Federal Energy Regulatory Commission

Office of Energy Projects

August 2019

Sabine Pass LNG, L.P. **Docket No. CP19-11-000**

SPLNG Third Berth Expansion Project Environmental Assessment

Cooperating Agencies:

Washington, DC 20426

FEDERAL ENERGY REGULATORY COMMISSION
WASHINGTON, DC 20426

OFFICE OF ENERGY PROJECTS

In Reply Refer To:
OEP/DG2E/Gas 2
Sabine Pass LNG, L.P.
Docket No. CP19-11-000

TO THE INTERESTED PARTIES:

The staff of the Federal Energy Regulatory Commission (FERC or Commission) has prepared an environmental assessment (EA) for the Third Berth Expansion Project (Project), proposed by Sabine Pass LNG, L.P. (hereby referred to as SPLNG) in the above referenced docket. SPLNG requests authorization to construct and operate a third marine berth at the existing Sabine Pass LNG Terminal in Cameron Parish, Louisiana. The Project would also include the addition of piping, pipe racks, utilities, and other infrastructure necessary to transport liquefied natural gas (LNG) to the third berth.

The EA assesses the potential environmental effects of the construction and operation of the Project in accordance with the requirements of the National Environmental Policy Act (NEPA). The FERC staff concludes that approval of the Project, with appropriate mitigating measures, would not constitute a major federal action significantly affecting the quality of the human environment.

The U.S. Army Corps of Engineers, U.S. Department of Energy, U.S. Department of Transportation, U.S. Coast Guard, U.S. Fish and Wildlife Service, and the Louisiana Department of Wildlife and Fisheries participated as cooperating agencies in the preparation of the EA. Cooperating agencies have jurisdiction by law or special expertise with respect to resources potentially affected by the proposal and participate in the NEPA analysis.

The Project would consist of the following facilities in Cameron Parish, Louisiana:

- a new marine berth to be dredged adjacent and southeast of the two existing marine berths along the Sabine Pass Channel;
- additional two tugs to the existing dedicated tug fleet;
- an LNG loading system consisting of a new platform, LNG loading and cooldown lines, and LNG loading arms (two liquid, one vapor, and one hybrid liquid/vapor);

- two new 30-inch-diameter loading lines are proposed to transfer LNG to the Third Berth loading platform;
- an LNG spill collection system to provide spill protection for the new LNG piping and equipment; and
- appurtenant facilities including, the customs/security building, analyzer shelters, telecommunications systems, digital control systems upgrades, security fencing, cathodic protection systems, elevated fire monitor towers, and gangway with associated gangway hydraulic power unit and local control panel.

The Commission mailed a copy of the *Notice of Availability* to federal, state, and local government representatives and agencies; elected officials; environmental and public interest groups; Native American tribes; potentially affected landowners and other interested individuals and groups; and newspapers and libraries in the Project area. The EA is only available in electronic format. It may be viewed and downloaded from the FERC's website (www.ferc.gov), on the Environmental Documents page (https://www.ferc.gov/industries/gas/enviro/eis.asp). In addition, the EA may be accessed by using the eLibrary link on the FERC's website. Click on the eLibrary link (https://www.ferc.gov/docs-filing/elibrary.asp), click on General Search, and enter the docket number in the "Docket Number" field, excluding the last three digits (i.e. CP19-11). 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, or for TTY, contact (202) 502-8659.

Any person wishing to comment on the EA may do so. Your comments should focus on the EA's disclosure and discussion of potential environmental effects, reasonable alternatives, and measures to avoid or lessen environmental impacts. The more specific your comments, the more useful they would be. To ensure that your comments are properly recorded and considered prior to a Commission decision on the proposal, it is important that the FERC receives your comments in Washington, DC on or before 5:00 pm Eastern Time on **September 23, 2019**.

For your convenience, there are three methods you can use to submit your comments to the Commission. The Commission encourages electronic filing of comments and has staff available to assist you at (866) 208-3676 or FercOnlineSupport@ferc.gov. Please carefully follow these instructions so that your comments are properly recorded.

(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 also file your comments electronically 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." You must select the type of filing you are making. If you are filing a comment on a particular project, please select "Comment on a Filing;" or

(3) You can file a paper copy of your comments by mailing them to the following address. Be sure to reference the project docket number (CP19-11-000) with your submission: Kimberly D. Bose, Secretary, Federal Energy Regulatory Commission, 888 First Street NE, Room 1A, Washington, DC 20426 NE, Room 1A, Washington, DC 20426.

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 (18 CFR 385.214). Motions to intervene are more fully described at http://www.ferc.gov/resources/guides/how-to/intervene.asp. Only intervenors have the right to seek rehearing or judicial review of the Commission's decision. The Commission may grant 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 which 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.**

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. 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, which 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\

Table of Contents

SECTION A – PROPOSED ACTION 1

1.0 INTRODUCTION 1

2.0 PURPOSE AND NEED 3

3.0 SCOPE OF THIS ENVIRONMENTAL ASSESSMENT 3

4.0 COOPERATING AGENCIES 4

4.1 U.S. Army Corps of Engineers 4

4.2 U.S. Department of Energy 5

4.3 U.S. Department of Transportation 5

4.4 U.S. Coast Guard 6

4.5 U.S. Fish and Wildlife Service 6

4.6 Louisiana Department of Wildlife and Fisheries 7

5.0 PUBLIC REVIEW AND COMMENTS 7

6.0 PROPOSED FACILITIES 8

6.1 Marine Facilities 8

6.2 LNG Transfer Lines 11

6.3 LNG Impoundments 11

6.4 Other Terminal Infrastructure 12

6.4.1 Vapor Handling 12

6.4.2 Electrical System 12

6.4.3 Fire and Gas Detection Protection System 12

7.0 NON-JURISDICTIONAL FACILITIES 13

8.0 CONSTRUCTION, OPERATION, AND MAINTENANCE PROCEDURES 13

8.1 Temporary Construction Facilities 14

8.2 Marine Construction 15

8.2.1 Dredging and Dredge Material Placement 16

8.3 Site Access and Traffic 16

8.4 Sanitary Sewer Collection and Disposal 17

8.5 Operation and Maintenance 17

8.5.1 Operation 17

8.5.2 Maintenance 18

9.0 LAND REQUIREMENTS 18

9.1 Access Roads/Staging Areas 20
9.1.1 Access Roads 20
9.1.2 Staging Areas 21
10.0 PERMITS, APPROVALS, AND REGULATORY CONSULTATION 21
SECTION B – ENVIRONMENTAL ANALYSIS 23
1.0 GEOLOGY 23
1.1 Blasting 24
1.2 Mineral Resources 24
1.2.1 Non-Fuel Minerals 24
1.2.2 Oil and Gas 24
1.3 Geologic and Other Natural Hazards 25
1.4 Paleontology 25
2.0 SOILS 25
2.1 Hydric Soils and Compaction 27
2.2 Erosion and Revegetation 28
2.3 Soil Contamination 28
2.4 Conclusion 28
3.0 WATER RESOURCES AND WETLANDS 28
3.1 Groundwater 28
3.2 Surface Water 30
3.2.1 Dredging and Dredge Material Placement 33
3.2.2 Stormwater Runoff 34
3.2.3 Water Use 35
3.2.4 Hydrostatic Testing 36
3.2.5 Vessel Traffic 36
3.2.6 Conclusion 37
3.3 Wetlands 37
4.0 VEGETATION, WILDLIFE, AND THREATENED AND ENDANGERED SPECIES 39
4.1 Vegetation 39
4.2 Wildlife and Aquatic Resources 40
4.2.1 Terrestrial Wildlife 40
4.2.2 Aquatic Resources 42

4.3 Essential Fish Habitat 52
4.4 Migratory Birds 54
4.5 Special Status, Threatened, and Endangered 57
4.5.1 Federally Listed Species 57
4.5.2 State-listed Species 70
4.5.3 Marine Mammals 70
5.0 CULTURAL RESOURCES 73
5.1 Survey Results and Consultation 73
5.2 Unanticipated Discovery Plan 77
5.3 Conclusion 77
6.0 LAND USE, RECREATION, AND VISUAL RESOURCES 78
6.1 Land Use 78
6.2 Existing Residences and Planned Development 81
6.3 Recreation and Special Interest Areas 81
6.4 Contaminated or Hazardous Waste Sites 82
6.5 Coastal Zone Management 82
6.6 Visual Resources 83
7.0 SOCIOECONOMICS 84
7.1 Population, Economy, and Employment 84
7.2 Housing 87
7.2.1 Displacement of Residences and Businesses 88
7.3 Public Services 88
7.4 Transportation and Traffic 89
7.4.1 Land Transportation and Traffic 89
7.4.2 Marine Transportation and Traffic 90
7.5 Property Values 91
7.6 Tax Revenues 91
7.7 Environmental Justice 91
8.0 AIR QUALITY AND NOISE 95
8.1 Air Quality 95
8.1.1 Regional Climate 95
8.1.2 Regulatory Requirements for Air Quality 101

8.1.3 Construction Emissions and Impacts 107
8.1.4 Operation Emissions Impacts and Mitigation 111
8.2 Noise 118
8.2.1 Existing Noise Conditions 120
8.2.2 Construction Noise Impacts and Mitigation 121
8.2.3 Ground-Borne Vibration 126
8.2.4 Operational Noise Impacts and Mitigation 127
9.0 RELIABILITY AND SAFETY 130
9.1 LNG Safety 130
9.1.1 LNG Facility Reliability, Safety, and Security Regulatory Oversight 130
9.1.2 USDOT PHMSA Siting Requirements and 49 CFR 193 Subpart B Determination 132
9.1.3 Coast Guard Safety Regulatory Requirements and Letter of Recommendation 134
9.1.4 LNG Facility Security Regulatory Requirements 137
9.1.5 FERC Engineering and Technical Review of the Preliminary Engineering Designs 139
9.1.6 Recommendations from FERC Preliminary Engineering and Technical Review 172
9.1.7 Conclusions on LNG Facility and LNG Marine Vessel Reliability and Safety 184
10.0 CUMULATIVE IMPACTS 184
10.1 Temporal and Geographic Distribution (Geographic Scope) 185
10.2 Projects and Activities Considered 186
10.3 Analysis of Cumulative Impacts 200
10.3.1 Geological Resources and Soils 200
10.3.2 Water Resources 201
10.3.3 Vegetation, Wildlife, and Aquatic Resources 205
10.3.4 Socioeconomics 207
10.3.5 Land Use and Visual Resources 209
10.3.6 Recreation 210
10.3.7 Air and Noise Quality 210
SECTION C – ALTERNATIVES 219
1.0 EVALUATION PROCESS 219

