN PARISH
JEFFERSON DAVIS PARISH
ALLEN
JEFFERSON
LA-JEFW-0026-1AR
LA-JEFW-0027-1AR
MLV 303-A
Mainline Connector
189
188
187
11
10
Arkansas
Mississippi
Texas
Louisiana
Legend
Existing Facility
Proposed Permanent Easement
Temporary Workspace
Additional Temporary Workspace
Proposed Mainline 200-3 Loop
Proposed Mainline Connector
Additional Construction Workspace
HDD - Permanent Easement
Access Road
Contractor Yard
Existing TGC Pipelines
Mile Post
N
0
1,000
2,000
Feet
Sources: USGS, LDOTD, Tiger, LCLP, TRC
Lake Charles Liquefaction Project
Appendix C
USGS Map Sheets of the Project
Indian Village Quadrangle
Page 5 of 21
12/30/2014

Legend

- Existing Facility
- Proposed Permanent Easement
- Temporary Workspace
- Additional Temporary Workspace
- Proposed Mainline 200-3 Loop
- Proposed Mainline Connector
- Additional Construction Workspace
- HDD - Permanent Easement
- Access Road
- Contractor Yard
- Existing TGC Pipelines
- (10) Mile Post

N

0 1,000 2,000
Feet

Sources: USGS, LDOTD, Tiger, LCLP, TRC

Lake Charles Liquefaction Project

Appendix C
USGS Map Sheets of the Project

Lacassine Quadrangle

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12/30/2014

Lake Charles Liquefaction Project

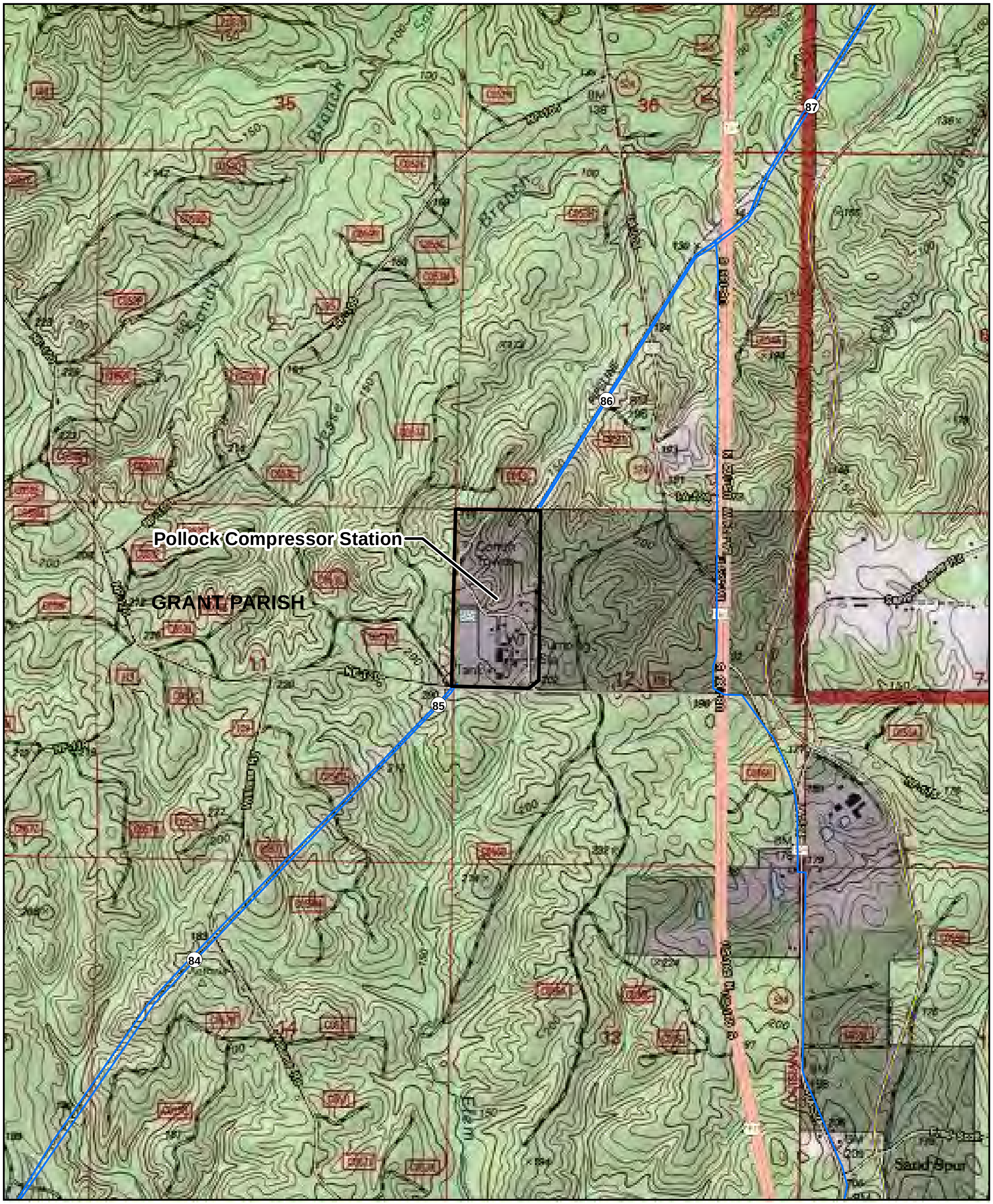
Appendix C
USGS Map Sheets of the Project

Lacassine Quadrangle

Page 7 of 21

12/30/2014


BEAUREGARD PARISH
Longville Compressor Station
Longville
Longville Lake
Arkansas
Mississippi
Texas
Louisiana
Legend
Existing Facility
Proposed Permanent Easement
Temporary Workspace
Additional Temporary Workspace
Proposed Mainline 200-3 Loop
Proposed Mainline Connector
Additional Construction Workspace
HDD - Permanent Easement
Access Road
Contractor Yard
Existing TGC Pipelines
Mile Post
0 1,000 2,000
Feet
Sources: USGS, LDOTD, Tiger, LCLP, TRC
Lake Charles
Liquefaction Project
Appendix C
USGS Map Sheets of the Project
Longville Quadrangle
Page 8 of 21
12/30/2014



Legend

- Existing Facility
- Proposed Permanent Easement
- Temporary Workspace
- Additional Temporary Workspace
- Proposed Mainline 200-3 Loop
- Proposed Mainline Connector
- Additional Construction Workspace
- HDD - Permanent Easement
- Access Road
- Contractor Yard
- Existing TGC Pipelines
- 10 Mile Post

N

0 1,000 2,000
Feet

Sources: USGS, LDOTD, Tiger, LCLP, TRC

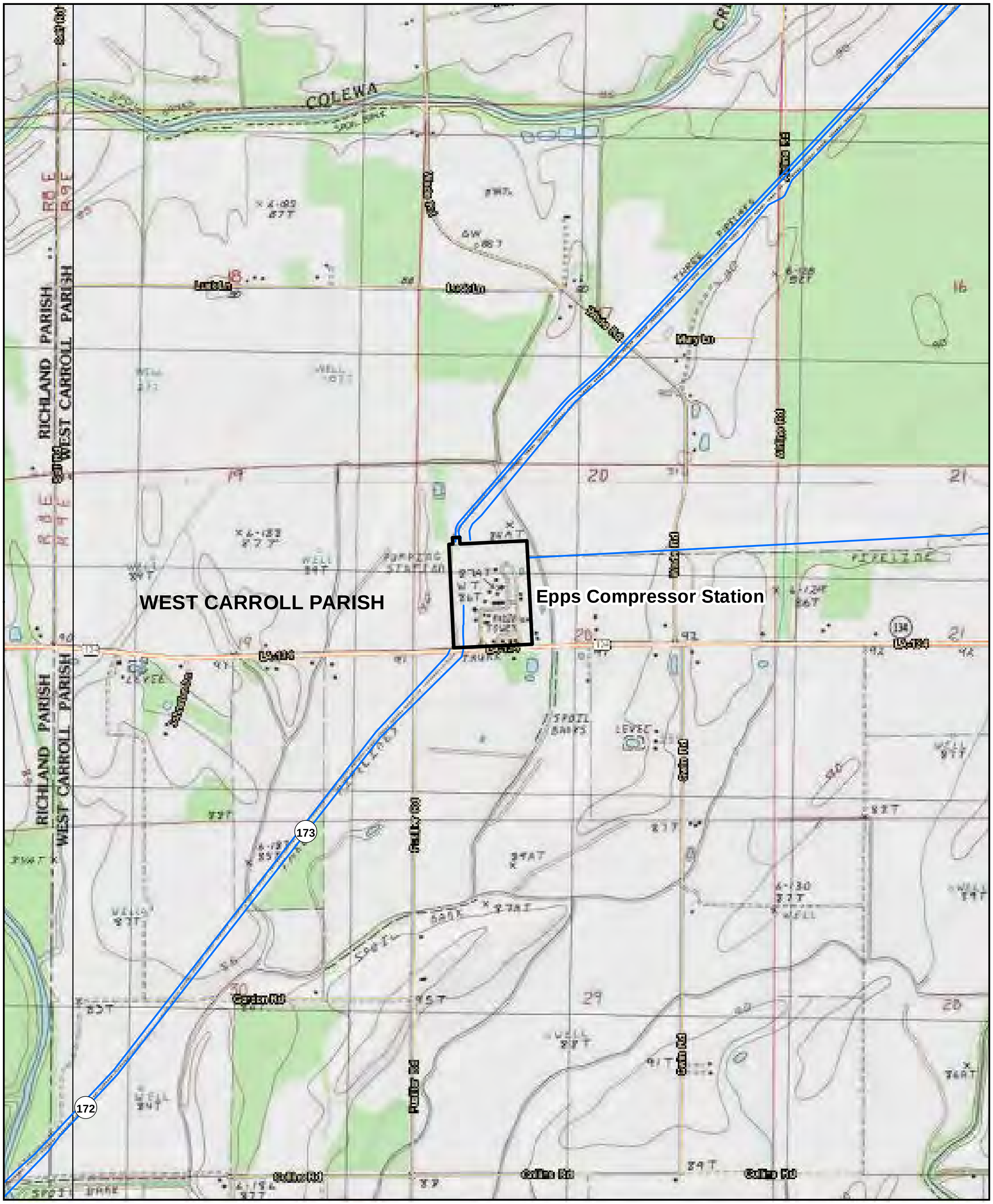
Lake Charles Liquefaction Project

Appendix C
USGS Map Sheets of the Project

Pollock Quadrangle

Page 9 of 21

12/30/2014



Legend

- Existing Facility
- Proposed Permanent Easement
- Temporary Workspace
- Additional Temporary Workspace
- Proposed Mainline 200-3 Loop
- Proposed Mainline Connector
- Additional Construction Workspace
- HDD - Permanent Easement
- Access Road
- Contractor Yard
- Existing TGC Pipelines
- (10) Mile Post

0 1,000 2,000
Feet

Sources: USGS, LDOTD, Tiger, LCLP, TRC

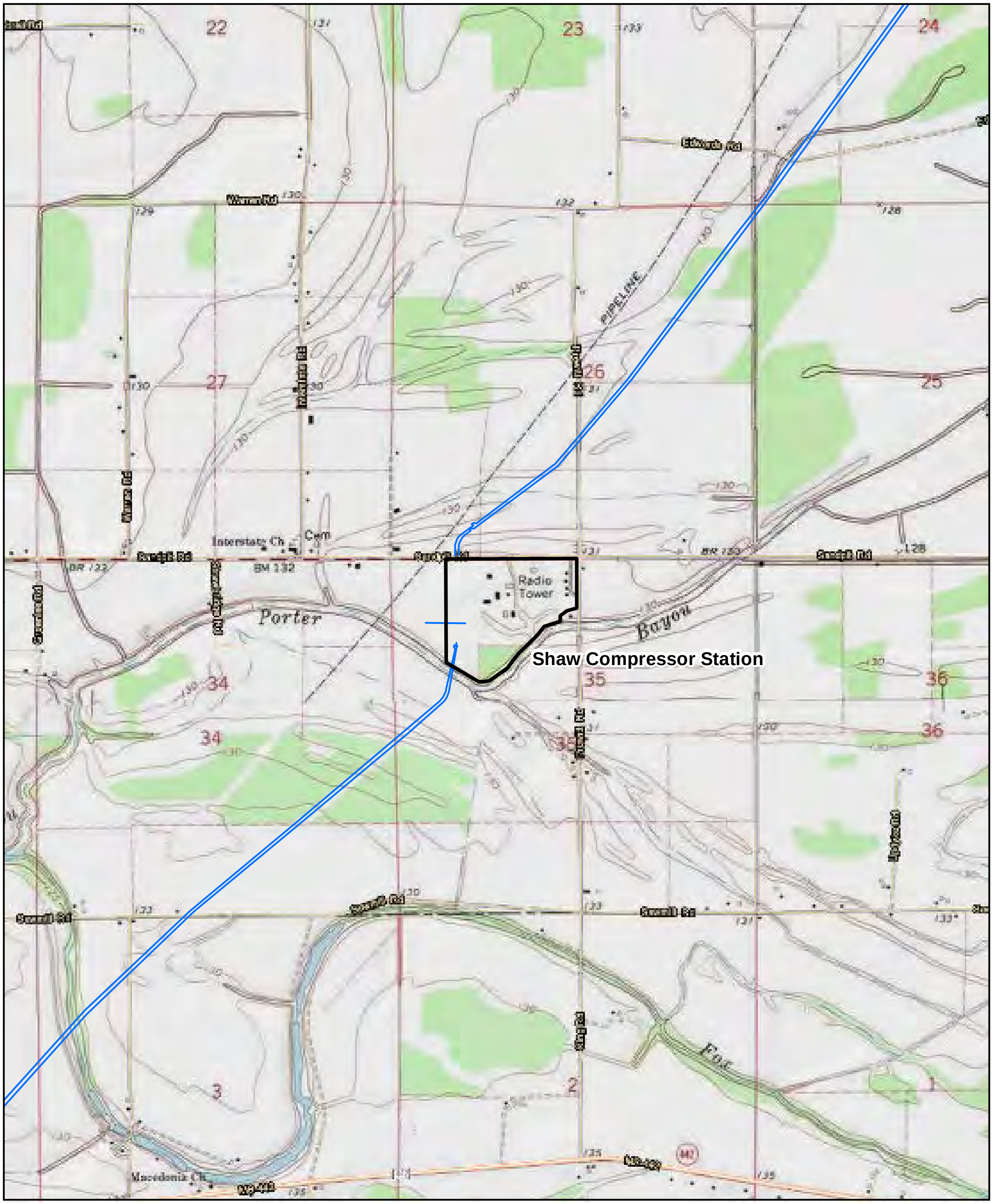
Lake Charles Liquefaction Project

Appendix C
USGS Map Sheets of the Project

Congo Creek Quadrangle

Page 10 of 21

12/30/2014



Legend

- Existing Facility
- Proposed Permanent Easement
- Temporary Workspace
- Additional Temporary Workspace
- Proposed Mainline 200-3 Loop
- Proposed Mainline Connector
- Additional Construction Workspace
- HDD - Permanent Easement
- Access Road
- Contractor Yard
- Existing TGC Pipelines
- (10) Mile Post