1.1 No-Action Alternative 221
1.2 System Alternatives 221
1.3 Site Alternatives 221
1.3.1 Site 1 222
1.3.2 Site 2 224
1.3.3 Site 3 (Preferred Site) 224
SECTION D – CONCLUSIONS AND RECOMMENDATIONS 225
SECTION E – REFERENCES 242
SECTION F – LIST OF PREPARERS 255

List of Tables

Table A.5.0-1 Issues Identified During the Scoping Period 8
Table A.9.0-1 Land Requirements for the SPLNG Third Berth Expansion Project 18
Table A.9.1-1 Proposed Access Roads for the SPLNG Third Berth Expansion Project 20
Table A.9.1-2 Proposed Staging Areas for the SPLNG Third Berth Expansion Project 21
Table A.10.0-1 Permits, Approvals, and Consultations for the SPLNG Third Berth Expansion Project 22
Table B.2.0-1 Summary of Soil Characteristics within the Project Site 26
Table B.3.2-1 Surface Waterbodies Affected by the SPLNG Third Berth Expansion Project 33
Table B.3.3-1 Wetlands Impacted by the SPLNG Third Berth Expansion Project 38
Table B.4.1-1 Vegetation Impacted by the SPLNG Third Berth Expansion Project 39
Table B.4.2-1 Habitats Affected by Construction and Operation of the SPLNG Third Berth Expansion Project 42
Table B.4.2-2 Underwater Sound Thresholds for Fish 46
Table B.4.2-3 Calculated Distances to Underwater Noise Thresholds from Dredging and Mitigated In-water Pile Driving 47
Table B.4.3-1 Managed EFH Species Likely to Occur in the Project Area 53
Table B.4.4-1 Migratory Bird Species Potentially Occurring in SPLNG Third Berth Expansion Project 55
Table B.4.5-1 Federally Listed Species within the Project Area 59
Table B.4.5-2 Underwater Sound Thresholds for Sea Turtles 66
Table B.4.5-3 Calculated Distances to Underwater Noise Thresholds for Sea Turtles from Dredging and Mitigated In-water Pile Driving 66
Table B.4.5-4 Marine Mammals that Have Been Observed in the Gulf 71
Table B.4.5-5 Underwater Sound Thresholds for Marine Mammals 72
Table B.4.5-6 Calculated Distances to Underwater Noise Thresholds for Marine Mammals from Dredging and Mitigated In-water Pile Driving 72
Table B.5.1-1 SPLNG's Coordination with Federally Recognized Tribes 74
Table B.5.1-2 Summary of SPLNG's Cultural Resource Surveys and Consultations 75
Table B.6.1-1 Detailed Summary of Land Use Affected by Project Construction and Operation (acres) 80
Table B.7.1-1 Existing population and Demographic Conditions 84
Table B.7.1-2 Existing Income and Employment Conditions in the Project Area 85
Table B.7.1-3 Summary of Estimated Peak Construction and Operational Workforce 86
Table B.7.2-1 Temporary Housing Units Available in the Project Vicinity 87
Table B.7.3-1 Public Service Data for the Project Vicinity 88
Table B.7.3-2 School Districts and School Enrollment in the Project Vicinity 89
Table B.7.7-1 Minority Populations and Low-Income Population Information for the Census Block Groups Within 2 Miles of the Project 93
Table B.8.1-1 Ambient Air Quality Standards 98
Table B.8.1-2 Ambient Air Quality Concentrations in the Vicinity of the Project 99

Table B.8.1-3 Major Stationary Source/Prevention of Significant Deterioration (PSD) Applicability Analysis – SPLNG Third Berth Project 102
Table B.8.1-4 Annual Project Construction Emissions (tpy) 110
Table B.8.1-5 Annual Emissions (tpy) for Operation of Existing and Proposed SPLNG Terminal Sources 112
Table B.8.1-6 Annual Emissions (tpy) for Marine Vessels Associated with Maneuvering and Hoteling Operations 115
Table B.8.1-7 Annual Emissions (tpy) for Marine Vessels Associated with Transiting in State Waters 115
Table B.8.1-8 Summary of Air Quality Impact Analysis Results 116
Table B.8.1-9 SPLNG Terminal, Expansion Project (Trains 5 and 6), and Third Berth Combined Construction, Commissioning, and Operation Emissions (tpy) 118
Table B.8.2-1 Baseline Sound Level Measurement Results at Noise Sensitive Areas near the Project Site 120
Table B.8.2-2 Pile Driving Activity Summary 122
Table B.8.2-3 Daytime Construction Sound Level Impact Evaluation – Pile Driving 124
Table B.8.2-4 Daytime Construction Sound Level Impact Evaluation –General Construction and Dredging 124
Table B.8.2-5 Nighttime Construction Sound Level Impact Evaluation –Dredging Only 125
Table B.8.2-6 Construction Sound Level Impact Evaluation – Overall Equivalent Day-Night Levels 125
Table B.8.2-7 Sound Level Impact Evaluation – Predicted Operations Noise at Noise Sensitive Area 128
Table B.8.2-8 Cumulative Sound Level Impact Evaluation – Marine Flare Contribution to Operational Levels 130
Table B.10.2-1 Authorized, Planned, or Recently Completed Major Projects in the Vicinity of the Project Considered for Cumulative Analysis 188
Table B.10.3-1 Wetland Impacts for Other Projects Occurring within same Temporal and Geographic Scope for Water Resources as the SPLNG Third Berth Expansion Project 204
Table B.10.3-2 Cumulative Sound Level Impact Evaluation for Construction of the Project and the Sabine Pass Liquefaction Expansion Project (Train 6) 216
Table B.10.3-3 Cumulative Sound Level Impact Evaluation for Operation of the Project, Sabine Pass Compression Project, and SPLNG Terminal Trains 1 - 6 218

List of Figures

Figure A.6.1-1. Artist Rendition of SPLNG Third Berth Expansion Project 9
Figure A.6.1-2 Third Berth dredge area within the Sabine Pass Channel 10
Figure A.9.0-1 SPLNG Third Berth Expansion Project Land Requirements 19
Figure B.3.2-1 Third Berth Expansion Project Wetland and Waterbody Impact Map 31
Figure B.3.2-2 Third Berth Expansion Project Wetland and Waterbody Impact Detail Map ... 32
Figure B.7.7-1 Third Berth Expansion Project General Location Map 94

Figure B.8.2-1 NSAs and Ambient Sound Measurement Locations 121
Figure B.8.2-2 NSAs and Modeled Operational Noise Contours 128
Figure B.9.1-1 Accidental Hazard Zones along LNG Marine Vessel Route 136
Figure B.9.1-2 Intentional Hazard Zones along LNG Marine Vessel Route 136
Figure B.10.2-1 Projects Evaluated for Cumulative Impact Analysis 199
Figure C.1.3-1 SPLNG Third Berth Expansion Project Site Alternatives 223

Technical Abbreviations and Acronyms

APE	area of potential effect
API	American Petroleum Institute
AQCR	Air Quality Control Regions
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
BACT	Best Available Control Technology
BOG	boil off gas
ºC	degrees Celsius
CAA	Clean Air Act
CAAA	1990 Clean Air Act Amendments
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CH_4	methane
CMMS	Computerized Maintenance Management System
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	CO_2 equivalents
Coast Guard	U.S. Coast Guard
COE	U.S. Army Corp of Engineers
Commission	Federal Energy Regulatory Commission
COTP	Captain of the Port
CWA	Clean Water Act
dB	decibels
dBA	A-weighted decibels
DHS	U.S. Department of Homeland Security
DMPA	dredged material placement area
DOD	U.S. Department of Defense
DOE	U.S. Department of Energy
DOE/FE	U.S. Department of Energy's Office of Fossil Energy
E2EM	estuarine intertidal emergent
E2SS	estuarine intertidal scrub-shrub
EA	Environmental Assessment
EFH	Essential Fish Habitat
EI	Environmental Inspector
El	elevation
EPA	U.S. Environmental Protection Agency
ERP	Emergency Response Plan
ESA	Endangered Species Act
ESMP	Erosion and Sediment Management Plan

FDCP	Fugitive Dust Control Plan
FEED	front-end engineering design
FERC	Federal Energy Regulatory Commission
FTA	Free Trade Agreement
FWS	U.S. Fish and Wildlife Service
GHG	greenhouse gas
GMD	geomagnetic disturbance
GMFMC	Gulf of Mexico Fishery Management Council
GWP	global warming potential
HAP	hazardous air pollutant
HGB	Houston Galveston-Brazoria
HMB	heat and material balances
HUC	hydrologic unit code
HVAC	heating, ventilation, and air conditioning
IBC	International Building Code
ISA	International Society for Automation
L_{dn}	day-night equivalent sound level
L_{eq}	equivalent sound level
L_{max}	short-term maximum noise level
LAC	Louisiana Administrative Code
LCI	Lettis Consultants International, Inc.
LDEQ	Louisiana Department of Environmental Quality
LDNR	Louisiana Department of Natural Resources
LDWF	Louisiana Department of Wildlife and Fisheries
LFL	lower flammability limits
LNG	liquefied natural gas
LNGC	liquefied natural gas carrier
LOD	Letter of Determination
LOR	Letter of Recommendation
LPDES	Louisiana Pollutant Discharge Elimination System
m^3	cubic meters
m^3/hour	cubic meters per hour
MARPOL	International Convention for the Prevention of Pollution from Ships
MBTA	Migratory Bird Treaty Act
MEOW	maximum envelope of water
mg/l	milligrams per liter
MOU	Memorandum of Understanding
MOU-FWS	Memorandum of Understanding with the U.S. Fish and Wildlife Service

mph	miles per hour
MSA	Magnuson-Stevens Fisheries Conservation and Management Act
MTPA	metric tonnes per annum
MTSA	Maritime Transportation Security Act
NAAQS	National Ambient Air Quality Standards
NAVD 88	North American Vertical Datum of 1988
NEPA	National Environmental Policy Act
NFPA	National Fire Protection Association
NGA	Natural Gas Act
NMFS	National Marine Fisheries Service
N_2O	nitrous oxide
NO_x	oxides of nitrogen
NO_2	nitrogen dioxide
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NPS	National Park Service
NSA	noise sensitive areas
NSPS	New Source Performance Standards
NSR	New Source Review
O^3	ozone
OEP	Office of Energy Projects
P&ID	piping and instrumentation diagram
PFD	process flow diagram
PHMSA	Pipeline and Hazardous Materials Safety Administration
Plan	FERC *Upland Erosion Control, Revegetation, and Maintenance Plan*
PM	particulate matter
ppt	parts per thousand
Procedures	FERC *Wetland and Waterbody Construction and Mitigation Procedures*
Project	SPLNG Third Berth Expansion Project
PSD	Prevention of Significant Deterioration
PTE	potential to emit
RMP	Risk Management Plan
RMS	root mean-square sound pressure
Secretary	Secretary of the Commission
SH	State Highway
SHPO	State Historic Preservation Officers
SIP	State Implementation Plans
SIS	safety instrumented systems

SLOSH	Sea, Lake, and Overland Surge from Hurricanes
SLR	sea level rise
SNND	Sabine Neches Navigation District
SNWW	Sabine Neches Waterway
SO_2	sulfur dioxide
SONRIS	Strategic Online Natural Resources Information System
SOPEP	Shipboard Oil Pollution Emergency Plan
SPC-SPCC Plan	Spill Prevention and Control - Spill Prevention, Control, and Countermeasures Plan
SPCC Plan	Spill Prevention, Control, and Countermeasures Plan
SPLE	Sabine Pass Liquefaction Expansion
SPLNG	Sabine Pass LNG, L.P.
SSD	slow speed diesel
SSURGO	Soil Survey Geographic
TAP	toxic air pollutant
TCEQ	Texas Commission on Environmental Quality
Third Berth	Third Marine Berth
T&E	threatened and endangered
tpy	tons per year
TSS	total suspended solids
TWEI	Tolunay-Wong Engineers, Inc.
TWIC	Transportation Worker Identification Credential
µPa	micro Pascal
$\mu g/m^3$	microgram per cubic meter
USC	United States Code
USDOT	U.S. Department of Transportation
USDA	U.S. Department of Agriculture
USGCRP	U.S. Global Change Research Program
USGS	U.S. Geological Survey
VOC	volatile organic compound
WSA	Waterway Suitability Assessment
y^3	cubic yards

SECTION A – PROPOSED ACTION

1.0 INTRODUCTION

The staff of the Federal Energy Regulatory Commission (FERC or Commission) has prepared this environmental assessment (EA) to assess the potential environmental impacts of the construction and operation of an expansion of the existing Sabine Pass liquefied natural gas (LNG) facility (SPLNG Terminal), located in Cameron Parish, Louisiana.[1] Sabine Pass LNG, L.P. (SPLNG) requests authorization to construct and operate a third marine berth (Third Berth) and supporting facilities as part of the SPLNG Third Berth Expansion Project (Project). The location and a general overview of the proposed facilities are provided on figure A.1.0-1.

The FERC is the lead federal agency responsible for authorizing the siting and construction of onshore and near-shore LNG import or export facilities under the Natural Gas Act (NGA) and is the lead federal agency for preparation of the EA. We[2] prepared this EA in compliance with the requirements of the National Environmental Policy Act (NEPA) (Title 40 of the Code of Federal Regulations [CFR] Parts 1500-1508) and the Commission's implementing regulations under 18 CFR 380.

On October 29, 2018, SPLNG filed an application with the Commission in Docket No. CP19-11-000 for authorization under Section 3 of the NGA and Part 157 of the Commission's regulations. The application requested authorization to construct and operate the Third Berth and supporting facilities adjacent to the existing marine berths at the SPLNG Terminal. SPLNG also proposes to increase LNG carriers (LNGCs) calling on the SPLNG Terminal from the currently authorized 400 LNGCs to 580 LNGCs. On March 8, 2018, Commission staff approved SPLNG to commence the pre-filing process under Docket No. PF18-3-000. During pre-filing, Commission staff reviewed the Project prior to its formal application. The main purposes of pre-filing are to encourage early involvement of interested stakeholders, facilitate interagency cooperation, and identify and resolve environmental issues before an application is filed with FERC.

[1] Previous expansions of the SPLNG Terminal include the SPLNG Terminal Phase II Project (Docket No. CP05-396-000), SPLNG Export Project (Docket Nos. CP04-47-000, CP05-396-001), Sabine Pass Liquefaction Project (Docket No. CP11-72-000), Sabine Pass Liquefaction Project Modification (Docket No. CP13-2-000), Capacity Increase Amendment (Docket No. CP14-12-000), and Sabine Pass Liquefaction Expansion Project (Docket No. CP13-552).

[2] The pronouns "we," "us," and "our" refers to environmental and engineering staff of the Office of Energy Projects.

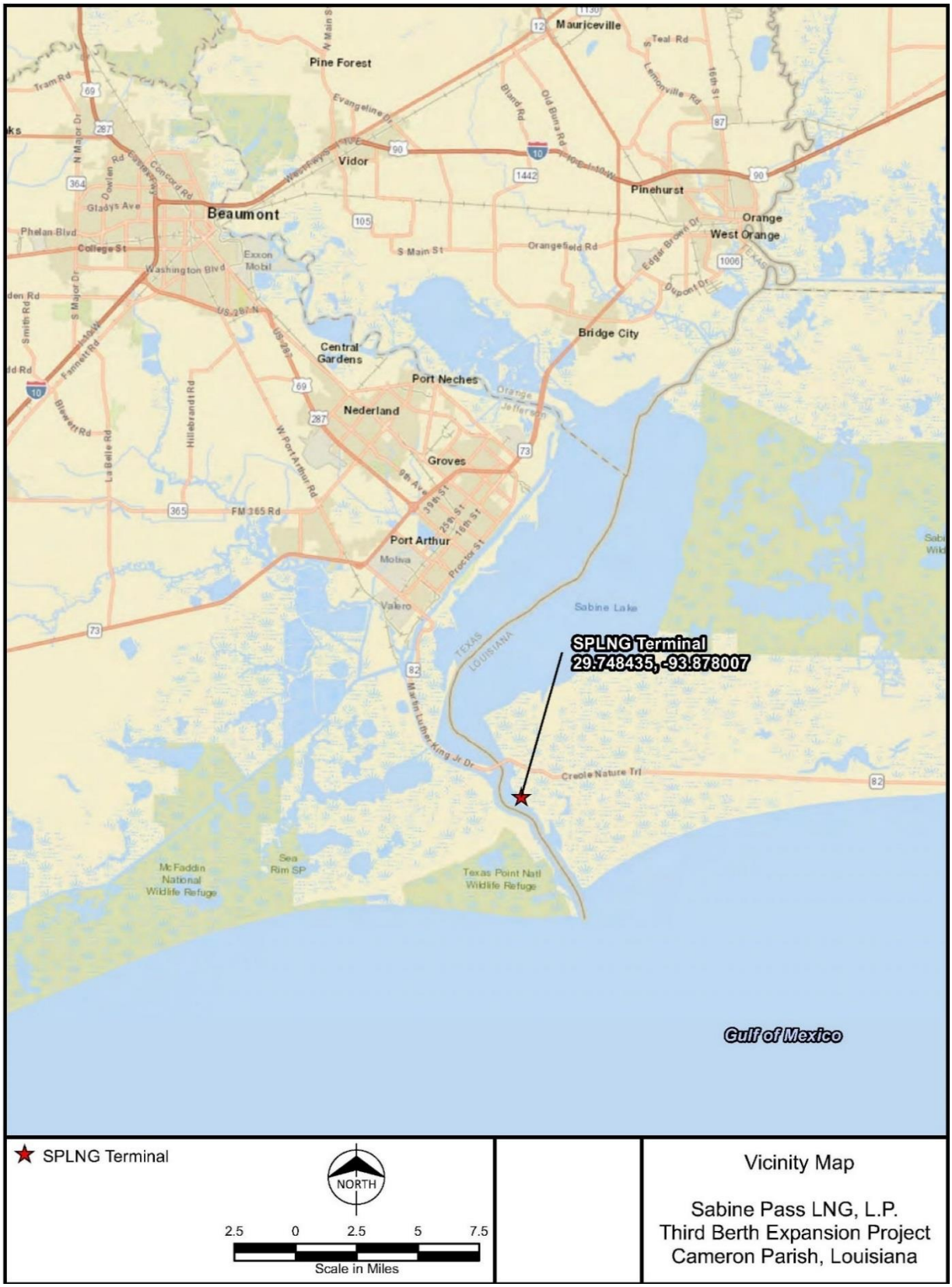

Figure A.1.0-1 Third Berth Expansion Project General Location Map

2.0 PURPOSE AND NEED

The SPLNG Terminal currently has four LNG trains in service, with a fifth LNG train currently under construction and expected to be completed in 2019. A sixth LNG train has been authorized, but not yet constructed. The production capacity of each LNG train is about 5 million metric tonnes per annum (MTPA). Once all six LNG trains are completed, SPLNG would have a total production capacity of about 30 MTPA. The SPLNG Terminal has five storage tanks with nominal capacities of 160,000 cubic meters (m^3) each.