0 1,000 2,000
Feet

Sources: USGS, LDOTD, Tiger, LCLP, TRC

Lake Charles Liquefaction Project

Appendix C
USGS Map Sheets of the Project

Cleveland Quadrangle

Page 11 of 21

12/30/2014

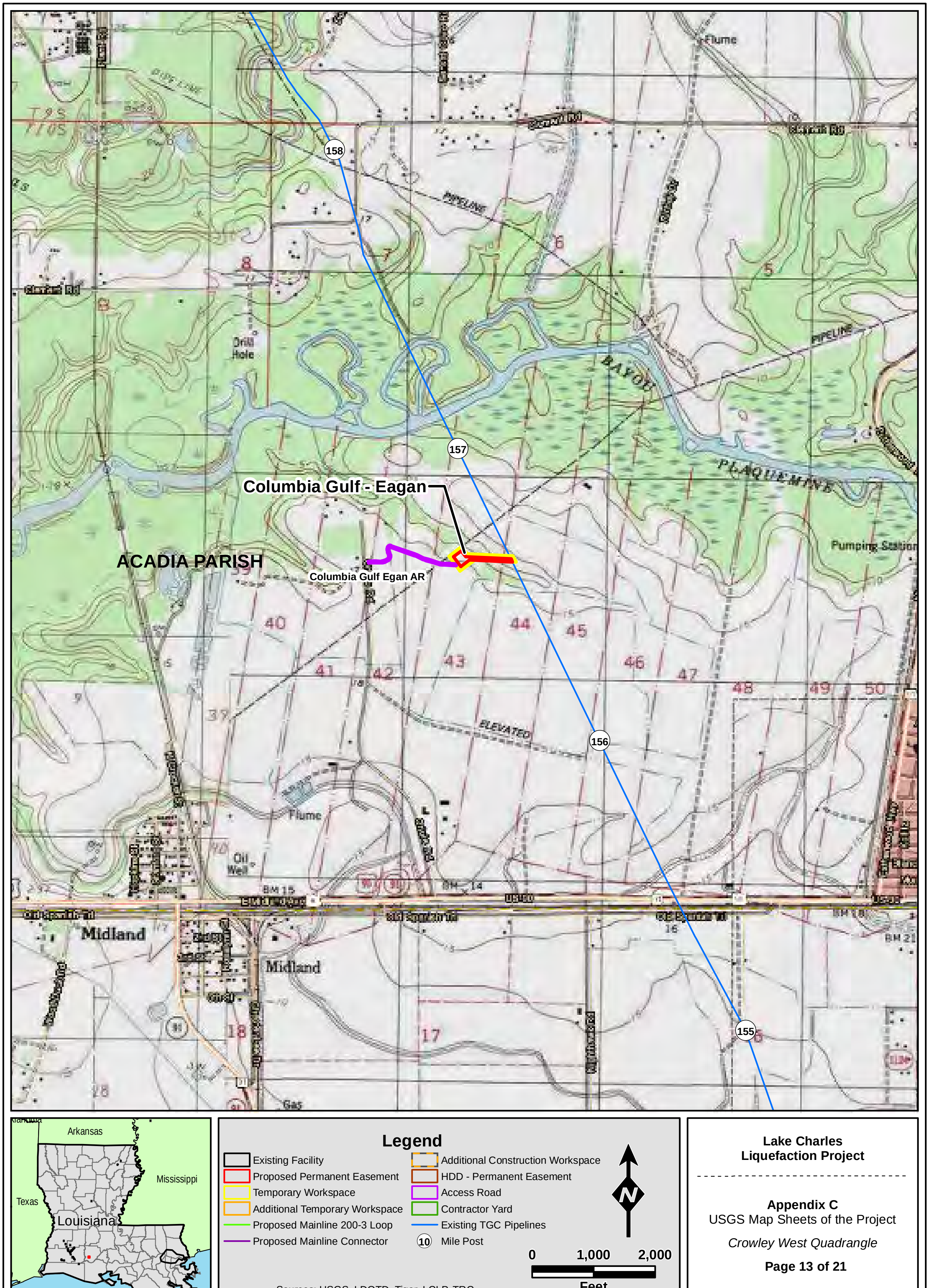
Lake Charles Liquefaction Project

Appendix C
USGS Map Sheets of the Project

Lake Charles SW Quadrangle

Page 12 of 21

12/30/2014



Lake Charles Liquefaction Project

Appendix C
USGS Map Sheets of the Project

Crowley West Quadrangle

Page 13 of 21

12/30/2014

Legend

- Existing Facility
- Proposed Permanent Easement
- Temporary Workspace
- Additional Temporary Workspace
- Proposed Mainline 200-3 Loop
- Proposed Mainline Connector
- Additional Construction Workspace
- HDD - Permanent Easement
- Access Road
- Contractor Yard
- Existing TGC Pipelines
- (10) Mile Post

N

0 1,000 2,000
Feet

Sources: USGS, LDOTD, Tiger, LCLP, TRC

Lake Charles Liquefaction Project

Appendix C
USGS Map Sheets of the Project

Thornwell Quadrangle

Page 14 of 21

12/30/2014

Legend

- Existing Facility
- Proposed Permanent Easement
- Temporary Workspace
- Additional Temporary Workspace
- Proposed Mainline 200-3 Loop
- Proposed Mainline Connector
- Additional Construction Workspace
- HDD - Permanent Easement
- Access Road
- Contractor Yard
- Existing TGC Pipelines
- (10) Mile Post

0 1,000 2,000
Feet

Sources: USGS, LDOTD, Tiger, LCLP, TRC

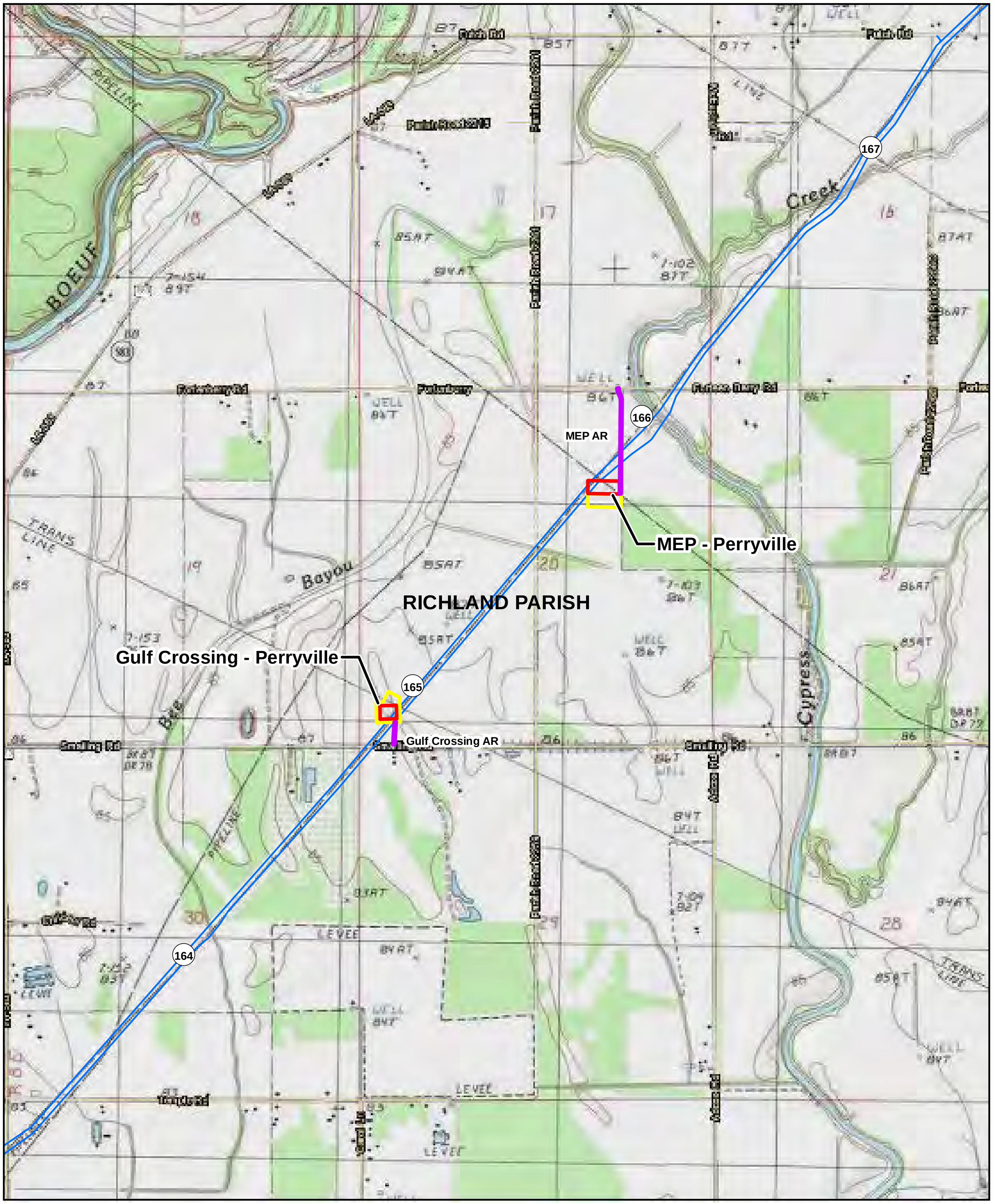
Lake Charles Liquefaction Project

Appendix C
USGS Map Sheets of the Project

Topsy Quadrangle

Page 15 of 21

12/30/2014



Legend

- Existing Facility
- Proposed Permanent Easement
- Temporary Workspace
- Additional Temporary Workspace
- Proposed Mainline 200-3 Loop
- Proposed Mainline Connector
- Additional Construction Workspace
- HDD - Permanent Easement
- Access Road
- Contractor Yard
- Existing TGC Pipelines
- (10) Mile Post

N

0 1,000 2,000
Feet

Sources: USGS, LDOTD, Tiger, LCLP, TRC

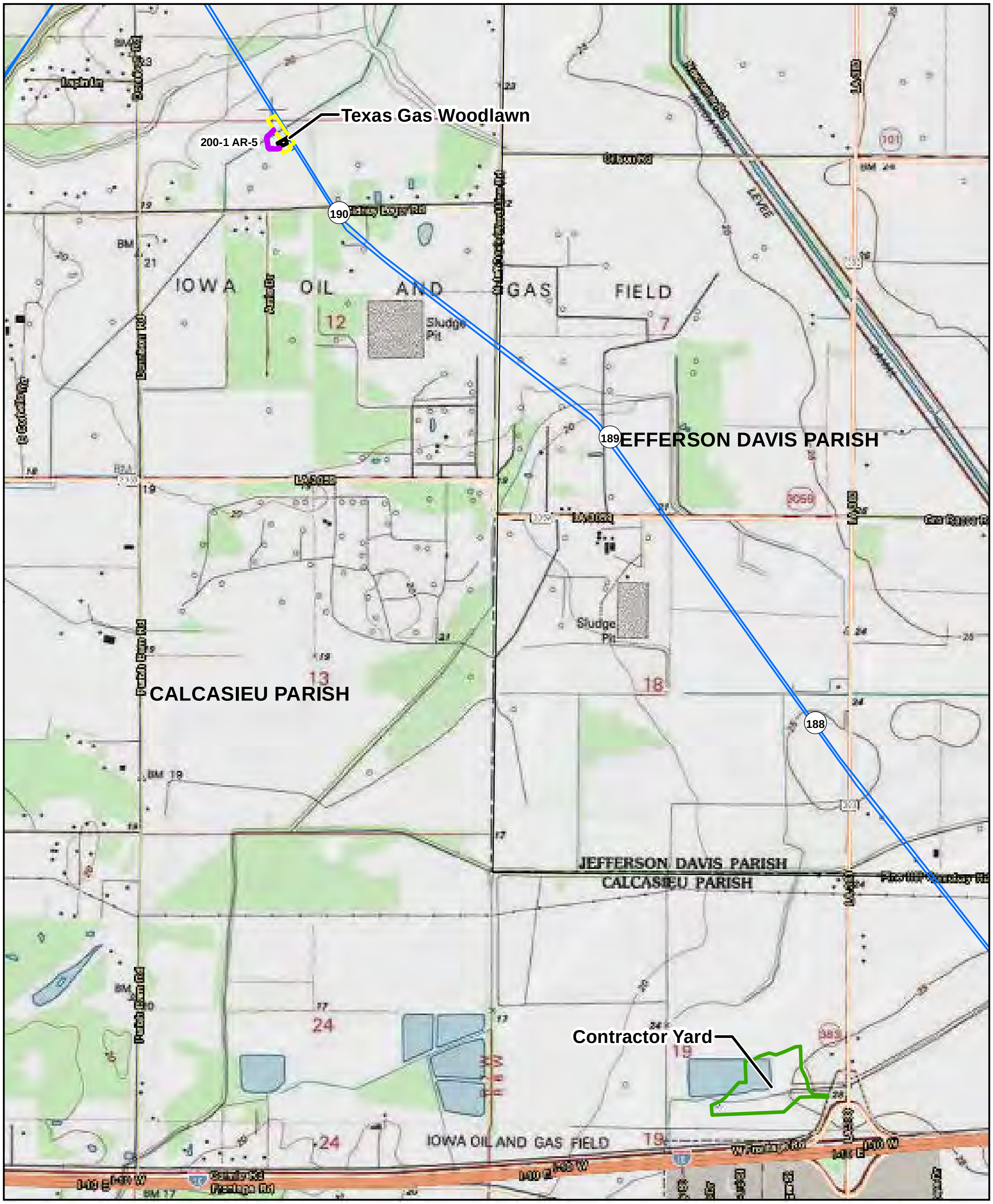
Lake Charles Liquefaction Project

Appendix C
USGS Map Sheets of the Project

Whitney Island South Quadrangle

Page 16 of 21

12/30/2014



Legend

- Existing Facility
- Proposed Permanent Easement
- Temporary Workspace
- Additional Temporary Workspace
- Proposed Mainline 200-3 Loop
- Proposed Mainline Connector
- Additional Construction Workspace
- HDD - Permanent Easement
- Access Road
- Contractor Yard
- Existing TGC Pipelines
- (10) Mile Post