The SPLNG Terminal, currently has a single marine basin with two vessel berths each capable of accommodating LNGCs with capacities up to 266,000 m^3 of LNG for both import and export operations. SPLNG's stated purpose of the project is to better accommodate the increased number of LNGCs arriving at the SPLNG Terminal. The Third Berth would minimize delayed cargoes due to maintenance dredging operations at the existing berths by allowing SPLNG to load and berth LNGCs while the existing berth undergoes maintenance dredging. In addition, the third berth would minimize delayed cargoes from adverse weather or other ship traffic delays by allowing multiple ships to berth at the facility to wait for loading. The Third Berth would also allow for LNG production optimization through removing bottlenecks associated with LNG loading and marine constraints. The Third Berth would also allow SPLNG to accommodate an additional 180 LNGCs annually, increasing its total to 580 LNGCs per year.

Under Section 3 of the NGA, the Commission considers all factors bearing on the public interest as part of its decision to authorize natural gas facilities. Specifically, regarding whether or not to authorize natural gas facilities used for importation or exportation, the Commission shall authorize the proposal unless it finds that the proposed facilities would not be consistent with the public interest. The Commission bases its decision on financing, rates, market demand, gas supply, environmental impact, and other issues concerning a proposed project.

3.0 SCOPE OF THIS ENVIRONMENTAL ASSESSMENT

Our principal objectives in preparing this EA are to:

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

The topics addressed in this EA include: geology; soils; groundwater; surface water; wetlands; vegetation; wildlife and aquatic resources; special status species; land use, recreation, special interest areas, and visual resources; socioeconomics (including transportation and traffic); cultural resources; air quality and noise; reliability and safety; and cumulative impacts. The EA

describes the affected environment as it currently exists, discusses the environmental consequences of the Project, and compares the Project's potential impact with that of various alternatives. The EA also presents our recommended mitigation measures.

The EA will be used by the Commission in its decision-making process to determine whether to authorize SPLNG's proposal. Approval would be granted if, after consideration of both environmental and non-environmental issues, the Commission finds that the Project is in the public convenience and necessity.

4.0 COOPERATING AGENCIES

The U.S. Army Corps of Engineers (COE), U.S. Department of Energy (DOE), U.S. Department of Transportation (USDOT), U.S. Coast Guard (Coast Guard), U.S. Fish and Wildlife Service (FWS), and Louisiana Department of Wildlife and Fisheries (LDWF) participated as cooperating agencies in the preparation of the EA. Cooperating agencies have jurisdiction by law or special expertise with respect to environmental impacts involved with a proposal. The roles of the COE, DOE, USDOT, Coast Guard, FWS, and LDWF in the Project review process are described below. The EA provides a basis for coordinated federal decision making in a single document, avoiding duplication among federal agencies (or state agencies with federal delegation authority) in the NEPA environmental review process. In addition to the lead and cooperating agencies, other federal, state, and local agencies may use this EA in approving or issuing permits for all or part of the Project. Federal, state, and local permits, approvals, and consultations for the Project are discussed in section A.10.0.

4.1 U.S. Army Corps of Engineers

The COE has jurisdictional authority pursuant to Section 404 of the Clean Water Act (CWA) (33 United States Code [USC] 1344), which governs the discharge of dredged or fill material into waters of the U.S., 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 EA. The COE would adopt the EA in compliance with 40 CFR 1506.3 if, after an independent review of the document, it concludes that the EA satisfies the COE's comments and suggestions. The Project is within the Galveston District of the COE. Staff from the Galveston 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 a Section 404 permit for impacts on waters of the U.S. associated with construction and operation of the Project; and
- issuance of a Section 10 permit for construction activities within navigable waters of the U.S. associated with the Project.

As an element of its review, the COE must consider whether a proposed action 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 must also evaluate whether or not a project has "water dependency." The COE would issue a Record of Decision to formally document its decision on the proposed action, including Section 404(b)(1) analysis and required environmental mitigation commitments.

4.2 U.S. Department of Energy

The DOE's Office of Fossil Energy (DOE/FE) must meet its obligation under Section 3 of the NGA to authorize the import and/or export of natural gas, including LNG, unless it finds that the proposed import or export is not consistent with the public interest. By law, under Section 3(c) of the NGA, applications to export natural gas to countries with which the United States has free trade agreements (FTA) that require national treatment for trade in natural gas are deemed to be consistent with the public interest and the Secretary of Energy must grant authorization without modification or delay. In the case of applications to export LNG to non-FTA countries, Section 3(a) of the NGA requires DOE/FE to conduct a public interest review and to grant authorizations unless the DOE/FE finds that the proposed exports would not be consistent with the public interest. Additionally, NEPA requires the DOE/FE to consider the environmental impacts of its decisions regarding applications to export natural gas to non-FTA nations. In this regard, the DOE/FE has acted as a cooperating agency, with the FERC as the lead agency, pursuant to the requirements of NEPA.

The DOE/FE has granted Sabine Pass Liquefaction, LLC, an affiliate of SPLNG, multiple long-term, multi-contract authorizations to export natural gas from the SPLNG Terminal. The SPLNG Third Berth Expansion Project would facilitate the exportation of volumes previously authorized by the DOE/FE. SPLNG does not propose an increase in export capacity as part of the Project; therefore, no additional DOE/FE authorization is required.

4.3 U.S. Department of Transportation

Under 49 USC 60101, the USDOT has prescribed the minimum federal safety standards for LNG facilities. Those standards are codified in 49 CFR Part 193 *Liquefied Natural Gas Facilities: Federal Safety Standards* and apply to the siting, design, construction, operation, maintenance, and security of LNG facilities. The National Fire Protection Association (NFPA) Standard 59A, *Standard for the Production, Storage, and Handling of Liquefied Natural Gas* (2001 ed.), is incorporated into these requirements by reference, with regulatory preemption in the event of conflict. In accordance with the 2004 Interagency Agreement, the USDOT participates as a cooperating agency on the safety and security review of waterfront import/export LNG facilities. The USDOT does not issue a permit or license, but, as a cooperating agency, assists FERC staff in evaluating whether an applicant's proposed siting criteria meets the DOT requirement sin Part 193, Subpart B. On August 31, 2018, FERC and

USDOT signed a Memorandum of Understanding (MOU) to improve agency coordination on LNG project reviews for FERC jurisdictional LNG facilities and eliminate duplicative efforts.[3]

Under the August 31, 2018 MOU, the USDOT would issue a Letter of Determination (LOD) to FERC, which FERC would rely upon in determining whether a proposed LNG facility would be capable of complying with the 49 CFR 193, Subpart B, regulatory requirements. The LOD would provide the USDOT's Pipeline and Hazardous Materials Safety Administration's (PHMSA) analysis and conclusions on the Subpart B regulatory requirements. The USDOT's conclusion on the siting and hazard analysis required by Part 193 would be based on preliminary design information, which may be revised as the engineering design progresses to final design. The USDOT issued the LOD for the Project on July 24, 2019.

4.4 U.S. Coast Guard

The Coast Guard is the principal federal agency responsible for maritime safety, security, and environmental stewardship in U.S. ports and waterways. As such, the Coast Guard is the federal agency responsible for assessing the suitability of the Project Waterways (defined as the waterways that begin at the outer boundary of the navigable waters of the U.S.) for LNG marine traffic. The Coast Guard exercises regulatory authority over LNG facilities that affect the safety and security of port areas and navigable waterways under 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 (MTSA) of 2002 (46 USC 701). If the Project is approved, constructed, and operated, the Coast Guard would continue to exercise regulatory oversight of the safety and security of the SPLNG Terminal, including the proposed Project facilities in compliance with 33 CFR 127.

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 to the Captain of the Port (COTP). As required by 33 CFR 127.007, SPLNG submitted its Letter of Intent along with a preliminary WSA to the Coast Guard in January 2018. In a letter dated May 21, 2019, the Coast Guard issued the LOR for the Project, which stated that the Sabine Pass Channel is considered suitable for the increased LNGC traffic associated with the Project in accordance with the guidance in the Coast Guard Navigation and Vessel Inspection Circular 01-2011.

4.5 U.S. Fish and Wildlife Service

The FWS is responsible for ensuring compliance with the Endangered Species Act (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

[3] https://www.ferc.gov/legal/mou/2018/FERC-PHMSA-MOU.pdf

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 also 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 (16 USC 688).

The ultimate responsibility for compliance with Section 7 remains with the lead federal agency (i.e., FERC for this Project). As the lead federal agency for the Project, FERC consulted with the FWS, a cooperating agency, pursuant to Section 7 of the ESA to determine whether federally listed endangered or threatened species or designated critical habitat under the FWS jurisdiction are found in the vicinity of the Project, and to evaluate the proposed action's potential effects on those species or critical habitats. For the purposes of compliance with Section 7 of the ESA, this EA serves as our Biological Assessment for the Project. Furthermore, we are requesting concurrence from the FWS with our determinations of effect for the federally listed species presented in this EA and further discussed in section B.4.0.

4.6 Louisiana Department of Wildlife and Fisheries

The LDWF is a state agency charged with the management, conservation, and promotion of wise use of Louisiana's renewable fish and wildlife resources and their supporting habitats. The control and supervision of these resources are assigned to the LDWF in the Constitution of the State of Louisiana of 1974, Article IX, Section 7 and in revised statutes under Title 36 and Title 56.

5.0 PUBLIC REVIEW AND COMMENTS

On February 23, 2018, SPLNG filed a request to utilize our pre-filing process, and we approved and initiated the pre-filing process on March 8, 2018, in Docket No. PF18-3-000. We participated in one public open house sponsored by SPLNG near the Project site in Cameron Parish, Louisiana on April 17, 2018, to explain our environmental review process to interested stakeholders. FERC staff also participated in a site visit on that same day to examine the existing facilities and the proposed site for the Third Berth and associated facilities.

On April 20, 2018, the Commission issued a *Notice of Intent to Prepare an Environmental Assessment for the Planned SPLNG Third Berth Expansion Project, Request for Comments on Environmental Issues* (NOI). The NOI was published in the Federal Register and mailed to over 120 entities, including federal, state, and local government representatives and agencies; elected officials; Native American tribes; environmental and public interest groups, affected landowners, and other interested parties.[4] Comments received during the scoping process are part of the public record for the Project and are available for viewing on the FERC

[4] The NOI was published in 83 Federal Register No. 18549 on April 27, 2018.

internet website (http://www.ferc.gov).[5] Table A.5.0-1 summarizes the environmental issues identified during the scoping process. Substantive environmental issues raised by commenters are addressed in the applicable sections of the EA. Entities that commented on the NOI included the LDWF, Choctaw Nation, and FWS. We received two comments, one from LDWF and one from the Choctaw Nation after SPLNG filed its application on October 26, 2018.

Table A.5.0-1
Issues Identified During the Scoping Period

Issue	Comments	EA Section(s) Where Comments are Addressed
Wetlands	Impacts on marsh, including indirect impacts on adjacent marsh.	B.3.3
Threatened, Endangered, and Special-Status Species	Impacts on threatened and endangered species including manatee, loggerhead and green sea turtles, piping plover, and red knot.	B.4.5
Migratory Birds	Impacts on colonial nesting birds and the black rail.	B.4.4 and B.4.5

6.0 PROPOSED FACILITIES

SPLNG's Third Berth Expansion Project would involve the installation of a new marine berth and associated supporting facilities at the existing SPLNG Terminal. No new liquefaction trains or LNG storage tanks are proposed as part of the Project.

6.1 Marine Facilities

The Third Berth would require a new berth pocket to be dredged from land adjacent and southeast of the two existing marine berths along the Sabine Pass Channel. The Third Berth would be dredged to a depth of minus 46 feet North American Vertical Datum of 1988 (NAVD 88) and would include rock revetment slope protection and an open cell bulkhead for tug berths. The rock revetment slope protection would have a 3:1 slope and would form the sides of the Third Berth and the maneuvering area. Portions of the Third Berth would be protected using articulated block mats or other suitable means of stabilization. Figure A.6.1-1 depicts an artist's rendering of the proposed Project facilities.

[5] Using the "eLibrary" link, select "General Search" from the eLibrary menu and enter the docket number excluding the last three digits in the "Docket Number" field (i.e., PF18-3 and/or CP19-11). Select an appropriate date range.

Figure A.6.1-1. Artist Rendition of SPLNG Third Berth Expansion Project

Construction of the Third Berth would require the removal of approximately 3.6 million cubic yards (y^3) of dredge material. This material would be removed through a combination of hydraulic and mechanical dredging, as further discussed in section A.8.2. The Project is primarily located within Louisiana; however, a portion of the dredge area would cross the state line into Texas (refer to figure A.6.1-2).

Figure A.6.1-2 Third Berth dredge area within the Sabine Pass Channel

Louisiana coastal use regulations require that dredged material in excess of 25,000 y^3 be put to beneficial use. In accordance with this requirement, SPLNG proposes to beneficially use the estimated 3.6 million y^3 of dredge material by placing it at the existing Louisiana Point dredged material placement area (DMPA), 3.9 miles south of the Third Berth. Placement of dredged material at the existing Louisiana Point DMPA would build up the eroding shoreline and create marsh habitat.

The Third Berth would accommodate LNGCs with capacities up to 180,000 m^3 and drafts up to 40 feet. The berthing and mooring facilities would include four breasting and six mooring dolphins, a fender system, quick release hooks, and associated monitoring systems. The breasting dolphins would consist of reinforced concrete structures on steel piles and would be equipped with fenders suitable to safely berth and moor the full range of ships being considered. The breasting dolphins would also be equipped with mooring hooks with spring lines to provide

a greater flexibility in mooring various types of vessels. Access stairs and interconnecting walkways would be provided to connect the breasting dolphins to the loading platform and to the mooring dolphin. Six mooring dolphins would consist of reinforced concrete slabs supported on steel piles. Mooring dolphins would be provided with interconnecting walkways with protective handrails on the mooring line faces.

The existing construction dock (originally approved in FERC Docket No. CP04-47-000) would be used to support the construction of the Project and accommodate delivery of piles and concrete box girders for the marine super structure.

The LNG loading system would consist of a new platform, LNG loading and cooldown lines, and LNG loading arms (two liquid, one vapor, and one hybrid liquid/vapor). The loading arms would be designed with swivel joints to provide the required range of relative movement between the ship and the shore connections. Each arm would be fitted with two powered emergency release coupling valves to protect the arm. The valves would be fully closed before the coupling clamp opens, to ensure there is minimal spillage in the case of movement of the ship outside the normal operating envelope. Each arm would be operated by a hydraulic system with a counterbalance weight, to reduce the deadweight of the arm on the shipside connection and to reduce the power required to maneuver the arm into position. Only eight out of the 180 additional LNG carriers for the Project would require cool-down.

As part of the Project the number of LNGCs utilizing the SPLNG Terminal would increase from the currently permitted 400 per year to 580 per year, for export and import. The LNGCs would transit from the Gulf of Mexico and through the Sabine Pass Channel to the SPLNG Terminal. SPLNG would also add two tugs to the existing dedicated tug fleet to collectively serve the LNGCs calling at the expanded marine facility (two existing berths and the Third Berth). The Third Berth would include two tug berth mooring areas for the additional tugs when they are not in use.

6.2 LNG Transfer Lines

Two new 30-inch-diameter loading lines are proposed to transfer LNG to the Third Berth loading platform and into the LNGCs. The two new 30-inch-diameter loading lines would connect to tie-ins to the existing LNG loading lines and would be supported on a new piperack to the pipeway trestle and connected to the loading arm manifold on the Third Berth loading platform. The maximum LNG loading rate would be 12,000 cubic meters per hour (m^3/hour) to each ship, at approximately 15 pounds per square inch gauge at design flow.

6.3 LNG Impoundments

SPLNG would construct a new LNG spill collection system to provide spill protection for the new LNG piping and equipment. The new LNG spill collection system would include loading platform and associated pipeway containment curbing, and LNG spill collection swales.

There would be no buried utilities in the Project area, although there are three buried pipelines. No relocation of buried utilities, including pipelines would be required.

6.4 Other Terminal Infrastructure

In addition to the facilities described above, the Project would also require the following additional facilities and infrastructure:

- two new buildings, including the Jetty Marine Building and the Customs/Security Building;
- telecommunications systems;
- digital control systems upgrades and integrations;
- new security fencing;
- cathodic protection system;
- tie-ins to the existing plant and instrument air system, potable water line, and nitrogen system;
- elevated fire monitor tower; and
- gangway with associated hydraulic power unit and local control panel.

6.4.1 Vapor Handling

SPLNG would utilize the existing marine flare and boil off gas (BOG) compressors for operation of the Third Berth without improvement or modifications. Ship return vapors generated during ship loading at the Third Berth would be routed and connected to the existing vapor return line. A tie-in to the existing BOG collection system would be required to transfer ship return vapors from the Third Berth to the existing BOG handling system.

6.4.2 Electrical System

Electrical power required for the Third Berth would be provided by an essential power feeder from existing switchgear in the existing substation A-110A. At the Jetty Marine Building, incoming power would be stepped down with a dry type transformer. The Jetty Marine Building would serve as a substation for the Third Berth. Power for equipment, lighting, and the Customs/Security Building at the Third Berth would be provided by the Jetty Marine Building.

6.4.3 Fire and Gas Detection Protection System

The fire and gas detection and control system is a network of subsystems with monitoring and hazard detection devices located throughout the SPLNG Terminal. These subsystems are in areas where combustible and flammable liquids and gasses are stored and transported within the SPLNG Terminal facilities. The current fire and gas detection system in place at the SPLNG Terminal would be updated and integrated to cover the areas required by the Third Berth.

Firewater to the Third Berth would be supplied by connecting a new 14-inch-diameter firewater line to the existing firewater system to create a firewater loop for the Third Berth. This tie-in would provide firewater from the existing facility firewater pumps to the Third Berth and no new firewater pumps would be required for the Project.

7.0 NON-JURISDICTIONAL FACILITIES

As part of its decision to approve facilities under Commission jurisdiction, the Commission considers all factors bearing on the public convenience and necessity. Occasionally, proposed projects have associated facilities that do not come under the jurisdiction of FERC. These "non-jurisdictional" facilities may be integral to the needs of a project (e.g., a new or expanded power plant at the end of a pipeline that is not under the jurisdiction of FERC) or may be merely associated as minor, non-integral components of the jurisdictional facilities that would be constructed and operated as part of a project. There are no non-jurisdictional facilities proposed for the Project.

8.0 CONSTRUCTION, OPERATION, AND MAINTENANCE PROCEDURES

The Project facilities would be designed, constructed, tested, operated, and maintained in accordance with the USDOT regulations at 49 CFR 193, Liquefied Natural Gas Facilities: Federal Safety Standards, and the NFPA 59A, Standard for the Production, Storage, and Handling of LNG (as incorporated by reference in 49 CFR 193.2013). Pending the receipt of all necessary approvals and authorizations, SPLNG plans to begin construction of the Project in 2020 with an anticipated in-service date of December 2022. SPLNG adopted FERC staff's *Upland Erosion Control, Revegetation, and Maintenance Plan* (Plan) and *Wetland and Waterbody Construction and Mitigation Procedures* (Procedures). SPLNG has not proposed any deviations from our Plan and Procedures. SPLNG would also implement its *Spill Prevention and Control - Spill Prevention, Control, and Countermeasures Plan* (SPC-SPCC Plan) during operation and its Project-specific *Spill Prevention, Control and Countermeasures Plan* (SPCC Plan) during construction to help ensure proper handling of lubricants, fuel, or other potentially toxic materials and prevention of spills.

During construction, SPLNG would be represented on-site by a Chief Inspector, with assistance from craft inspectors and an Environmental Inspector (EI), to ensure compliance with mitigation measures, other applicable regulatory requirements, and Project specifications. All Project inspectors would have access to the relevant compliance specifications and other documents contained in the construction contracts. The EI's duties would be fully consistent with those contained in paragraph II.B (Responsibilities of the EI) of our Plan to ensure that the environmental conditions associated with other permits or authorizations are satisfied. The EI would have the authority to stop work or require other corrective actions to achieve environmental compliance. In addition to monitoring compliance, the EI's duties would include training Project personnel about environmental requirements and reporting compliance status to the contractors, SPLNG, FERC, and other agencies, as required.