N

0 1,000 2,000
Feet

Sources: USGS, LDOTD, Tiger, LCLP, TRC

Lake Charles Liquefaction Project

Appendix C
USGS Map Sheets of the Project

Hecker Quadrangle

Page 17 of 21

12/30/2014

Legend

- Existing Facility
- Proposed Permanent Easement
- Temporary Workspace
- Additional Temporary Workspace
- Proposed Mainline 200-3 Loop
- Proposed Mainline Connector
- Additional Construction Workspace
- HDD - Permanent Easement
- Access Road
- Contractor Yard
- Existing TGC Pipelines
- 10 Mile Post

N

0 1,000 2,000

Feet

Sources: USGS, LDOTD, Tiger, LCLP, TRC

Lake Charles Liquefaction Project

Appendix C

USGS Map Sheets of the Project

Gaytine Quadrangle

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12/30/2014

Legend

- Existing Facility
- Proposed Permanent Easement
- Temporary Workspace
- Additional Temporary Workspace
- Proposed Mainline 200-3 Loop
- Proposed Mainline Connector
- Additional Construction Workspace
- HDD - Permanent Easement
- Access Road
- Contractor Yard
- Existing TGC Pipelines
- (10) Mile Post

0 1,000 2,000
Feet

Sources: USGS, LDOTD, Tiger, LCLP, TRC

Lake Charles Liquefaction Project

Appendix C
USGS Map Sheets of the Project

Avon Quadrangle

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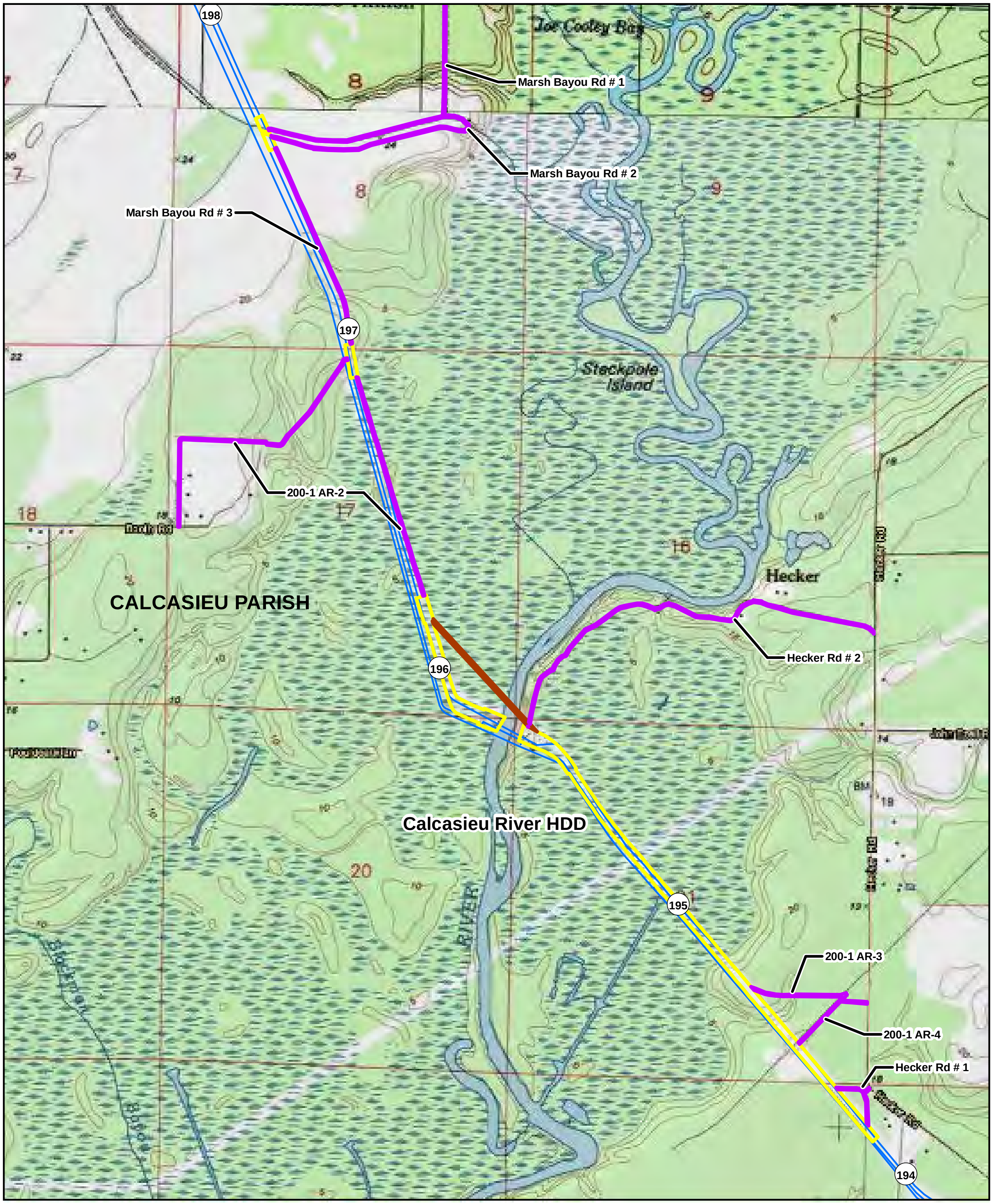
12/30/2014



Legend

Existing Facility	Additional Construction Workspace
Proposed Permanent Easement	HDD - Permanent Easement
Temporary Workspace	Access Road
Additional Temporary Workspace	Contractor Yard
Proposed Mainline 200-3 Loop	Existing TGC Pipelines
Proposed Mainline Connector	(10) Mile Post

N

0 1,000 2,000
Feet

Sources: USGS, LDOTD, Tiger, LCLP, TRC

Lake Charles Liquefaction Project

Appendix C
USGS Map Sheets of the Project

Hecker Quadrangle

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12/30/2014

US 190 Meter
BEAUREGARD PARISH
US 190 Meter AR
209
208
207
Arkansas
Mississippi
Texas
Louisiana
Legend
Existing Facility
Proposed Permanent Easement
Temporary Workspace
Additional Temporary Workspace
Proposed Mainline 200-3 Loop
Proposed Mainline Connector
Additional Construction Workspace
HDD - Permanent Easement
Access Road
Contractor Yard
Existing TGC Pipelines
10 Mile Post
N
0 1,000 2,000
Feet
Sources: USGS, LDOTD, Tiger, LCLP, TRC
Lake Charles Liquefaction Project
Appendix C
USGS Map Sheets of the Project
Longville Quadrangle
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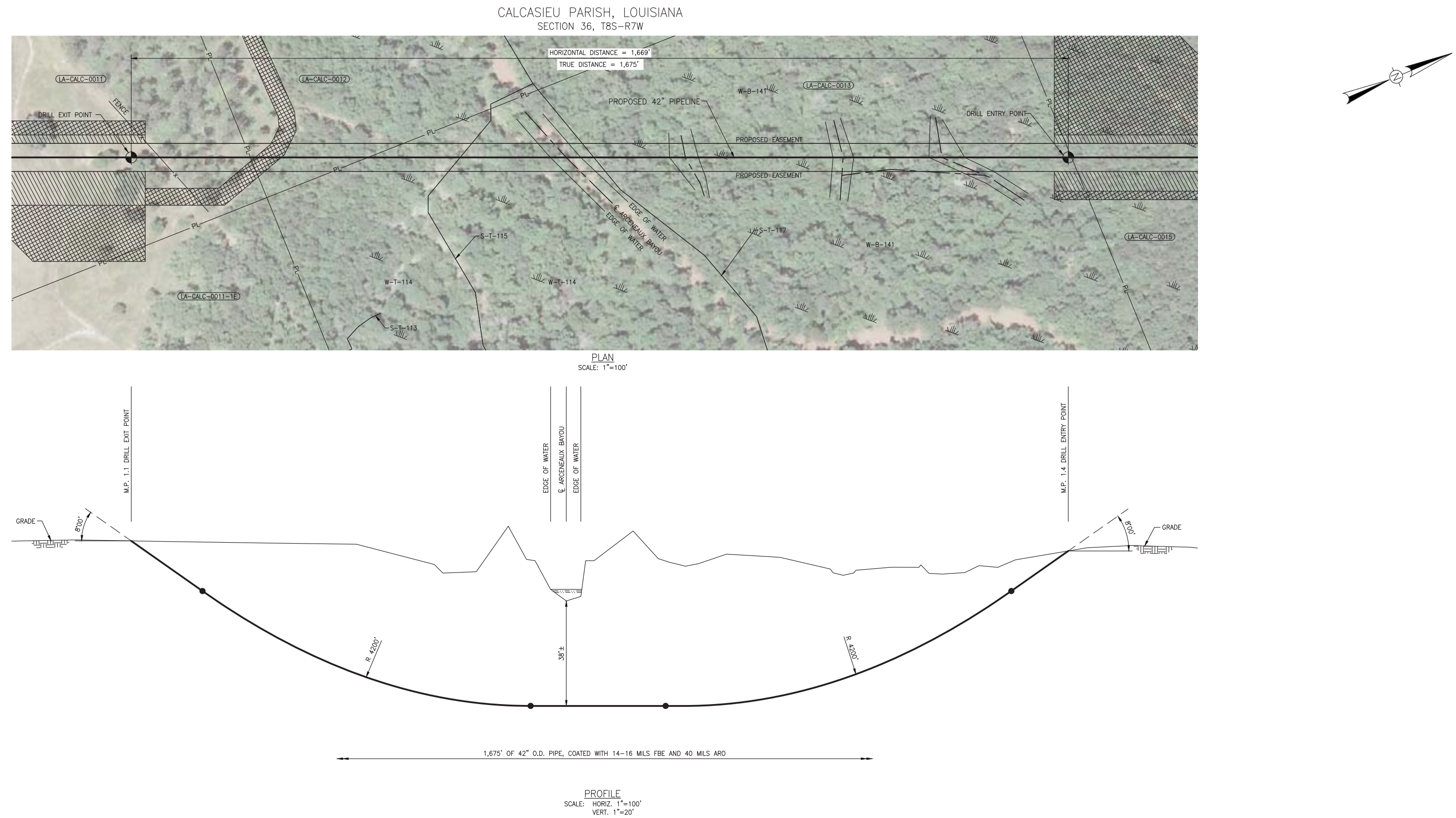
12/30/2014

APPENDIX D

DRAFT HORIZONTAL DIRECTIONAL DRILL PLAN AND PROFILE DRAWINGS, AND HORIZONTAL DIRECTIONAL DRILL CONTINGENCY PLAN

D-1



LEGEND

- DRILL ENTRY/EXIT POINT
- TEMPORARY WORK SPACE
- ADDITIONAL TEMPORARY WORK SPACE

100 50 0 100 200
SCALE: 1"=100'

Wood Group Mustang, Inc.
PROJECT NO: 100089

DWG. NO.	REFERENCE DRAWING TITLE	NO.	REVISION – DESCRIPTION	BY	DATE	CHK'D	APP'D
		C	ISSUED FOR FERC APPLICATION	JM	03/20/14	MEH	JWV
		B	RE-ISSUED PRELIMINARY	JM	06/21/13	MEH	JWV
		A	ISSUED PRELIMINARY	JM	05/22/13	MEH	JWV

DWG. STATUS	CHECKED BY	CHECKED DATE	APPROVED BY	APPROVED DATE	BY	DATE
PREL'Y	MEH	05/01/13	JWV	05/01/13		
BID						
CONSTR.						
CADDS	PLOT DATE: ––––					
	FILE NAME: 100089-F-1703					

P.L./STA. NO.
ACCOUNT NO.
CONSTRUCTION YEAR 2017

	BY	DATE
DESIGN	JWV	05/01/13
DRAWN	JM	05/01/13
ASBUILT		

FILE NO.
SCALE: AS SHOWN

TRUNKLINE GAS
An ENERGY TRANSFER Company
HOUSTON, TEXAS

42" MAIN LINE CONNECTOR
LIQUEFACTION PROJECT
ARCENEAUX BAYOU CROSSING PLAN AND PROFILE
HORIZONTAL DIRECTIONAL DRILL
CALCASIEU PARISH, LOUISIANA

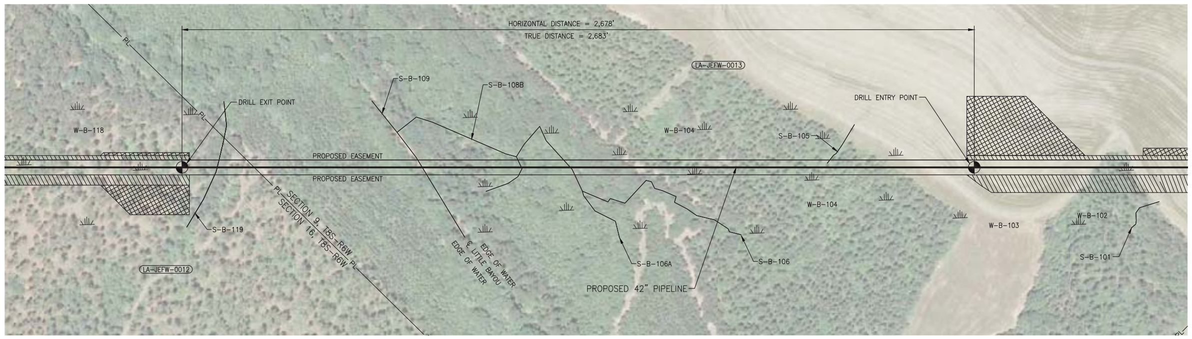
PROJECT NO. W.O. CONNECTOR
PREVIOUS DWG. NO.
SHEET 1 OF 1
DWG. NO. P4-1 C
SHEET 1 OF 1

P:\100089 – Trunkline – Field Zone Liquefaction\4.0 – DRAWINGS (MAPPING)\HDD\CONNECTOR P4-1.dwg (1) Plotted on: Mar 24, 2014 – 12:08pm by j1mcfal