SPLNG would include copies of all relevant environmental permits and approvals in the construction bid packages and contracts to third-party contractors. Construction contractors employed by SPLNG would be required to be familiar with all permits and licenses obtained for the Project, and to comply with all federal, state, and local laws, ordinances, and regulations that apply to construction of the Project, including restoration of areas temporarily disturbed during construction. The contractors would be required to observe and abide by all provisions of any other safety, design, and construction codes and regulations enacted or adopted by governmental agencies with jurisdiction over the Project.

SPLNG would develop an environmental training program tailored to the construction of the Project. The training program would be designed to ensure that:

- qualified environmental training personnel provide thorough and well-focused training sessions regarding the environmental requirements applicable to the trainees' activities;
- all individuals receive environmental training before they begin work;
- adequate training records are kept; and
- refresher training is provided, as needed to maintain high awareness of environmental requirements.

FERC staff would conduct field and engineering inspections during construction. Other federal and state agencies may also conduct oversight of inspection to the extent determined necessary by the individual agency. After construction is completed, the FERC staff would continue to conduct oversight inspection and monitoring during operation of the Project to ensure successful restoration. Additionally, the FERC staff would conduct annual engineering safety inspections of the Project operations.

The sections below describe the general procedures proposed by SPLNG for construction and operation activities within the Project site including restoration and maintenance following the completion of Project construction.

8.1 Temporary Construction Facilities

Geotechnical conditions within the Project site require all equipment and structures for permanent facilities to be located on pile supported foundations.[6] The main construction offices for the Project would be located in areas previously improved and utilized during construction of the SPLNG Terminal. To maintain control of the site, SPLNG would use these designated areas to provide common office areas for all contractors. Parking areas (located within the staging areas discussed in section A.9.0) would be within the SPLNG Terminal, but outside the secure

[6] Geotechnical investigations at the site for the Project were performed by Tolunay-Wong Engineers, Inc. The results of their investigations are reported in the *Geotechnical Report Sabine Pass LNG Third Berth Expansion Project, Cameron Parish, Louisiana* in May 2018. A copy of the Geotechnical Report is available on the FERC eLibrary under Accession No. 20181029-5210.

boundaries of the operational facility. No significant preparation work would be required for the main construction offices and temporary facilities in these designated areas, except for portions of Staging Area 5. Support/satellite offices, warehousing, lunchrooms, temporary access roads, parking lots, and material laydown storage would be constructed as necessary within the approved construction workspace.

SPLNG would place additional temporary facilities, primarily laydown areas and support/satellite areas, in existing laydown areas within and adjacent to the SPLNG Terminal. The permanent site grading for drainage would be directed to existing outfalls within the SPLNG Terminal to assure proper drainage during construction and operation. The discharge would be monitored to ensure they fall within the levels permitted under the Louisiana Pollutant Discharge Elimination System (LPDES) permits. All stormwater removal from within the Project area would be directed to the east of the SPLNG Terminal, to the roadside drainage ditch. In addition, SPLNG would relocate an existing outfall (Outfall 001) to the southeastern perimeter of the SPLNG Terminal. The stormwater would flow through Outfall 001 structure and directly into the existing ditch that is part of the larger drainage system. Stormwater flow rates are not anticipated to increase due to the relocation of Outfall 001 and stormwater discharge would only indirectly drain into the Sabine Pass Channel. SPLNG would continue to adhere to best management practices and employ proper erosion and sediment control devices in accordance with a Project-specific Erosion and Sediment Management Plan (ESMP). Implementation of this plan would prevent and minimize stormwater runoff from construction activities at the Project site.

8.2 Marine Construction

SPLNG would utilize the existing construction dock (approved in Docket No. CP04-47-000) to support the construction of the Project. The Third Berth would be dredged to a depth of -46 feet NAVD 88. The hydraulically dredged material would be utilized to develop the selected mitigation site. Excess dredged material would be deposited at an approved DMPA.

Four breasting and six mooring structures would be constructed to provide flexibility and safe mooring of the full range of design ships. Access points would include the roadway via the trestle from land (access road 7) and the gangway via the LNGC from water.

The loading platform would be a single-level, pile-supported concrete platform having a maximum nominal elevation of plus 25 feet NAVD 88. The surface of the jetty platform would slope landward in order to drain away rainwater and potential LNG spills. Curbs would be provided to serve as LNG spill containment and separate the LNG area from the remainder of the platform surfaces. Handrails would also be provided where necessary to meet Occupational Safety and Health Administration requirements at the perimeter of the jetty platform.

The Third Berth would require construction from land and water. The jetty approach trestle with associated pipeway and roadway would be constructed from land. The open cell bulkhead would be constructed from land as well. The loading platforms and dolphin structures

are marine based construction. All steel pilings would be coated with epoxy from a point 10 feet below the mudline or groundline, to the soffit of the pile cap, and outfitted with induced current cathodic protection.

Concrete piles would be used on land and steel pipe piles would be used in the Third Berth. The steel pipe piles would be driven using a combination of vibratory and impact hammer in steel leads employing crawler and barge mounted cranes. Driving templates would be used where adequate to ensure proper position and alignment of the piles. Piles would either be driven full length or spliced vertically in templates depending on ground conditions and final pile length. Approximately 1,460 piles would be driven from land (i.e., onshore piperack, bulkhead wall, and trestle) and approximately 116 piles would be driven in-water (i.e., loading platform). SPLNG anticipates commencing onshore and offshore pile driving activities in August 2020 for completion in June 2021.

8.2.1 Dredging and Dredge Material Placement

The maneuvering area and berthing area would be dredged roughly perpendicular to the Sabine Pass Channel to a design dredge depth of -46 feet NAVD 88, the same depth as the existing marine berth pocket. Over-dredged allowance for dredging the marine berth would be up to an additional 2 feet. The width of the navigable area within the slip would be approximately 2,268 feet at the entrance, decreasing to 1,521 feet about halfway into the slip and to 607 feet at the end. The end of the slip would be approximately 3,042 feet from the near bottom edge of the ship channel.

To minimize environmental impacts on the aquatic environment, SPLNG would dredge the Third Berth primarily through the use of a cutter suction dredge, which would employ both hydraulic and mechanical means. The rotating cutterhead would loosen and displace the material to be dredged, and a suction pipe located directly behind the cutterhead creates a low-pressure field that pulls the material and water into the suction pipe, forming a slurry. The slurry is then pumped through the discharge pipe to the existing Louisiana Point DMPA. No dredged material would be transported by barges to the disposal site. SPLNG would use a mechanical dredge for slope dressing and other ancillary items to ensure that the side slopes appropriately cut to the specified design grade, and for any bulk excavation that cannot be practically accessed with a cutter suction dredge. The mechanically dredged material would be side cast back into the water column to be captured by the cutter head dredge. The anticipated volume of hydraulically dredged material is approximately 3.24 million y^3 and the anticipated volume of mechanically dredged material is approximately 360,000 y^3. SPLNG anticipates that hydraulic dredging would occur over 270 days, with mechanical dredging occurring concurrently for 210 days.

8.3 Site Access and Traffic

Construction traffic would access the site primarily via State Highway (SH) 82. Once at the site, construction traffic would utilize the SPLNG Terminal main entrance road (Lighthouse Road or access road 6), which parallels the eastern boundary of the property.

Material deliveries to the site would be via truck using the main entrance on Lighthouse Road, and construction deliveries and personnel buses would be scheduled and timed accordingly to prevent significant traffic delays. However, due to height and width restrictions at the main entrance (see section A.9.1.1), large deliveries would enter the SPLNG Terminal from SH 82 through access road 1 and access road 3 and would use access road 2 and access road 4 to bypass the secured main entrance and perimeter fencing and merge onto Lighthouse Road. Material delivery vehicles would not exceed the load capacity of either the public roads or the SH 82 bridge. Heavy material delivery would occur via barge to the construction dock or alternately by truck via SH 27 to SH 82 from Holly Beach, Louisiana.

8.4 Sanitary Sewer Collection and Disposal

A new package treatment system would be required to treat sanitary wastewater generated from the new Jetty Marine Building and Customs/Security Building. Sanitary waste from the Customs/Security Building would flow directly to the package treatment system and sanitary waste from the Jetty Marine Building would be pumped via a lift station.

8.5 Operation and Maintenance

The Third Berth would be operated and maintained in accordance with applicable federal, state, and local regulations and guidelines, including the requirements of the Coast Guard for operations of the existing SPLNG Terminal. Operation safety is further discussed in section B.9.0.

8.5.1 Operation

The SPLNG Terminal maintains existing protocols and procedures. Extensive training would be provided for operational personnel to ensure that the facility personnel are familiar with and understand the importance of adherence to safe procedures. These procedures would address safe startup, shutdown, cool down, purging, etc., as well as routine operation and monitoring.

During operation, LNGCs would enter Sabine Pass under the command of a local pilot. The pilot would decide whether the current and wind conditions allow safe entry to the Sabine Pass Channel. The pilot would direct the maneuvering of the LNGC in the berth area using dedicated tugboats. The pilot would also direct the securing of the lines and return the command back to the captain when the ship is secured.

The loading arms would be coupled to the ship by shore-side operators boarding the vessel and remotely controlling the loading arms. Connecting the ship-to-shore cable of both systems would connect the instrument control system of the ship to shore. This would create one control system for the entire loading operation. SPLNG would test the emergency shutdown system before loading can begin.

8.5.2 Maintenance

SPLNG would maintain the Project facilities in accordance with the maintenance requirements of 33 CFR Part 127. The SPLNG Terminal maintenance staff would conduct routine maintenance and minor overhauls. SPLNG would conduct major overhauls and other major maintenance by soliciting the services of trained contract personnel to perform the maintenance. All scheduled and unscheduled maintenance would be entered into a computerized maintenance management system (CMMS). Appropriate personnel, by role including operations, maintenance, and others would be trained on the use of CMMS. CMMS work orders would then be distributed to the maintenance personnel for action.