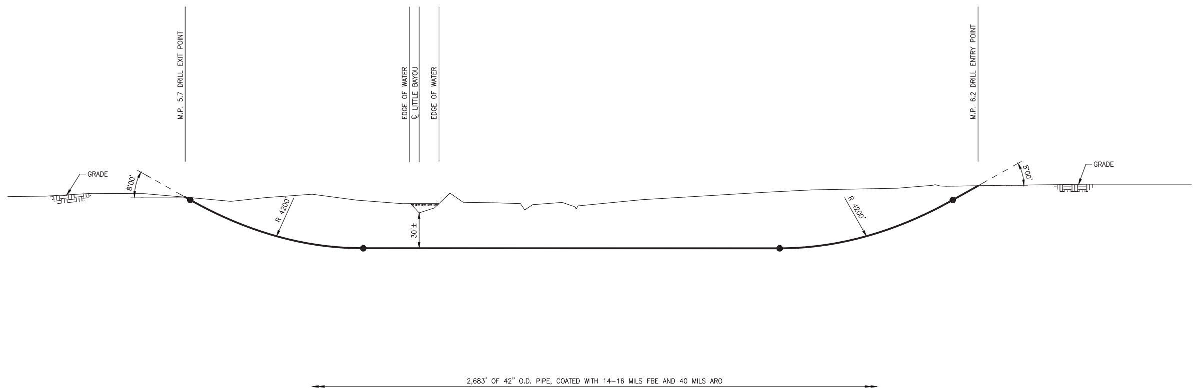
D-2

P:\100089 – Trunkline – Field Zone Liquefaction\4.0 – DRAWINGS (MAPPING)\HDD\CONNECTOR P4-2.dwg (1) Plotted on: Mar 24, 2014 – 1:15pm by j1mcfal

JEFFERSON DAVIS PARISH, LOUISIANA
SECTION 9 AND 16, T8S-R6W



PLAN
SCALE: 1"=200'



PROFILE
SCALE: HORIZ. 1"=200'
VERT. 1"=50'

LEGEND

DRILL ENTRY/EXIT POINT

TEMPORARY WORK SPACE

ADDITIONAL TEMPORARY WORK SPACE

200 100 0 200 400
SCALE: 1"=200'

Wood Group Mustang, Inc.
PROJECT NO: 100089

DWG. NO.	REFERENCE DRAWING TITLE	NO.	REVISION – DESCRIPTION	BY	DATE	CHK'D	APP'D
		C	ISSUED FOR FERC APPLICATION	JM	03/20/14	MEH	JWV
		B	RE-ISSUED PRELIMINARY	JM	06/21/13	MEH	JWV
		A	ISSUED PRELIMINARY	JM	05/22/13	MEH	JWV

DWG. STATUS	CHECKED BY	CHECKED DATE	APPROVED BY	APPROVED DATE	BY	DATE
PREL'Y	MEH	05/02/13	JWV	05/02/13		
BID						
CONSTR.						
CADDS	PLOT DATE: ----					
	FILE NAME: 100089-F-1704					

P.L./STA. NO. ACCOUNT NO.		
CONSTRUCTION YEAR		2017
	BY	DATE
DESIGN	JWV	05/02/13
DRAWN	JM	05/02/13
ASBUILT		
FILE NO.		
SCALE: AS SHOWN		

TRUNKLINE GAS
An ENERGY TRANSFER Company
HOUSTON, TEXAS

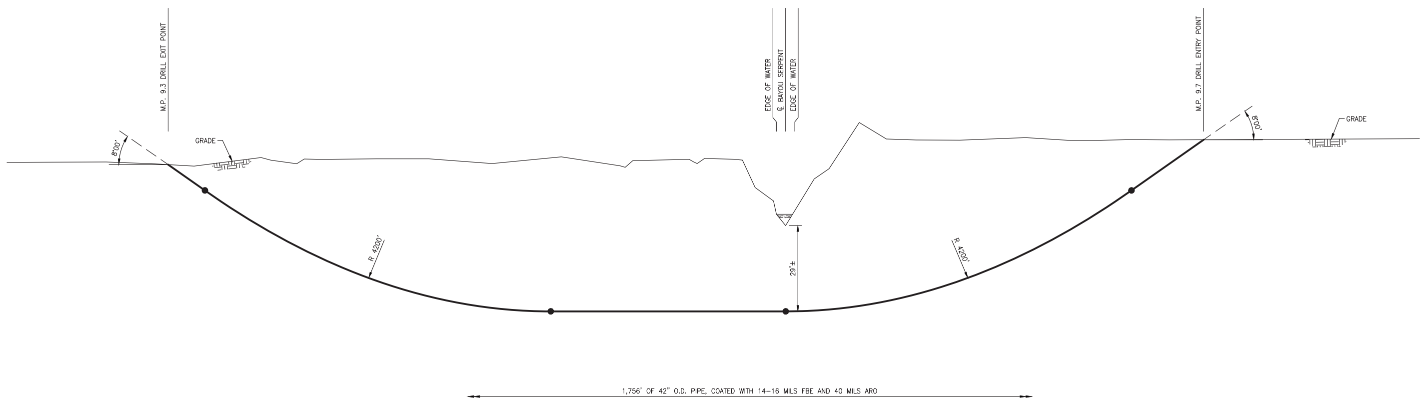
42" MAIN LINE CONNECTOR
LIQUEFACTION PROJECT
LITTLE BAYOU CROSSING PLAN AND PROFILE
HORIZONTAL DIRECTIONAL DRILL
JEFFERSON DAVIS PARISH, LOUISIANA

PROJECT NO.
W.O. CONNECTOR
PREVIOUS DWG. NO.
SHEET 1 OF 1
DWG. NO.
P4-2 C
SHEET 1 OF 1

D-3

JEFFERSON DAVIS PARISH, LOUISIANA
SECTION 25 AND 36, T7S-R6W

PLAN
SCALE: 1"=100'



PROFILE
SCALE: HORIZ. 1"=100'
VERT. 1"=20'

LEGEND

- DRILL ENTRY/EXIT POINT
- TEMPORARY WORK SPACE
- ADDITIONAL TEMPORARY WORK SPACE

100 50 0 100 200
SCALE: 1"=100'

Wood Group Mustang, Inc.
PROJECT NO: 100089

DWG. NO.	REFERENCE DRAWING TITLE	NO.	REVISION – DESCRIPTION	BY	DATE	CHK'D	APP'D
		C	ISSUED FOR FERC APPLICATION	JM	03/20/14	MEH	JWV
		B	RE-ISSUED PRELIMINARY	JM	06/21/13	MEH	JWV
		A	ISSUED PRELIMINARY	JM	05/22/13	MEH	JWV

DWG. STATUS	CHECKED BY	DATE	APPROVED BY	DATE	BY	DATE
PREL'Y	MEH	05/01/13	JWV	05/01/13		
BID						
CONSTR.						
CADDS	PLOT DATE: ----					
	FILE NAME: 100089-F-1705					

P.L./STA. NO.
ACCOUNT NO.
CONSTRUCTION YEAR 2017

	BY	DATE
DESIGN	JWV	05/01/13
DRAWN	JM	05/01/13
ASBUILT		

FILE NO.
SCALE: AS SHOWN

TRUNKLINE GAS
An ENERGY TRANSFER Company
HOUSTON, TEXAS

42" MAIN LINE CONNECTOR
LIQUEFACTION PROJECT
BAYOU SERPENT CROSSING PLAN AND PROFILE
HORIZONTAL DIRECTIONAL DRILL
JEFFERSON DAVIS PARISH, LOUISIANA

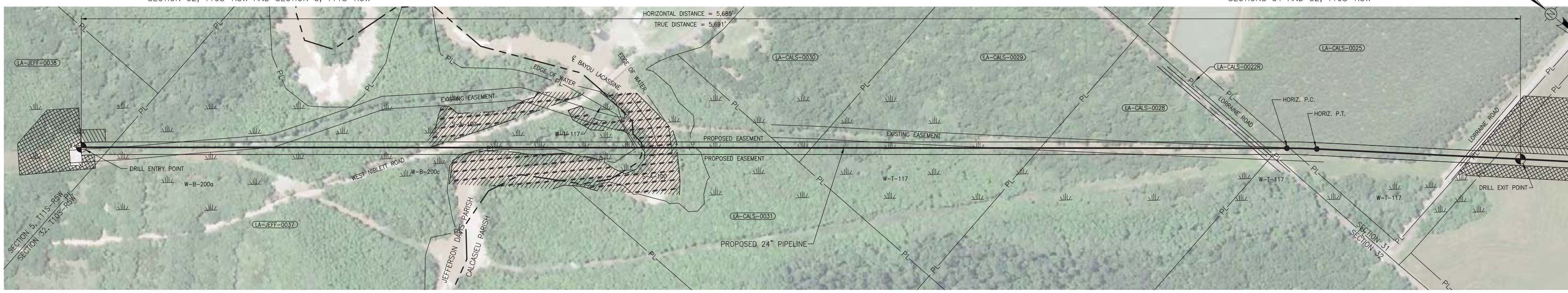
PROJECT NO.
W.O. CONNECTOR
PREVIOUS DWG. NO.
SHEET 1 OF 1
DWG. NO.
P4-3 C
SHEET 1 OF 1

P:\100089 – Trunkline – Field Zone Liquefaction\4.0 – DRAWINGS (MAPPING)\HDD\CONNECTOR P4-3.dwg (1) Plotted on: Mar 24, 2014 – 1:18pm by j1mcfal

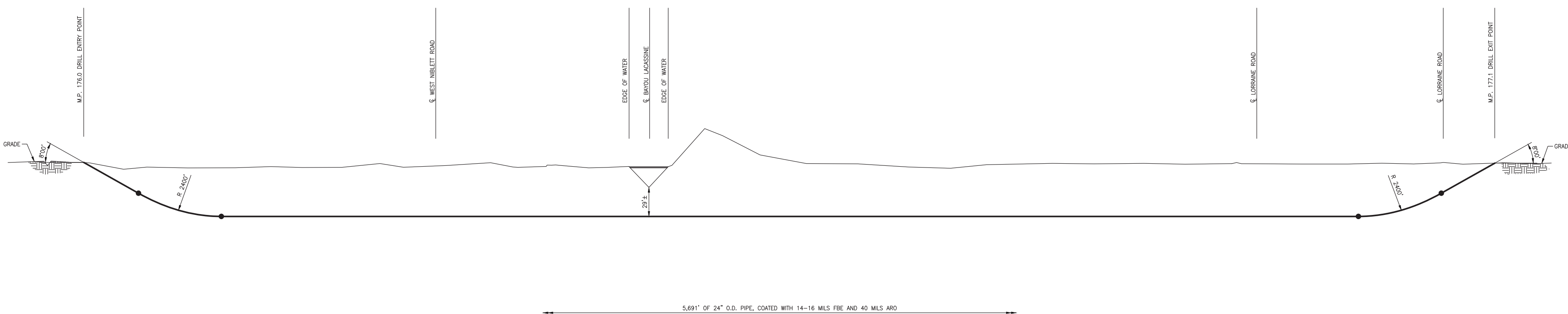
D-4

JEFFERSON DAVIS PARISH, LOUISIANA
SECTION 32, T10S-R5W AND SECTION 5, T11S-R5W

CALCASIEU PARISH, LOUISIANA
SECTIONS 31 AND 32, T10S-R5W



PLAN
SCALE: 1"=200'



PROFILE
SCALE: HORIZ. 1"=200'
VERT. 1"=50'

LEGEND

- DRILL ENTRY/EXIT POINT
- TEMPORARY WORK SPACE
- ADDITIONAL TEMPORARY WORK SPACE

200 100 0 200 400
SCALE: 1"=200'

Wood Group Mustang, Inc.
PROJECT NO: 100089

NO.	REVISION - DESCRIPTION	BY	DATE	CHK'D	APP'D
C	ISSUED FOR FERC APPLICATION	JM	03/20/14	MEH	JWV
B	RE-ISSUED PRELIMINARY	JM	06/21/13	MEH	JWV
A	ISSUED PRELIMINARY	JM	05/22/13	MEH	JWV

DWG. NO.	REFERENCE DRAWING TITLE

DWG. STATUS	CHECKED BY	CHECKED DATE	APPROVED BY	APPROVED DATE	BY	DATE
PREL'Y	MEH	05/02/13	JWV	05/02/13		
BID						
CONSTR.						
CADDS						

PLOT DATE: ----
FILE NAME: 100089-F-1701

P.L./STA. NO.
ACCOUNT NO.
CONSTRUCTION YEAR 2017

	BY	DATE
DESIGN	JWV	05/02/13
DRAWN	JM	05/02/13
ASBUILT		

FILE NO.
SCALE: AS SHOWN

TRUNKLINE GAS
An ENERGY TRANSFER Company
HOUSTON, TEXAS

24" MAIN LINE LOOP LINE - 200-3 LINE
LIQUEFACTION PROJECT
BAYOU LACASSINE CROSSING PLAN AND PROFILE
HORIZONTAL DIRECTIONAL DRILL
JEFFERSON DAVIS AND CALCASIEU PARISHES, LOUISIANA

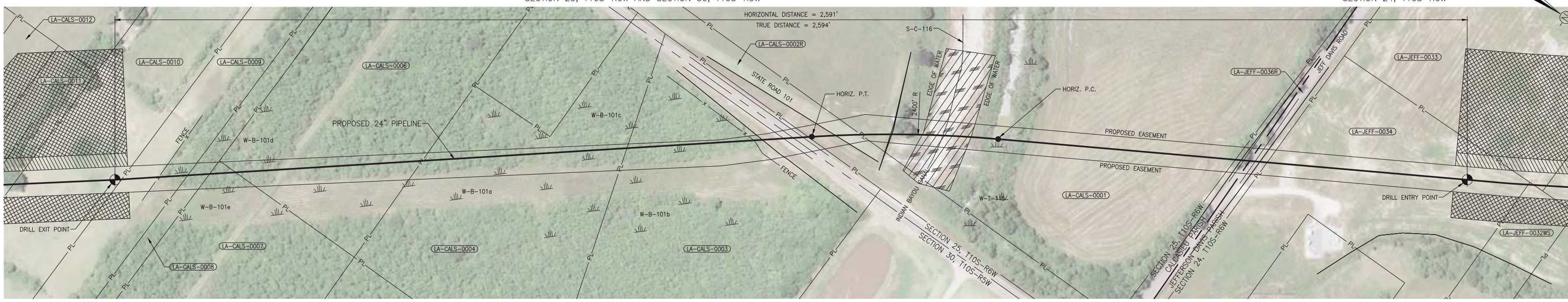
PROJECT NO. W.O. 200-3
PREVIOUS DWG. NO.
SHEET 1 OF 1
DWG. NO. P4-1 C
SHEET 1 OF 1

P:\100089 - Trunkline - Field Zone Liquefaction\4.0 - DRAWINGS (MAPPING)\HDD\200-3 P4-1.dwg (1) Plotted on: Mar 24, 2014 - 11:41am by j1mcfal

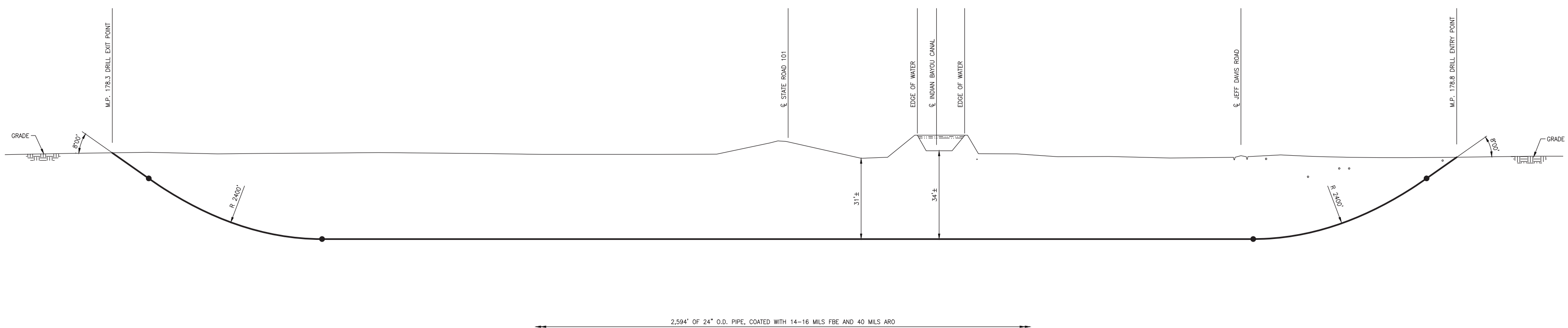
D-5

CALCASIEU PARISH, LOUISIANA
SECTION 25, T10S-R6W AND SECTION 30, T10S-R5W

JEFFERSON DAVIS PARISH, LOUISIANA
SECTION 24, T10S-R6W



PLAN
SCALE: 1"=100'



PROFILE
SCALE: HORIZ. 1"=100'
VERT. 1"=20'

LEGEND

DRILL ENTRY/EXIT POINT

TEMPORARY WORK SPACE

ADDITIONAL TEMPORARY WORK SPACE

100 50 0 100 200
SCALE: 1"=100'

Wood Group Mustang, Inc.
PROJECT NO: 100089

DWG. NO.	REFERENCE DRAWING TITLE	NO.	REVISION – DESCRIPTION	BY	DATE	CHK'D	APP'D
		C	ISSUED FOR FERC APPLICATION	JM	03/20/14	MEH	JWV
		B	RE-ISSUED PRELIMINARY	JM	06/21/13	MEH	JWV
		A	ISSUED PRELIMINARY	JM	05/22/13	MEH	JWV

DWG. STATUS	CHECKED BY	CHECKED DATE	APPROVED BY	APPROVED DATE	BY	DATE
PREL'Y	MEH	05/01/13	JWV	05/01/13		
BID						
CONSTR.						
CADDS	PLOT DATE: ---- FILE NAME: 100089-F-1702					

P.L./STA. NO.
ACCOUNT NO.

CONSTRUCTION YEAR		2017
	BY	DATE
DESIGN	JWV	05/01/13
DRAWN	JM	05/01/13
ASBUILT		

FILE NO.
SCALE: AS SHOWN

TRUNKLINE GAS
An ENERGY TRANSFER Company
HOUSTON, TEXAS

24" MAIN LINE LOOP LINE – 200-3 LINE
LIQUEFACTION PROJECT
INDIAN BAYOU CANAL CROSSING PLAN AND PROFILE
HORIZONTAL DIRECTIONAL DRILL
CALCASIEU AND JEFFERSON DAVIS PARISHES, LOUISIANA

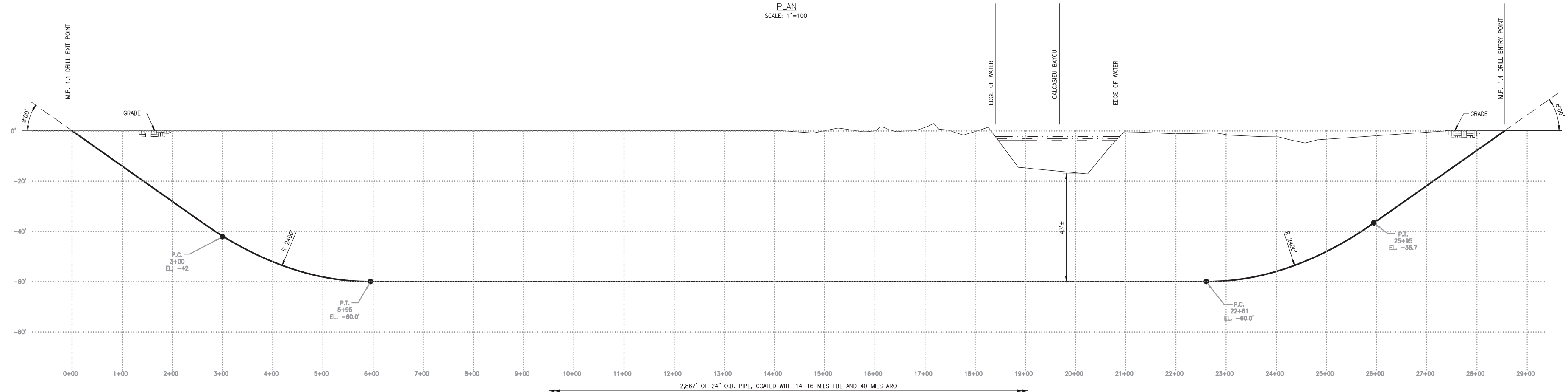
PROJECT NO. W.O. 200-3
PREVIOUS DWG. NO.
SHEET 1 OF 1
DWG. NO. P4-2
SHEET 1 OF 1
C

P:\100089 – Trunkline – Field Zone Liquefaction\4.0 – DRAWINGS (MAPPING)\HDD\200-3 P4-2.dwg (1) Plotted on: Mar 24, 2014 – 11:46am by jlmcfal

D-6

CALCASIEU PARISH, LOUISIANA
SECTIONS 16, 17 & 21, T8S-R7W

PLAN
SCALE: 1"=100'



PROFILE
SCALE: HORIZ. 1"=100'
VERT. 1"=20'

LEGEND

DRILL ENTRY/EXIT POINT

TEMPORARY WORK SPACE

ADDITIONAL TEMPORARY WORK SPACE

NOTE: PLACEMENT OF HORIZONTAL DRILLING RIG IS NOT FIXED BY DESIGNATION OF ENTRY AND EXIT POINTS. DRILLING RIG PLACEMENT AND/OR THE USE OF DUAL RIGS SHALL BE AT CONTRACTORS OPTION.

NOTE: CONTRACTOR SHALL ACTIVELY MONITOR ALL ROADS AND SURFACE AREA ALONG THE DRILLED PATH FOR IMPACTS THAT COULD OCCUR AS A RESULT OF THE HDD OPERATIONS (I.E. SETTLEMENT; HEAVE; AND DRILLING FLUID FLOW). CONTRACTOR'S MONITORING PROTOCOL AND ASSOCIATED EMERGENCY RESPONSE PLANS SHALL BE APPROPRIATE TO ENSURE THAT PUBLIC SAFETY IS NOT COMPROMISED.

GENERAL NOTES FOR HDD DRILL

1. NO REVISIONS TO, OR DEVIATIONS FROM, THESE DRAWINGS OR SUPPORTING SPECIFICATIONS MAY BE MADE BY THE CONTRACTOR WITHOUT PRIOR WRITTEN AUTHORIZATION FROM T.G.C.'S ENVIRONMENTAL INSPECTOR.
2. CONTRACTOR SHALL REFER TO THE "ENGINEERING STANDARDS AND SUPPLEMENTS" AS PROVIDED AS PART OF THIS CONTRACT FOR TYPICAL CONSTRUCTION REQUIREMENTS.

CONSTRUCTION WILL BE PERFORMED IN ACCORDANCE WITH T.G.C.'S PLAN AND PROCEDURES.

GEOTECHNICAL NOTES:

1. GEOTECHNICAL DATA TO BE PROVIDED SEPARATELY.

TOPOGRAPHIC SURVEY NOTES:

1. NO TOPOGRAPHIC SURVEY DATA OBTAINED.
2. RIVER PROFILE AND GRADE IN THE VICINITY OF THE RIVER FURNISHED BY TRUNKLINE PER PLAN AND PROFILE DRAWING NUMBER OL-200-1-203-A2 ORIGINAL ISSUE DATED 11-25-57.

DRILLED PATH NOTES:

1. DRILLED PATH STATIONING IS IN FEET BY HORIZONTAL MEASUREMENT AND IS REFERENCED TO CONTROL ESTABLISHED FOR THE DRILLED SEGMENT.
2. DRILLED PATH COORDINATES REFER TO CENTERLINE OF PIPE.

PILOT HOLE TOLERANCES:

1. THE PILOT HOLE SHALL BE DRILLED TO THE TOLERANCES LISTED BELOW. HOWEVER, IN ALL CASES, RIGHT-OF-WAY RESTRICTIONS AND CONCERN FOR ADJACENT UTILITIES SHALL TAKE PRECEDENCE OVER THESE TOLERANCES.
2. ELEVATION – PLUS 0 FEET, MINUS 10 FEET.
3. ALIGNMENT – PLUS OR MINUS 5 FEET.
4. ENTRY POINT – AT THE STAKED LOCATION.
5. EXIT POINT – PLUS OR MINUS 2 FEET IN ALIGNMENT. PLUS 10 FEET AND MINUS 0 FEET IN LENGTH.
6. CURVE RADIUS – NO LESS THAN 2,400 FEET.

PROTECTION OF UNDERGROUND FACILITIES:

CONTRACTOR SHALL UNDERTAKE THE FOLLOWING STEPS PRIOR TO COMMENCING DRILLING OPERATIONS.

1. CONTACT THE UTILITY LOCATION/NOTIFICATION SERVICE FOR THE CONSTRUCTION AREA.
2. POSITIVELY LOCATE AND STAKE ALL EXISTING UNDERGROUND FACILITIES. ANY FACILITIES LOCATED WITHIN 10 FEET OF THE DESIGNED DRILLED PATH SHALL BE EXPOSED.
3. MODIFY DRILLING PRACTICES AND DOWNHOLE ASSEMBLIES AS NECESSARY TO PREVENT DAMAGE TO EXISTING FACILITIES.

100 50 0 100 200
SCALE: 1"=100'

WoodGroupMustang, Inc.
PROJECT NO: 100089

DWG. NO.	REFERENCE DRAWING TITLE	NO.	REVISION – DESCRIPTION	BY	DATE	CHK'D	APP'D
		A	ISSUED FOR FERC APPLICATION	JM	03/20/14	MEH	JWV

DWG. STATUS	CHECKED BY	CHECKED DATE	APPROVED BY	APPROVED DATE	BY	DATE
PREL'Y						
BID						
CONSTR.						
CADDS	PLOT DATE: ----					
	FILE NAME: 100089-F-1700					

P.L./STA. NO. ACCOUNT NO.		
CONSTRUCTION YEAR		2017
	BY	DATE
DESIGN	JWV	02/17/14
DRAWN	JM	02/17/14
ASBUILT		
FILE NO.		
SCALE: AS SHOWN		

TRUNKLINE GAS
An ENERGY TRANSFER Company
HOUSTON, TEXAS

24" MAIN LINE REPLACEMENT
LIQUEFACTION PROJECT
CALCASIEU BAYOU CROSSING PLAN AND PROFILE
HORIZONTAL DIRECTIONAL DRILL
CALCASIEU PARISH, LOUISIANA

PROJECT NO.
W.O. 200-1
PREVIOUS DWG. NO.
SHEET 1 OF 1
DWG. NO.
P4-1
SHEET 1 OF 1
A

P:\100089 - Trunkline - Field Zone Liquefaction\4.0 - DRAWINGS (MAPPING)\HDD\200-1 P4-1.dwg (1) Plotted on: Mar 24, 2014 - 11:33am by j1mcfal

HORIZONTAL DIRECTIONAL DRILL CONTINGENCY PLAN

TRUNKLINE GAS COMPANY, LLC
Lake Charles Liquefaction Project

1.0 INTRODUCTION

For the Federal Energy Regulatory Commission (FERC) regulated Trunkline Gas Company (TGC) Lake Charles Liquefaction Project (Project), portions of the pipeline will be installed using horizontal directional drilling method (HDD). This directional drill contingency plan provides specific procedures and steps to detect and respond to any inadvertent release of drilling fluids for the above-described canal crossings.

Elements of this plan include:

- Preparation;
- Monitoring Procedures;
- Notification Procedures;
- Corrective Action and Cleanup; and
- Abandonment.

2.0 PREPARATION

An Environmental Inspector will be employed throughout construction and restoration of this Project. All work will be performed in compliance with environmental permits, laws, and regulations. Construction personnel will be provided environmental training prior to commencing work, and the Contractors will be provided a Project specific Environmental Clearance Package including copies of all environmental permits secured for the Project in advance of commencing activities.

Best management practices employed during this Project will meet or exceed the measures outlined in the FERC's Upland Erosion Control, Revegetation and Maintenance Plan as well as the Wetland and Waterbody Construction and Mitigation Procedures (copies provided in Project Environmental Clearance Package). This includes the use of erosion control devices and turbidity control measures to protect sensitive resources (e.g. wetlands and waterbodies). Furthermore, containment equipment including earth-moving equipment, portable pumps, hand tools, sand, hay bales, silt fencing, turbidity screens, and/or lumber will be readily available at the Project site in the event of a frac-out and vac truck will be employed as necessary.

3.0 MONITORING PROCEDURES

The Environmental Inspector and construction personnel will monitor operations during drilling activities. Monitoring will include:

- Inspection along the drill path, including surface waters along the path for evidence of a release.
- Continuous examination of drilling fluid pressures and return flows.
- The drilling operator will provide information regarding drilling conditions to the

Environmental Inspector and Chief Inspector during the course of drilling activities.

- Monitoring will be documented by the Environmental Inspector. TGC will keep photographs of release events on record.

4.0 NOTIFICATION PROCEDURES

If an inadvertent release is discovered, steps will be taken by construction personnel to contain the release as described below in the Corrective Action and Cleanup Section below (Section 5.0).

If monitoring indicates an in-stream or wetland release has occurred, the Environmental Inspector(s) will immediately notify TGC's construction management and environmental management personnel. The drilling crew will take immediate corrective action to contain the release and to prevent or minimize impacts. TGC will notify the U.S. Army Corps of Engineers (USACE), and County Environmental Department as soon as possible (within 24 hours), and provide details of the nature of the release and corrective actions being taken, completed, and/or planned. TGC will work with the respective agencies regarding additional measures that may be warranted. If it is determined that the release cannot be remedied without causing additional negative environmental impacts, TGC will request that drilling operations continue.