Scheduled maintenance, such as preventive and predictive maintenance of equipment, would be input into the system to automatically print out work orders either on a time basis or on hours of operation, depending on the requirement. Scheduled maintenance would be performed on safety and environmental equipment, instrumentation, and any other equipment that would require maintenance on a routine basis. When a problem is detected that requires unscheduled maintenance attention, the problem would be entered into the CMMS. If a problem requires immediate attention, the appropriate person would be notified.

The Third Berth would require periodic maintenance dredging during operation to remove deposited sediments. SPLNG estimates that maintenance dredging would be required approximately once annually and would remove an anticipated 495,000 y^3. Hydraulically dredged sediments would be pumped via pipe to a selected mitigation site or approved DMPA in accordance with all necessary permits and authorizations.

9.0 LAND REQUIREMENTS

The land requirements for the Project are presented in table A.9.0-1 and figure A.9.0-1. A total of 375.2 acres would be utilized for construction of the Project with 171.6 acres permanently impacted during operation. Approximately 90.3 acres would be impacted for dredging of the third berth.

Table A.9.0-1

Land Requirements for the SPLNG Third Berth Expansion Project

Facility	Total Construction Impacts (acres) [a]	Permanent Operation Impacts (acres)
Third Berth	90.25	90.25
Staging Areas	272.48	80.16
Existing Access Roads (6)	11.24	0.00
New Access Roads (2) [b]	1.02	1.02
Outfall 001	0.21	0.13
Total	**375.20**	**171.56**

[a] Construction impacts are inclusive of operation impacts.

[b] A portion of access road 7 would be elevated on the trestle within the Third Berth area. Acreages for this portion of access road 7 have been accounted for as part of the acreage associated with the Third Berth.

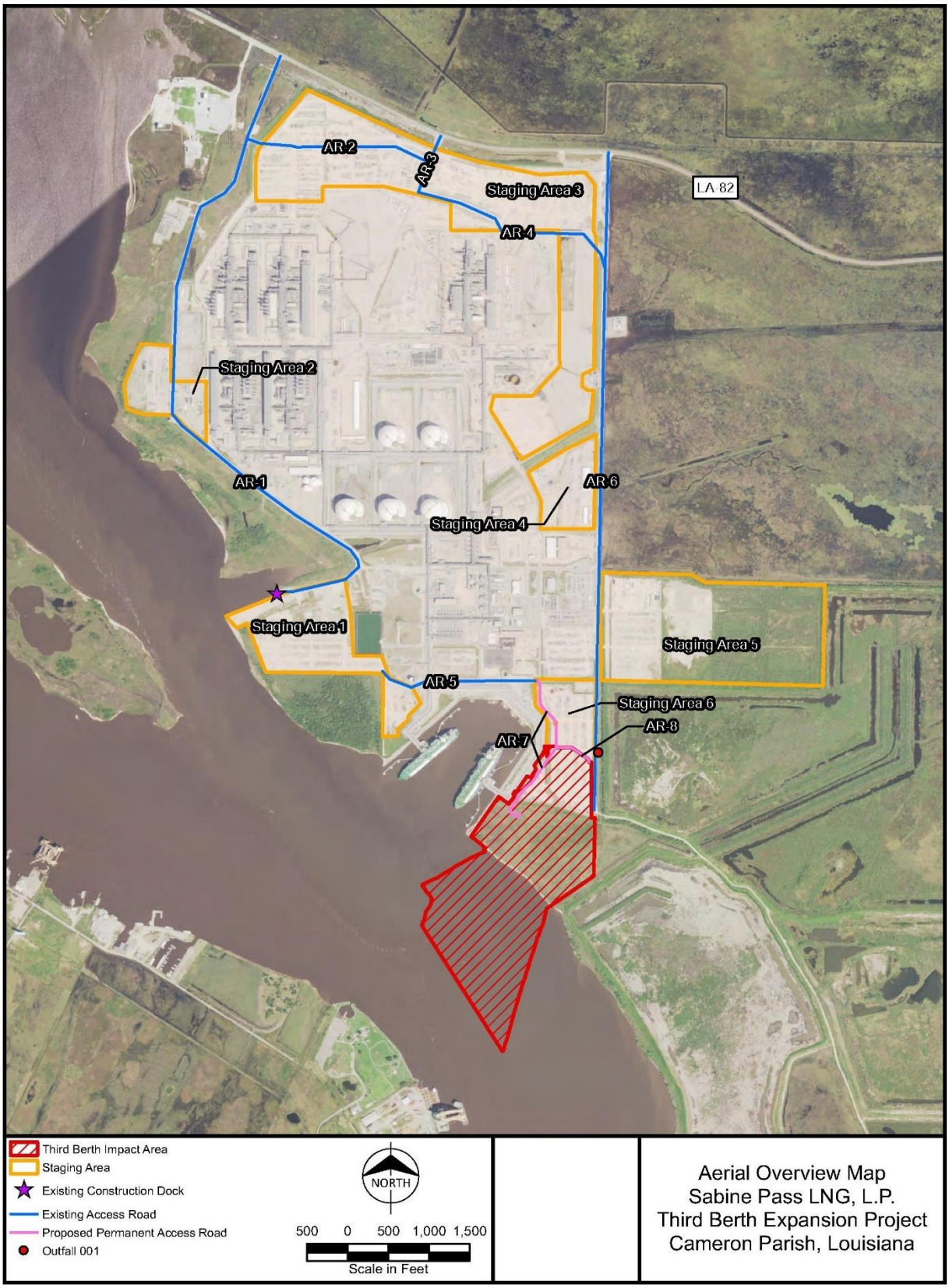

Figure A.9.0-1 SPLNG Third Berth Expansion Project Land Requirements

9.1 Access Roads/Staging Areas

9.1.1 Access Roads

SPLNG would utilize eight access roads (access roads 1 through 8), as depicted on figure A.9.0-1. Access roads 1 through 6 are existing roads within the SPLNG Terminal. Access roads 7 and 8 would be new permanent roads required to access the Third Berth jetty trestle and would be approximately 20 feet wide. A portion of access road 7 would be elevated on the trestle and overlap with the area of the Third Berth. Impacts associated with this portion of the road have been captured as part of the overall impacts associated with the Third Berth. SPLNG's proposed access roads for Project use are summarized in table A.9.1-1.

The main entrance to the SPLNG Terminal is a secured entrance under the jurisdiction of the Coast Guard and Department of Homeland Security. This entrance is on the north side of Lighthouse Road (access road 6), south of SH 82. This secure entrance has a height restriction of 15 feet and a width limitation of 12 feet. SPLNG anticipates that many construction deliveries required for the Project would exceed these dimensions and would not be able to safely enter the SPLNG Terminal via access road 6. During construction, access road 6 would be used for some construction deliveries as well as personnel vehicles. Large deliveries would enter the SPLNG Terminal from SH 82 through access road 1 and access road 3 and would use access road 2 and access road 4 to bypass the secured main entrance and perimeter fencing and merge onto access road 6.

Table A.9.1-1
Proposed Access Roads for the SPLNG Third Berth Expansion Project

Access Road ID	New or Existing	Approximate Length (feet)	Approximate Width (feet)
Access road 1	Existing	8,808	20
Access road 2	Existing	2,293	20
Access road 3	Existing	742	20
Access road 4	Existing	2,706	20
Access road 5	Existing	1,984	20
Access road 6	Existing	8,075	20
Access road 7	New (within existing SPLNG Terminal)	2,041	20
Access road 8	New (partially within existing SPLNG Terminal)	473	20

9.1.2 Staging Areas

SPLNG would utilize previously approved, existing laydown areas for the Project (see figure A.9.0-1). Staging areas proposed for the Project that do not require site improvements and that were previously approved as permanent laydown include:

- staging areas 1 and 2 – approved in Docket Nos. CP11-72-000 and CP 13-2-000;
- staging area 3 – approved in Docket Nos. CP13-2-000 and CP13-552-000;
- staging area 4 – approved in Docket No. CP11-72-000; and
- staging area 6 – approved in Docket No. CP13-2-000.

Staging area 5 is currently stabilized with rock base for use as laydown and parking and was approved under Docket No. CP13-2-000 as temporary workspace. SPLNG proposes to maintain staging area 5 permanently as part of the Project. Table A.9.1-2 summarizes the staging areas proposed for the Project.

Table A.9.1-2
Proposed Staging Areas for the SPLNG Third Berth Expansion Project

Staging Area ID	New or Existing	Previous FERC Approval Status	Acreage
Staging area 1	Existing	Permanent	35.27
Staging area 2	Existing	Permanent	15.48
Staging area 3	Existing	Permanent	113.13
Staging area 4	Existing	Permanent	15.79
Staging area 5	Existing/New	Temporary	80.16
Staging area 6	Existing	Permanent	12.65
Total			**272.48**

10.0 PERMITS, APPROVALS, AND REGULATORY CONSULTATION

Table A.10.0-1 lists the federal, state, and local regulatory agencies that have permit approval authority or consultation requirements and the status of that review for portions of the SPLNG Third Berth Expansion Project. SPLNG would be responsible for obtaining all necessary permits, licenses, and approvals required for the SPLNG Third Berth Expansion Project, regardless of whether or not they are listed in table A.10.0-1.