5.0 CORRECTIVE ACTION AND CLEANUP

By monitoring drilling operations continuously, TGC intends to correct problems before they occur. However, if a release does occur, the following measures will be implemented to stop or minimize the release and to clean it up:

- The drilling contractor will decide what modifications to make to the drilling technique or composition of drilling fluid (i.e., thickening of fluid by increasing bentonite content) to reduce or stop minor losses of drilling fluid.
- If a minor bore path void is encountered during drilling, making a slight change in the direction of the bore path may avoid loss of circulation.
- If the borehead becomes lodged resulting in loss of drilling pressure, the borehole may be sized by moving the borehead back and forth to dislodge the stuck materials.
- If public health and safety are threatened, drilling fluid circulation pumps will be turned off. This measure will be taken as a last resort because of the potential for drill hole collapse resulting from loss of down-hole pressure.

Land Release:

- If a land release is detected, the drilling crew will take immediate corrective action to contain the release and to prevent or minimize migration off site.
- Steps will be taken (such as installing berms, silt fence and/or hay bales) to prevent silt-laden water from flowing into protected resources.
- The contractor will construct pits and/or berms around the frac-out point to contain inadvertent releases onto the ground.
- Vacuum trucks may be called in as necessary to assist in the removal of released material.

- If the amount of an on-land release does not allow practical collection, the affected area will be diluted with fresh water and allowed to dry.
- If hand tools cannot contain a small on-land release, small collection sumps (less than 5 cubic yards) may be constructed to pump the release material into the mud-processing system.
- Once the release is contained and materials are removed, it will be disposed of properly.

Wetland or Waterbody Release:

- If a release occurs within a waterbody, USACE will be contacted as soon as possible (within 24 hours) by TGC. TGC will inform USACE about any threat to public health and safety and explain whether or not the release can be corrected without incurring additional environment impact. If necessary, drilling operations will be reduced or suspended to assess the extent of the release and to implement corrective actions.
    - Temporary dams (e.g. sand bags) may be installed to isolate the fluid from a frac-within a protected feature.
    - Vacuum trucks will be called in as necessary to assist in timely, effective removal of released drilling mud.
    - Once the release is contained and materials are removed, it will be properly disposed of.

6.0 ABANDONMENT

If corrective actions do not prevent or control releases from occurring into a protected feature, TGC may opt to re-drill the hole along a different alignment within their easement rights or suspend the installation altogether. Other issues may require abandoning the hole, such as refusal or misalignment. In any case, the following procedures will be implemented to abandon the drill hole:

- The method for sealing the abandoned drill hole is to pump thickened drilling fluid into the hole as the drill assembly is extracted and using cement grout to make a cap.
- Closer to the surface (within approximately 10 feet of the surface), a soil cap will be installed by filling with soil extracted during construction of the pit and berms.
- The borehole entry location will be graded and seeded by the contractor to its original grade and condition after the drill hole has been abandoned.

APPENDIX E

UNANTICIPATED DISCOVERY
PLAN FOR CONTAMINATED SOILS OR GROUNDWATER

Unanticipated Discovery
Plan for Contaminated Soils or Groundwater

The environmental inspectors and construction contractor personnel will be adequately trained on identification of contaminated soils and/or groundwater during construction. Indicators of possible contamination include:

- Rusted (or otherwise poor condition) drums or containers
- Stained or otherwise discolored soil (in contrast to adjoining materials)
- Spoil material containing debris other than obvious construction material
- Chemical or hydrocarbon odors emanating from excavations
- Oily residues
- Visible sheen or other discoloration on groundwater
- Structures such as pipelines (concrete, PVC or steel) or underground storage tanks.

The EI and appropriate contractor personnel will be trained in hazard identification and worker protection and these topics will be discussed regularly in safety meetings. Thorough pre-construction inspections shall be conducted prior to beginning work in each area of the project. The following activities will be implemented in the event that suspected contamination is encountered:

- Immediately cease construction activities within that area and notify the Environmental Inspector and Project Environmental Manager.
- Upon notification, the Project Environmental Manager will perform a hazard assessment to determine appropriate control measures to be implemented at the specific site. If warranted by the assessment, the Project Environmental Manager will notify all appropriate Federal, State and Local agencies.
- The Contractor will ensure that potentially contaminated groundwater or soils are contained to minimize the spread of further contamination and to prevent the contamination from reaching wetlands or waterbodies.
- If potentially contaminated groundwater or soil reaches (or has potential to reach) surface waters, booms and/or absorbent materials shall be immediately deployed to contain and reduce downstream migration of the spilled material. If conditions are warranted, the response contractor as specified in the project SPCC plan shall be mobilized to assist in the response. Trunkline has developed a Spill Prevention and Response Plan for use by its contractors in developing project specific Spill Prevention, Control, and Countermeasures Plans (SPCCP). These SPCCPs will be filed with the FERC prior to construction.

- The applicable regulatory agencies shall be consulted to develop a site specific plan for removal and disposal or treatment of the contaminated area. All identification/characterization, handling, labeling, storage, manifesting, transportation, record keeping, and disposal of potentially contaminated materials shall be conducted in accordance with all applicable federal, state, and local regulations and guidance.

APPENDIX F

WATERBODIES POTENTIALLY AFFECTED BY THE LAKE CHARLES LIQUEFACTION PROJECT

APPENDIX F

TABLE F-1

Waterbodies Potentially Affected by the Liquefaction Facility Associated With the Lake Charles Liquefaction Project

Waterbody Name	Waterbody Unique ID	Waterbody Type	Affected Area	Waterbody Classifications [a]	Impact Profile
LNG Terminal					
Industrial Canal/Turning Basin	Not applicable	Open water	22.1 acres	ABCF [b,c]	Dredge and construction of in-water structures
Liquefaction Facility					
Unnamed stream	S103	Perennial	4,824.3 feet	ABCF	Armor and realign
Unnamed stream	S108	Intermittent	443.9 feet	ABCF	Fill
Unnamed stream	S120	Intermittent	513.7 feet	ABCF	Fill
Unnamed pond	WB115	Open water	1.2 acres	ABCF	Fill
Unnamed drainage	D100	Road drainage	224.2 feet	NA	Fill
Unnamed drainage	D101	Road drainage	3,008.0 feet	NA	Fill
Unnamed drainage	D102	Road drainage	717.3 feet	NA	Fill
Unnamed drainage	D103	Road drainage	3,636.8 feet	NA	Fill
Unnamed drainage	D104	Road drainage	103.1 feet	NA	Fill
Unnamed drainage	D105	Road drainage	1,542.1 feet	NA	Fill
Unnamed drainage	D112	Road drainage	787.8 feet	NA	Fill
Unnamed drainage	D113	Road drainage	2,529.4 feet	NA	Fill
Unnamed drainage	D116	Road drainage	436.4 feet	NA	Fill
Unnamed drainage	D117	Road drainage	234.3 feet	NA	Fill
Unnamed drainage	D118	Road drainage	285.4 feet	NA	Fill
TOTAL – INTERMITTENT			**957.6 feet**		
TOTAL – PERENNIAL			**4,824.3 feet**		
TOTAL – DRAINAGE			**13,504.6 feet**		
TOTAL – OPEN WATER			**23.3 acres**		

[a] Louisiana State Water Quality Classifications (Louisiana Department of Environmental Quality):
A = Primary Contact Recreation
B = Secondary Contact Recreation
C = Propagation of Fish and Wildlife
F = Agriculture

[b] Designated as a section 10 waterbody under the Rivers and Harbors Act.

[c] Designated as an impaired waterbody on the State of Louisiana's 2012 Clean Water Act §303(d) List.

NA These waterbodies have not been designated as streams.

TABLE F-2

Waterbodies Potentially Affected by the Non-Liquefaction Facilities Associated With the Lake Charles Liquefaction Project

Waterbody Name	Waterbody Unique ID	Milepost	Stream Type	Crossing Width (feet)	Water Quality Classification [a]	Crossing Method
NEW PIPELINES						
Mainline Connector						
Unnamed agricultural canal	WB-C-162	0.3	Agricultural ditch	25	ABCF	Open-cut
Unnamed agricultural canal	D-T-120	0.6	Agricultural ditch	10	ABCF	Open-cut
Unnamed drainage	D-T-119	0.6	Drainage canal	5	NA [c]	Open-cut
Unnamed drainage	D-T-118	0.6	Drainage canal	5	NA [c]	Open-cut
Unnamed tributary to Arceneaux Bayou	S-T-115	1.2	Perennial	40	ABCF	HDD
Arceneaux Bayou	S-T-117	1.2	Perennial	80	ABCF	HDD
Unnamed tributary to Arceneaux Bayou	S-B-139	1.7	Intermittent	30	ABCF	HDD
Unnamed agricultural canal	WB-C-140	1.9	Agricultural ditch	30	ABCF	Open-cut
Unnamed agricultural canal	WB-C-139	2.3	Agricultural ditch	30	ABCF	Open-cut
Unnamed agricultural canal	WB-C-136	2.5	Agricultural ditch	45	ABCF	Open-cut
Unnamed drainage	D-C-135	2.5	Drainage canal	5	NA [c]	Open-cut
Unnamed tributary to Arceneaux Bayou	S-C-138	2.5	Ephemeral	1	ABCF	Open-cut
Unnamed tributary to Arceneaux Bayou	S-C-134	2.8	Ephemeral	1.5	ABCF	Open-cut
Unnamed pond	WB-C-133	2.8	Pond	150	ABCF	Open-cut
Unnamed drainage	D-C-132	2.8	Drainage canal	5	NA [c]	Open-cut
Unnamed drainage	D-C-131	2.9	Drainage canal	5	NA [c]	Open-cut
Unnamed pond	WB-D-114	3.1	Pond	30	ABCF	Open-cut
Unnamed tributary to Arceneaux Bayou	S-D-109	3.1	Intermittent	40	ABCF	Open-cut
Unnamed pond	WB-D-110	3.2	Pond	55	ABCF	Open-cut
Unnamed stream	S-D-105	3.2	Intermittent	14	ABCF	Open-cut
Unnamed drainage	D-D-102	3.6	Drainage canal	5	NA [c]	Open-cut
Unnamed drainage	D-D-100	3.6	Drainage canal	5	NA [c]	Open-cut
Unnamed drainage	D-T-123	3.7	Drainage canal	5	NA [c]	Open-cut
Unnamed drainage	D-B-145	4.3	Drainage canal	5	NA [c]	Open-cut
Unnamed drainage	D-B-146	4.4	Drainage canal	5	NA [c]	Open-cut
Unnamed tributary to Little Bayou	S-B-117	5.0	Perennial	15	ABCF	Open-cut
Unnamed tributary to Little Bayou	S-B-116	5.1	Intermittent	15	ABCF	Open-cut
Unnamed tributary to Little Bayou	S-B-119	5.7	Intermittent	8	ABCF	HDD
Little Bayou	S-B-109	5.9	Perennial	150	ABCF	HDD
Unnamed tributary to Little Bayou	S-B-108B	5.9	Intermittent	30	ABCF	HDD

TABLE F-2 (cont'd)

Waterbodies Potentially Affected by the Non-Liquefaction Facilities Associated With the Lake Charles Liquefaction Project

Waterbody Name	Waterbody Unique ID	Milepost	Stream Type	Crossing Width (feet)	Water Quality Classification [a]	Crossing Method
Unnamed tributary to Little Bayou	S-B-106	6.0	Intermittent	15	ABCF	HDD
Unnamed tributary to Little Bayou	S-B-105	6.1	Intermittent	6	ABCF	HDD
Unnamed drainage	D-B-100	7.2	Drainage canal	5	NA [c]	Open-cut
Unnamed drainage	D-C-109	7.2	Drainage canal	5	NA [c]	Open-cut
Unnamed drainage	D-C-110	7.2	Drainage canal	5	NA [c]	Open-cut
Unnamed tributary to Serpent Bayou	S-C-125	8.2	Ephemeral	4	ABCF	Open-cut
Unnamed tributary to Serpent Bayou	S-C-119	8.2	Ephemeral	7	ABCF	Open-cut
Unnamed pond	WB-C-118	8.3	Pond	40	ABCF	Open-cut
Unnamed tributary to Serpent Bayou	S-C-124	8.3	Ephemeral	2	ABCF	Open-cut
Unnamed tributary to Serpent Bayou	S-C-123	8.3	Ephemeral	2	ABCF	Open-cut
Unnamed tributary to Serpent Bayou	S-C-122	8.3	Ephemeral	3	ABCF	Open-cut
Unnamed tributary to Serpent Bayou	S-C-126	8.3	Perennial	8	ABCF	Open-cut
Unnamed drainage	D-C-201	9.2	Drainage canal	5	NA [c]	HDD
Serpent Bayou	S-T-110	9.5	Perennial	150	ABCF	HDD
Unnamed drainage	D-T-107	10.1	Drainage canal	2	NA [c]	Open-cut
Unnamed drainage	D-T-108	10.1	Drainage canal	2	NA [c]	Open-cut
Unnamed drainage	D-T-108	10.3	Drainage canal	2	NA [c]	Open-cut
Unnamed drainage	D-T-107	10.3	Drainage canal	2	NA [c]	Open-cut
Unnamed tributary to Serpent Bayou	S-T-103	10.5	Perennial	10	ABCF	Open-cut
Unnamed tributary to Serpent Bayou	S-C-102	10.5	Intermittent	5	ABCF	Open-cut
Unnamed drainage	D-C-101	10.8	Drainage canal	1	NA [c]	Open-cut
Unnamed drainage	D-T-101	10.8	Drainage canal	5	NA [c]	Open-cut
Unnamed drainage	D-C-100	11.3	Drainage canal	5	NA [c]	Open-cut
Unnamed drainage	D-C-155	11.4	Drainage canal	3	NA [c]	Open-cut
Unnamed drainage	D-T-107	11.4	Drainage canal	2	NA [c]	Open-cut
Unnamed drainage	D-C-153	11.4	Drainage canal	3	NA [c]	Open-cut
Mainline 200-3 Loop						
Unnamed tributary to East Bayou Lacassine	S-B-204	176.0	Intermittent	20	ABCF	Open-cut
East Bayou Lacassine	S-A-100	176.5	Perennial	135	ABCF [d]	HDD
Unnamed drainage	D-T-120	176.9	Drainage canal	5	NA [c]	HDD
Unnamed drainage	D-T-119	176.9	Drainage canal	5	NA [c]	HDD
Unnamed drainage	D-T-118	177.1	Drainage canal	5	NA [c]	HDD

TABLE F-2 (cont'd)

Waterbodies Potentially Affected by the Non-Liquefaction Facilities Associated With the Lake Charles Liquefaction Project

Waterbody Name	Waterbody Unique ID	Milepost	Stream Type	Crossing Width (feet)	Water Quality Classification [a]	Crossing Method
Unnamed drainage	D-C-111	177.3	Drainage canal	5	NA [c]	Open-cut
Unnamed drainage	D-C-112	177.3	Drainage canal	3	NA [c]	Open-cut
Unnamed drainage	D-C-113	177.3	Drainage canal	3	NA [c]	Open-cut
Unnamed drainage	D-C-114	177.4	Drainage canal	3	NA [c]	Open-cut
Unnamed drainage	D-C-115	177.4	Drainage canal	3	NA [c]	Open-cut
Unnamed drainage	D-B-100	178.5	Drainage canal	2	NA [c]	HDD
Unnamed drainage	D-T-116	178.5	Drainage canal	3	NA [c]	HDD
Unnamed drainage	D-C-117	178.6	Drainage canal	3	NA [c]	HDD
Indian Bayou Canal	S-C-116	178.6	Perennial	70	ABCF	HDD
Unnamed drainage	D-T-114	178.7	Drainage canal	3	NA [c]	HDD
Unnamed drainage	D-T-113	178.7	Drainage canal	3	NA [c]	HDD
Unnamed drainage	D-T-111	179.0	Drainage canal	3	NA [c]	Open-cut
Unnamed drainage	D-T-109	179.0	Drainage canal	3	NA [c]	Open-cut
Unnamed drainage	D-T-109	179.0	Drainage canal	3	NA [c]	Open-cut
Unnamed drainage	D-T-109	179.1	Drainage canal	3	NA [c]	Open-cut
Unnamed drainage	D-T-108	179.4	Drainage canal	3	NA [c]	Open-cut
Unnamed drainage	D-T-107	179.5	Drainage canal	3	NA [c]	Open-cut
Unnamed tributary to West Bayou Lacassine	S-T-106	179.8	Perennial	20	ABCF	Open-cut
Unnamed drainage	D-T-105	179.9	Drainage canal	3	NA [c]	Open-cut
Unnamed tributary to West Bayou Lacassine	S-C-104	180.1	Perennial	8	ABCF	Open-cut
Unnamed drainage	D-C-105	180.3	Drainage canal	2	NA [c]	Open-cut
Unnamed drainage	D-C-106	180.4	Drainage canal	2	NA [c]	Open-cut
Unnamed drainage	D-C-107	180.6	Drainage canal	3	NA [c]	Open-cut
Unnamed drainage	D-C-108	180.9	Drainage canal	3	NA [c]	Open-cut
Unnamed drainage	D-C-109	181.3	Drainage canal	2	NA [c]	Open-cut
Unnamed drainage	D-C-110	181.3	Drainage canal	2	NA [c]	Open-cut
Unnamed drainage	D-C-126	181.6	Drainage canal	3	NA [c]	Open-cut

TABLE F-2 (cont'd)

Waterbodies Potentially Affected by the Non-Liquefaction Facilities Associated With the Lake Charles Liquefaction Project

Waterbody Name	Waterbody Unique ID	Milepost	Stream Type	Crossing Width (feet)	Water Quality Classification [a]	Crossing Method
Unnamed tributary to West Bayou Lacassine	S-T-104	181.7	Perennial	8	ABCF	Open-cut
Unnamed drainage	D-T-102	182.1	Drainage canal	3	NA [c]	Open-cut
Unnamed drainage	D-C-102	182.1	Drainage canal	3	NA [c]	Open-cut
Mainline 200-1 Modifications						
Calcasieu River	NHD-1	194.7	Perennial	325	ABCFG [b,d,f]	HDD
Unnamed stream	WB-C-CA-621	194.8	Perennial	1,060	NA [c]	HDD
Unnamed stream	WB-C-CA-621	194.8	Perennial	4,585	NA [c]	Matted [e]
Unnamed stream	WB-C-CA-621	195.7	Perennial	64	NA [c]	Matted [e]
Unnamed stream	S-B-CA-604	195.9	Ephemeral	112	NA [c]	Matted [e]
Unknown	None	195.7	Perennial	8	NA [c]	Matted [e]
Marsh Bayou	None	Access Road	Perennial	31	ABC	Matted [e]
ABOVEGROUND FACILITIES						
Compressor Station 203-A						
Unnamed stream	WB-C-167		Intermittent	10	ABCF	Open-cut
Unnamed agricultural canal	D-C-166		Agricultural ditch	660	NA [c]	Fill
Unnamed drainage	D-T-122		Drainage canal	5	NA [c]	Open-cut
Unnamed drainage	D-C-170		Drainage canal	2	NA [c]	Open-cut
Unnamed drainage	D-C-171		Drainage canal	2	NA [c]	Open-cut
Columbia Gulf Egan Meter Station						
Unnamed tributary to Bayou Plaquemine Brule	S-AV-030		Intermittent	8	ABCF	Matted [e]
Unnamed drainage	D-D-118		Drainage canal	-	NA [c]	Matted [e]
Unnamed drainage	None		Drainage canal	-	NA [c]	Matted [e]

[a] Louisiana State Water Quality Classifications (Louisiana Department of Environmental Quality):
A = Primary Contact Recreation
B = Secondary Contact Recreation
C = Propagation of Fish and Wildlife
D = Drinking Supply
E = Oyster Propagation
F = Agriculture
G = Outstanding Natural Resource Waters

[b] Designated as a section 10 waterbody under the Rivers and Harbors Act.

[c] NA = Waterbody has not been designated as a stream by the State of Louisiana.

[d] Designated as an impaired waterbody on the State of Louisiana's 2012 Clean Water Act §303(d) List.

[e] Matted = Waterbody would be matted over during construction activities. In-water pipe installation is not proposed.

[f] Designated as a Louisiana Natural and Scenic River by the Louisiana Department of Wildlife and Fisheries.

APPENDIX G

WETLANDS AFFECTED BY THE LAKE CHARLES LIQUEFACTION PROJECT

APPENDIX G

TABLE G-1

Wetlands Affected by the Lake Charles Liquefaction Project

Milepost/ Facility	Wetland ID Number	Wetland Type [a]	Length Crossed (feet)	Construction Impact (acres) [b]	Operation Impact (acres)	Impact Type	PFO Conversion (acres)[c]
LIQUEFACTION FACILITY							
NA	Mosaic 1	Mosaic (PFO)	–	42.37	42.37	Fill	–
NA	Mosaic 2	Mosaic (PFO)	–	9.58	9.58	Fill	–
NA	W105	PEM	–	0.32	0.32	Fill	–
NA	W106	PFO	–	1.75	1.75	Fill	–
NA	W107	PEM	–	2.25	2.25	Fill	–
NA	W109	PFO	–	0.05	0.05	Fill	–
NA	W110	PEM	–	0.05	0.05	Fill	–
NA	W114	PEM	–	5.38	5.38	Fill	–
NA	W115	PSS	–	2.00	2.00	Fill	–
NA	WM-1	PFO	–	1.74	1.74	Fill	–
NA	WM-2	PFO	–	2.23	2.23	Fill	–
NA	WM-3	PFO	–	1.01	1.01	Fill	–
NA	WM-4	PFO	–	3.82	3.82	Fill	–
NA	WM-5	PFO	–	1.54	1.54	Fill	–
NA	WM-6	PFO	–	1.76	1.76	Fill	–
NA	WM-7	PFO	–	0.73	0.73	Fill	–
NA	WM-8	PSS	–	2.07	2.07	Fill	–
NA	WM-9	PFO	–	1.93	1.93	Fill	–
NA	WM-10	PFO	–	4.16	4.16	Fill	–
NA	WM-11	PSS	–	19.54	19.54	Fill	–
NA	WM-12	PFO	–	0.99	0.99	Fill	–
	Liquefaction Facility Subtotal		**-**	**105.27**	**105.27**	**Fill**	**-**
		PEM	**–**	**8.00**	**8.00**	**Fill**	**–**
		PFO	**–**	**21.71**	**21.71**	**Fill**	**–**
		PSS	**–**	**23.61**	**23.61**	**Fill**	**–**
		Mosaic (PFO)	**–**	**51.95**	**51.95**	**Fill**	**–**
ADDITIONAL CONSTRUCTION WORKSPACES (ACW)							
ACW A	W-B-803	PEM	–	2.58	2.58	Fill	–
	W-B-802	PSS	–	1.49	1.49	Fill	–
	WA-808	PSS	–	2.36	2.36	Fill	–
	Mosaic 4	Mosaic (PFO)	–	69.50	69.50	Fill	–
ACW B	W-AV-054	PEM	–	0.01	0.01	Fill	–
	W-AV-055	PEM	–	0.54	0.54	Fill	–
	W-AV-047	PSS	–	4.90	4.90	Fill	–
	Mosaic-MV-7	Mosaic (PEM)	–	7.88	7.88	Fill	–
	Mosaic-MV-8	Mosaic (PFO)	–	2.15	2.15	Fill	–
ACW C	Mosaic-MV-9	Mosaic (PEM)	–	1.72	1.72	Fill	–
	Mosaic-MV-10	Mosaic (PSS)	–	1.91	1.91	Fill	–
	Mosaic-MV-11	Mosaic (PFO)	–	0.68	0.68	Fill	–

TABLE G-1 (cont'd)

Wetlands Affected by the Lake Charles Liquefaction Project

Milepost/ Facility	Wetland ID Number	Wetland Type [a]	Length Crossed (feet)	Construction Impact (acres) [b]	Operation Impact (acres)	Impact Type	PFO Conversion (acres)[c]
ACW D	Mosaic-MV-13	Mosaic (PSS)	–	1.91	1.91	Fill	–
	Mosaic-MV-14	Mosaic (PFO)	–	12.52	12.52	Fill	–
		ACW Subtotal	**–**	**110.15**	**110.15**	**Fill**	**–**
		PEM	**–**	**3.13**	**3.13**	**Fill**	**–**
		PFO	**–**	**0.00**	**0.00**	**Fill**	**–**
		PSS	**–**	**8.75**	**8.75**	**Fill**	**–**
		Mosaic (PEM)	**–**	**9.60**	**9.60**	**Fill**	**–**
		Mosaic (PFO)	**–**	**84.85**	**84.85**	**Fill**	**–**
		Mosaic (PSS)	**–**	**3.82**	**3.82**	**Fill**	**–**
PIPELINES							
Mainline 200-3 Loop							
176.0	W-B-200A	PEM	2	1.09	0.08	Temp	0.00
176.1	W-B-200C	PFO	1,280	0.37	0.03	Temp	0.01
182.1	W-C-100	PSS	1,673	3.92	1.92	Temp	0.00
182.4	W-AV-131	PSS	0	0.00	0.00	Temp	0.00
182.4	W-AV-132	PSS	0	0.01	0.00	Temp	0.00
182.5	W-AV-133	PSS	181	0.33	0.19	Temp	0.00
		Mainline 200-3 Loop Subtotal	**3,137**	**5.72**	**2.22**	**Temp**	**0.01**
		PEM	**2**	**1.09**	**0.08**	**Temp**	**0.00**
		PFO	**1,280**	**0.37**	**0.03**	**Temp**	**0.01**
		PSS	**1,854**	**4.26**	**2.11**	**Temp**	**0.00**
Mainline Connector							
2.6	W-C-137	PSS	1,219	3.12	1.40	Temp	0.00
3.4	W-AT-11	PEM	173	0.41	0.20	Temp	0.00
3.6	W-AT-12	PSS	147	0.51	0.19	Temp	0.00
3.7	W-AT-10	PSS	0	0.25	0.00	Temp	0.00
4.2	W-AT-7	PEM	835	1.96	0.97	Temp	0.00
5.1	W-AT-6	PFO	305	0.74	0.34	Temp	0.21
5.9	W-B-120	PFO	0	0.25	0.00	Temp	0.00
5.9	W-B-121	PSS	0	0.31	0.00	Temp	0.00
5.9	W-B-122	PFO	0	0.11	0.00	Temp	0.00
5.9	W-B-123	PSS	0	0.01	0.00	Temp	0.00
6.3	W-AT-15	PFO	64	0.17	0.08	Temp	0.04
8.3	W-C-121	PFO	188	0.41	0.21	Temp	0.13
10.5	W-AT-3	PSS	367	1.12	0.43	Temp	0.00
11.0	W-C-148	PEM	0	0.05	0.00	Temp	0.00
11.0	W-C-149	PEM	0	0.14	0.00	Temp	0.00
11.4	W-D-125	PEM	0	2.04	0.00	Temp	0.00
		Mainline Connector Subtotal	**3,297**	**11.62**	**3.82**	**Temp**	**0.38**
		PEM	**1,008**	**4.61**	**1.17**	**Temp**	**0.00**
		PFO	**556**	**1.68**	**0.63**	**Temp**	**0.38**
		PSS	**1,733**	**5.33**	**2.02**	**Temp**	**0.00**

TABLE G-1 (cont'd)

Wetlands Affected by the Lake Charles Liquefaction Project

Milepost/ Facility	Wetland ID Number	Wetland Type [a]	Length Crossed (feet)	Construction Impact (acres) [b]	Operation Impact (acres)	Impact Type	PFO Conversion (acres)[c]
Mainline 200-1 Modifications- Calcasieu River HDD							
194.1	W-B-CA-624	PEM	189	0.59	0.00	Temp	0.00
194.2	W-B-CA-623	PEM	239	0.70	0.00	Temp	0.00
194.3	W-B-CA-622	PEM	797	2.00	0.00	Temp	0.00
194.5	W-B-CA-606	PFO	0	0.16	0.00	Temp	0.00
194.5	W-B-CA-605	PEM	1,645	3.89	0.00	Temp	0.00
194.7	W-B-CA-607	PSS	0	0.06	0.00	Temp	0.00
195.6	W-E-005	PFO	0	0.64	0.00	Temp	0.00
195.7	W-E-004	PFO	0	0.07	0.00	Temp	0.00
195.7	W-E-001	PEM	3,158	10.98	0.00	Temp	0.00
196.1	W-E-003	PFO	0	0.02	0.00	Temp	0.00
197.6	W-B-CA-619	PFO	0	0.01	0.00	Temp	0.00
197.6	W-B-CA-620	PFO	0	0.20	0.00	Temp	0.00
		Mainline 200-1 Subtotal	**6,028**	**19.31**	**0.00**	**Temp**	**0.00**
		PEM	**6,028**	**18.16**	**0.00**	**Temp**	**0.00**
		PFO	**0**	**1.10**	**0.00**	**Temp**	**0.00**
		PSS	**0**	**0.06**	**0.00**	**Temp**	**0.00**
PIPELINE TOTALS			**12,462**	**36.65**	**6.04**	**Temp**	**0.39**
		PEM	**7,038**	**23.86**	**1.25**	**Temp**	**0**
		PFO	**1,836**	**3.15**	**0.66**	**Temp**	**0.39**
		PSS	**3,587**	**9.65**	**4.13**	**Temp**	**0**
METER STATIONS							
Kinder Morgan–Lake Charles							
NA	W-AV-039	PSS	NA	0.18	0.08	Temp and fill	0.00
NA	W-AV-041	PSS	NA	0.21	0.06	Temp and fill	0.00
		Subtotal	**NA**	**0.39**	**0.14**	**Temp and fill**	**0.00**
		PSS	**NA**	**0.39**	**0.14**	**Temp and fill**	**0.00**
Columbia Gulf–Eagan							
NA	W-AV-034	PFO	NA	0.32	0.16	Temp and fill	0.16
		Subtotal	**NA**	**0.32**	**0.16**	**Temp and fill**	**0.16**
		PFO	**NA**	**0.32**	**0.16**	**Temp and fill**	**0.16**
NGPL–Lakeside							
NA	W-C-108A	PEM	NA	0.08	0.08	Fill	0.00
		Subtotal	**NA**	**0.08**	**0.08**	**Fill**	**0.00**
		PEM	**NA**	**0.08**	**0.08**	**Fill**	**0.00**
Gulf Crossing–Perryville							
NA	W-C-172	PEM	NA	0.07	0.00	Temp	0.00
		Subtotal	**NA**	**0.07**	**0.00**	**Temp**	**0.00**
		PEM	**NA**	**0.07**	**0.00**	**Temp**	**0.00**
Texas Gas–Woodlawn							
NA	W-AV-045	PFO	NA	0.04	0.00	Temp	0.00
		Subtotal	**NA**	**0.04**	**0.00**	**Temp**	**0.00**
		PFO	**NA**	**0.04**	**0.00**	**Temp**	**0.00**

TABLE G-1 (cont'd)

Wetlands Affected by the Lake Charles Liquefaction Project

Milepost/ Facility	Wetland ID Number	Wetland Type [a]	Length Crossed (feet)	Construction Impact (acres) [b]	Operation Impact (acres)	Impact Type	PFO Conversion (acres)[c]
Transco Ragley							
NA	W-B-CA-603	PEM	NA	1.25	0.00	Temp	0.00
		Subtotal	**NA**	**1.25**	**0.00**	**Temp**	**0.00**
		PEM	**NA**	**1.25**	**0.00**	**Temp**	**0.00**
METER STATIONS SUBTOTAL			**NA**	**2.15**	**0.38**	**Temp and fill**	**0.16**
		PEM	**NA**	**1.40**	**0.08**	**Temp and fill**	**0.00**
		PFO	**NA**	**0.36**	**0.16**	**Temp and fill**	**0.16**
		PSS	**NA**	**0.39**	**0.14**	**Temp and fill**	**0.00**
PROJECT TOTALS			**12,462**	**254.23**	**221.84**	**Temp and fill**	**0.39**
		PEM	**7,038**	**36.39**	**12.45**	**Temp and fill**	**0.00**
		PFO	**1,836**	**25.22**	**22.53**	**Temp and fill**	**0.39**
		PSS	**3,587**	**42.40**	**36.64**	**Temp and fill**	**0.00**
		Mosaic (PEM)	**0**	**9.60**	**9.60**	**Temp and fill**	**0.00**
		Mosaic (PFO)	**0**	**136.80**	**136.80**	**Temp and fill**	**0.00**
		Mosaic (PSS)	**0**	**3.82**	**3.82**	**Temp and fill**	**0.00**

[a] PEM Palustrine emergent
PFO Palustrine forested
PSS Palustrine scrub-shrub

[b] Construction Impact (acres) includes booth temporary and permanent right-of-way impacts.

[c] PFO Conversion refers to areas within the PFO systems that, during operation, will be maintained as either a PEM or PSS wetland.

NA = Not applicable

APPENDIX H

BIRDS OF CONSERVATION CONCERN LIKELY TO OCCUR IN THE VICINITY OF THE LAKE CHARLES LIQUEFACTION PROJECT

APPENDIX H

TABLE H-1

Birds of Conservation Concern Likely to Occur in the Vicinity of the Lake Charles Liquefaction Project

Common Name	Gulf Coastal Prairie Region 37	West Gulf Coastal Plain/Ouachitas Region 25	Mississippi Alluvial Valley Region 26
Audubon's shearwater	✓		
Band-rumped storm-petrel	✓		
American bittern	✓		✓
Least bittern	✓	✓	✓
Little blue heron		✓	
Reddish egret	✓		
Swallow-tailed kite	✓	✓	✓
Bald eagle	✓	✓	✓
American kestrel		✓	
White-tailed hawk	✓		
Peregrine falcon	✓		✓
Yellow rail	✓	✓	✓
Black rail	✓		✓
Snowy plover	✓		
Wilson's plover	✓		
Mountain plover	✓		
American oystercatcher	✓		
Solitary sandpiper	✓	✓	✓
Lesser yellowlegs	✓		
Upland sandpiper	✓		
Whimbrel	✓		
Long-billed curlew	✓		
Hudsonian godwit	✓	✓	✓
Marbled dodwit	✓		✓
Red knot	✓		
Buff-breasted sandpiper	✓	✓	✓
Chuck-will's-widow		✓	
Red-headed woodpecker		✓	✓
Short-billed dowitcher	✓		✓
Least tern	✓		
Gull-billed tern	✓		
Sandwich tern	✓		
Black skimmer	✓		
Short-eared owl	✓		✓
Loggerhead shrike	✓	✓	
Sedge wren	✓		✓
Brown-headed nuthatch		✓	

TABLE H-1 (cont'd)

Birds of Conservation Concern Likely to Occur in the Vicinity of the Lake Charles Liquefaction Project

Common Name	Gulf Coastal Prairie Region 37	West Gulf Coastal Plain/Ouachitas Region 25	Mississippi Alluvial Valley Region 26
Bewick's wren		✓	
Wood thrush		✓	✓
Sprague's pipit	✓	✓	
Prairie warbler		✓	
Cerulean warbler		✓	✓
Prothonotary warbler	✓	✓	✓
Worm-eating warbler		✓	
Swainson's warbler	✓	✓	✓
Louisiana waterthrush		✓	
Kentucky warbler		✓	✓
Bachman's sparrow		✓	
Botteri's sparrow	✓		
Grasshopper sparrow	✓		
Henslow's sparrow	✓	✓	✓
LeConte's sparrow	✓		✓
Nelson's sharp-tailed sparrow	✓		
Seaside sparrow	✓		
Smith's longspur		✓	
Painted bunting	✓	✓	✓
Orchard oriole		✓	✓
Dickcissel	✓		✓
Rusty blackbird			✓

APPENDIX I

ACCESS ROADS IDENTIFIED FOR THE LAKE CHARLES LIQUEFACTION PROJECT

APPENDIX I

TABLE I-1

Access Roads Identified for the Lake Charles Liquefaction Project

Facility/ Milepost	Road Name	Permanent or Temporary	Length (feet)	Existing Condition	Upgrades or Improvements Needed
Mainline Connector					
1.1	LA-CALC-0011	Temporary	3,003.4	Existing dirt path	Depending on weather and ground conditions, board road, gravel, grading, or side trimming
1.9	LA-JEFW-0001-1AR	Temporary	4,325.2	Existing dirt path	Depending on weather and ground conditions, board road, gravel, grading, or side trimming
3.6	LA-JEFW-006-1AR	Temporary	200.2	Existing dirt path	Depending on weather and ground conditions, board road, gravel, grading, or side trimming
3.7	LA-JEFW-008-3AR	Temporary	22.1	Existing dirt path	Depending on weather and ground conditions, board road, gravel, grading, or side trimming
4.0	LA-JEFW-0008-2AR	Temporary	3,462.9	Existing dirt path	Depending on weather and ground conditions, board road, gravel, grading, or side trimming
4.3	LA-JEFW-0008-1AR	Temporary	2,883.5	Existing dirt path	Depending on weather and ground conditions, board road, gravel, grading, or side trimming
4.7	LA-JEFW-0009-1AR	Temporary	7,829.3	Existing dirt path	Depending on weather and ground conditions, board road, gravel, grading, or side trimming
5.3	LA-JEFW-0012-2AR	Temporary	4,777.0	Existing dirt path	Depending on weather and ground conditions, board road, gravel, grading, or side trimming
5.8	LA-JEFW-0012-1AR	Temporary	8,806.7	Existing dirt path	Depending on weather and ground conditions, board road, gravel, grading, or side trimming
6.5	LA-JEFW-0013-1AR	Temporary	3,590.1	Existing dirt path	Depending on weather and ground conditions, board road, gravel, grading, or side trimming
7.8	LA-JEFW-0015-1AR	Temporary	2,129.7	Existing dirt path	Depending on weather and ground conditions, board road, gravel, grading, or side trimming
8.3	LA-JEFW-0017-1AR	Temporary	4,058.3	Existing dirt path	Depending on weather and ground conditions, board road, gravel, grading, or side trimming
8.7	LA-JEFW-0019-1AR	Temporary	2,550.3	Existing dirt path	Depending on weather and ground conditions, board road, gravel, grading, or side trimming
8.8	LA-JEFW-0019-2AR	Temporary	420.3	Existing dirt path	Depending on weather and ground conditions, board road, gravel, grading, or side trimming
10.1	LA-JEFW-0026-2AR	Temporary	2,716.6	Existing dirt path	Depending on weather and ground conditions, board road, gravel, grading, or side trimming
10.2	LA-JEFW-0026-1AR	Temporary	15,244.6	Existing dirt path	Depending on weather and ground conditions, board road, gravel, grading, or side trimming
11.4	LA-JEFW-0027-1AR	Temporary	6,690.6	Existing dirt path	Depending on weather and ground conditions, board road, gravel, grading, or side trimming

TABLE I-1 (cont'd)

Access Roads Identified for the Lake Charles Liquefaction Project

Facility/ Milepost	Road Name	Permanent or Temporary	Length (feet)	Existing Condition	Upgrades or Improvements Needed
Mainline 200-3 Loop					
176.0	LA-JEFF-0038-1AR	Temporary	340.0	Existing dirt path	Depending on weather and ground conditions, board road, gravel, grading, or side trimming
177.7	LA-CALS-0020-1AR	Temporary	1,251.3	Existing dirt path	Depending on weather and ground conditions, board road, gravel, grading, or side trimming
177.9	LA-CALS-0017-1AR	Temporary	2,028.4	Existing dirt path	Depending on weather and ground conditions, board road, gravel, grading, or side trimming
178.3	LA-CALS-0006-1AR	Temporary	557.8	Existing dirt path	Depending on weather and ground conditions, board road, gravel, grading, or side trimming
178.8	LA-JEFF-033-1AR	Temporary	483.5	Open Land	Depending on weather and ground conditions, board road, gravel, grading, or side trimming
179.4	LA-JEFF-0016-1AR	Temporary	3,299.4	Existing dirt path	Depending on weather and ground conditions, board road, gravel, grading, or side trimming
179.6	LA-JEFF-0015-2AR	Temporary	450.4	Existing dirt path	Depending on weather and ground conditions, board road, gravel, grading, or side trimming
179.7	LA-JEFF-0015-1AR	Temporary	1,528.6	Existing dirt path	Depending on weather and ground conditions, board road, gravel, grading, or side trimming
179.7	LA-JEFF-0016-2AR	Temporary	769.6	Existing dirt path	Depending on weather and ground conditions, board road, gravel, grading, or side trimming
180.9	LA-JEFF-0005-1AR	Temporary	1,666.3	Existing dirt path	Depending on weather and ground conditions, board road, gravel, grading, or side trimming
181.5	LA-JEFF-0003-1AR	Temporary	892.4	Agriculture	Depending on weather and ground conditions, board road, gravel, grading, or side trimming
181.7	LA-JEFF-002-1AR	Temporary	1,729.2	Agriculture	Depending on weather and ground conditions, board road, gravel, grading, or side trimming
Compressor Station					
Compressor Station 203-A					
CS-203-A Access Road		Permanent	1,393.0	Agriculture	Depending on weather and ground conditions, board road, gravel, grading, or side trimming
Meter Stations					
Texas Gas–Woodlawn					
190.3	200-1 AR-5	Temporary	499.3	Existing dirt path	Depending on weather and ground conditions, board road, gravel, grading, or side trimming
Transco Ragley					
203.4	Transco Ragley Access Road	Permanent	151.8	Existing dirt path	Depending on weather and ground conditions, board road, gravel, grading, or side trimming

TABLE I-1 (cont'd)

Access Roads Identified for the Lake Charles Liquefaction Project

Facility/ Milepost	Road Name	Permanent or Temporary	Length (feet)	Existing Condition	Upgrades or Improvements Needed
US 190 Meter					
208.1	US 190 Meter Access Road	Permanent	7.4	Existing dirt path	Depending on weather and ground conditions, board road, gravel, grading, or side trimming
Columbia Gulf–Egan					
156.6	Columbia Gulf-Egan Access Road	Permanent	1,687.0	Open Land	Depending on weather and ground conditions, board road, gravel, grading, or side trimming
Gulf Crossing–Perryville					
164.9	Gulf Crossing Access Road	Permanent	335.0	Existing dirt path	Depending on weather and ground conditions, board road, gravel, grading, or side trimming
MEP–Perryville					
165.9	MEP Access Road	Permanent	1,594.0	Existing dirt path	Depending on weather and ground conditions, board road, gravel, grading, or side trimming
TETCO–Allen					
197.0	TETCO Allen Access Road	Permanent	796.0	Existing dirt path	Depending on weather and ground conditions, board road, gravel, grading, or side trimming
Mainline 200-1 – Modifications					
Calcasieu River HDD					
194.2	Hecker Road #1	Temporary	1,014.9	Existing dirt path	Depending on weather and ground conditions, board road, gravel, grading, or side trimming
194.5	200-1 AR-4	Temporary	1,295.6	Existing dirt path	Depending on weather and ground conditions, board road, gravel, grading, or side trimming
194.7	200-1 AR-3	Temporary	1,454.4	Existing dirt path	Depending on weather and ground conditions, board road, gravel, grading, or side trimming
195.7	Hecker Rd # 2	Temporary	6,394.5	Existing dirt path	Depending on weather and ground conditions, board road, gravel, grading, or side trimming
196.19	200-1 AR-2	Temporary	7,891.0	Existing dirt path	Depending on weather and ground conditions, board road, gravel, grading, or side trimming
196.9	Marsh Bayou Rd # 3	Temporary	3,158.7	Existing dirt path	Depending on weather and ground conditions, board road, gravel, grading, or side trimming
197.6	Marsh Bayou Rd # 1	Temporary	12,622.0	Existing dirt path	Depending on weather and ground conditions, board road, gravel, grading, or side trimming
197.6	Marsh Bayou Rd # 2	Temporary	6,174.8	Existing dirt path	Depending on weather and ground conditions, board road, gravel, grading, or side trimming
		Total Temporary	**128,212.9**		
		Total Permanent	**5,964.2**		
		Grand Total	**134,177.1**		

APPENDIX J

REFERENCES AND CONTACTS

APPENDIX J
REFERENCES AND CONTACTS

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APPENDIX K

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