Table A.10.0-1 Permits, Approvals, and Consultations for the SPLNG Third Berth Expansion Project			
Agency and Agency Contact	**Permit/Approval/Consultation**	**Actual or Anticipated Submittal**	**Actual/Pending Issuance**
FERC	Authorization pursuant to Section 3 of the Natural Gas Act	October 2018	Pending
FWS	Section 7 Endangered Species Act Consultation/Clearance; Migratory Bird Consultation; Fish and Wildlife Coordination Act	Informal consultation initiated February 2018	Pending
COE	Clean Water Act Section 404 Permit	Submitted October 2018	1st Quarter 2020
	Section 408 Authorization	Submitted October 2018	1st Quarter 2020
	Real Estate Easement	Submitted October 2018	1st Quarter 2020
National Marine Fisheries Service (NMFS)	Essential Fish Habitat; Endangered Species Act Aquatic Threatened and Endangered Species; Marine Mammal Protection Act; Fish and Wildlife Coordination Act	Consultation initiated February 2018	1st Quarter 2020
Coast Guard	Waterway Suitability Assessment	Submitted January 2018	Letter of Recommendation issued May 21, 2019
Louisiana Department of Environmental Quality	Water Quality Certification under Section 401	Submitted October 2018	October 2019
	Part 70 Operating and Prevention of Significant Deterioration Air Permit revisions	Submitted October 2018	1st Quarter 2020
Louisiana Department of Natural Resources	Coastal Use Permit	Submitted October 2018	1st Quarter 2020
Louisiana State Historic Preservation Office	Section 106 of the National Historic Preservation Act	Consultation initiated February 2018 Additional information provided October 2018 for the Third Berth and Mitigation Sites	Concurrence Issued March 27, 2018 Concurrence issued January 9, 2019
Louisiana Department of Wildlife and Fisheries	Sensitive Species/Habitat Consultation	Consultation initiated February 2018	Ongoing
Louisiana State Land Office	Land Use Agreement	Submitted July 23, 2018	1st Quarter 2020
Texas Historical Commission	Section 106 of the National Historic Preservation Act	Submitted April 2, 2018	Pending
Texas Parks and Wildlife Department	Sensitive Species/Habitat Consultation	Consultation initiated April 2018	1st Quarter 2020

SECTION B – ENVIRONMENTAL ANALYSIS

In the following sections, we address the affected environment, general construction and direct and indirect operational impacts, and proposed mitigation to minimize or avoid impacts for each resource.

When considering the environmental consequences of the Project, the duration and significance of any potential impacts are described below according to the following four levels: temporary, short-term, long-term, and permanent. Temporary impacts generally occur during construction, with the resources returning to pre-construction conditions almost immediately. Short-term impacts could continue for up to three years following construction. Long-term impacts would require more than three years to recover, but eventually would recover to pre-construction conditions. Permanent impacts could occur because of activities that modify resources to the extent that they may not return to pre-construction conditions during the life of the Project, such as with the construction of an aboveground facility. An impact would be considered significant if it would result in a substantial adverse change in the physical environment. In the following sections, we address direct and indirect effects collectively, by resource.

SPLNG, as part of its proposal, 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.

1.0 GEOLOGY

The Project is entirely within the West Gulf Coastal Plain section of the Coastal Plain physiographic province. The Project is within a portion of the West Gulf Coastal Plain characterized by a belt of Holocene Epoch coastal marshland known as the Chenier Plain (U.S. Geological Survey [USGS], 2002).

The upper 65 feet to 75 feet of sediment in the Chenier Plain are comprised of Holocene Epoch geologic materials, which generally consist of fluvial, tidal, and deltaic sediments that dip gently toward the Gulf of Mexico (Tolunay-Wong Engineers, Inc. [TWEI], 2018). Sediments from the Pleistocene Epoch (Deweyville Terrace and Beaumont formation) underlie Holocene Epoch materials. The Deweyville Terrace is present at depths of about 65 feet to 90 feet below the existing ground surface. The Beaumont formation underlies the Deweyville Terrace at depths of about 85 feet to 200 feet below the surface. The Beaumont formation consists predominantly of interbedded clay and silt; the Deweyville Terrace consists predominantly of clay, with minor sand and gravel constituents.

The Chenier Plain is characterized by low lying marshes, which built out gulfward during periods of high sediment supply, and ridges or cheniers, which represent relict beach fronts formed by wave action during periods of low sediment supply. The cheniers are composed of sand, silt, and shell, and support grass and scrub oak vegetation (Owen, 2008).

The southern portion of the Third Berth consists of dredged fill material comprised of very soft clays and has a current grade elevation (El) of +2 feet to +3 feet. The northern portion of the Third Berth was improved during previous activities at the site with fill material consisting of fat clays and crushed limestone; up to 6 feet was deposited within the area to reach the current grade El +6 feet to +9 feet (TWEI, 2018). The existing fill material was sourced from a supplier whose products are required to comply with all applicable EPA/COE *Evaluation of Dredged Material Proposed for Discharge in Waters of the U.S.* requirements with regard to control of contaminants. SPLNG is not aware of any issues or problems pertaining to environmental contaminants of the existing fill material.

Geotechnical investigations for the Project were performed by TWEI from June through July 2017. Based on the field information and laboratory test data, the interpreted subsurface stratigraphy typically consists of very soft to stiff clays (fat clays and organic clays) from approximately El -60 feet to -80 feet, medium to very dense sands between approximately El -70 feet to -100 feet, stiff to very stiff clays typically between El -90 feet and El -120 feet, and very dense sands typically between El -120 feet to -190 feet. Observed substructures in the recovered soil samples included slickensides, shell fragments, calcareous and ferrous nodules, and sand seams and pockets, which are typically encountered in the Gulf Coast soils.

1.1 Blasting

Because of the thick sequence of unconsolidated deposits in the region; geotechnical information; and analysis of parish soils data obtained from the Natural Resources Conservation Service Soil Survey Geographic (SSURGO) soils database for shallow to bedrock soils (U.S. Department of Agriculture [USDA], 2013), it is anticipated that blasting would not be necessary for construction at the Third Berth site.

1.2 Mineral Resources

1.2.1 Non-Fuel Minerals

In 2015, salt was Louisiana's leading non-fuel raw mineral (USGS, 2019). Louisiana's other principal non-fuel raw minerals include common clay, construction sand and gravel, industrial sand and gravel, and crushed stone (USGS, 2019). The principal producing mineral for Cameron Parish is salt; however, the nearest salt dome is approximately 14 miles east of the proposed Project site and would not be impacted by the Project (Higginbotham, 1972). Based on a review of the USGS Mineral Resources Data System and Louisiana Department of Natural Resources (LDNR) Strategic Online Natural Resources Information System (SONRIS), there are no active or historic mines within 0.25 mile of the SPLNG Terminal (USGS, 2011; LDNR, 2018a).

1.2.2 Oil and Gas

Based on a review of the LDNR SONRIS database for oil and gas wells, there are two oil and gas wells and one saltwater injection well within 0.25 mile of the proposed Project site

(LDNR, 2018a). The saltwater injection well is active and is approximately 570 feet west of the north end of access road 1. The two oil and gas wells identified are plugged and abandoned. One is approximately 185 feet east of the north end of access road 6, and the other is within the southwest corner of staging area 1, south of access road 5. Both oil and gas wells are within areas already developed for industrial use and no impacts on these wells are anticipated as a result of the Project. No oil and gas wells in Texas are within 1 mile of the proposed Project site (Railroad Commission of Texas, 2018).

Due to the distance of the Project site from active mineral extraction, as well as the previous development of the Project site where oil and gas wells were identified through the state-maintained databases, we conclude that the Project would not impact fuel and non-fuel mineral resources.

1.3 Geologic and Other Natural Hazards

Section B.9.0 provides a discussion of the engineering review completed for the proposed Project site, including safeguards built into the engineering design to reduce the risk of an incident occurring and impacting the public and the results of a geotechnical and structural design review. The discussion in section B.9.0 focuses on the resilience of the Project facilities against natural hazards, including extreme geological, meteorological, and hydrological events, such as earthquakes, tsunamis, seiches, hurricanes, tornadoes, floods, regional subsidence, sea level rise, landslides, wildfires, volcanic activity, and geomagnetism.

1.4 Paleontology

The sediments in the Project area are of Pleistocene age (less than 2.6 million years old) with the surficial sediments less than 10,000 years old (Holocene Epoch). These sediments were formed from erosional deposition. These environments are typically not conducive to the preservation of fossils, especially when compared to the marine environment. The geological composition in Louisiana causes marine fossils to be relative uncommon in surface exposures (Louisiana Geological Survey, 2002). Therefore, impacts on paleontological resources are not anticipated.

2.0 SOILS

Soil characteristics at the Project site were identified and assessed using the available Natural Resources Conservation Service SSURGO for Cameron Parish (USDA, 2013). Additional information about Project soils was obtained from geotechnical investigations of the Project area (TWEI, 2018) and the USDA Official Soil Series Descriptions (USDA, 2017).

There are three soil series within the Project area, as identified in table B.2.0-1. These soils are generally classified as frequently flooded mucky clay with drainage classes ranging from somewhat poorly drained to very poorly drained. A portion of the workspace required for construction of the Third Berth is comprised of soils dredged from the Sabine Pass Channel. A summary of soil attributes and impacts is provided in table B.2.0-1.

Table B.2.0-1

Summary of Soil Characteristics within the Project Site

Map Unit (Map Symbol)	Project Facility	Total Acres [a]	Drainage Class	Prime Farmland [b]	Hydric	Highly Erodible Land		Revegetation Potential [e]
						Water (K Factor) [c]	Wind (WEI) [d]	
Aquents, frequently flooded (AN)	Existing Staging Areas	16.05	Very poorly drained	No	Yes	Not rated	Not rated	Not rated
	Staging Area 5	35.91						
	Access Roads	5.13						
Creole mucky clay (CR)	Existing Staging Areas	0.41	Very poorly drained	No	Yes	0.2	8	Poor
	Access Roads	0.33						
Udifluvents, 1 to 20 percent slopes (UD)	Third Berth	41.02	Somewhat poorly drained	No	No	Not rated	Not rated	Not rated
	Existing Staging Areas	175.86						
	Staging Area 5	44.25						
	Access Roads	6.80						
	Outfall 001	0.21						

WEI = Wind Erodibility Index

Source: USDA, 2017

[a] The remaining 49.23 acres of impacts would be in open water and would not impact soils.

[b] Includes land that is designated as prime farmland, unique farmland, farmland of statewide importance, and farmland of local importance.

[c] Susceptibility of soils to erosion from water, is measured by the K Factor. The K Factor ranges from 0.02 to 0.69. The higher the K Factor, the more susceptible the soil is to erosion by water.

[d] Susceptibility of soils to erosion by wind is measured by the Wind Erodibility Index. Soils with a Wind Erodibility Index of 1 or 2, as ranked by SSURGO, are considered highly susceptible to wind erosion.

[e] Revegetation potential was determined based on Land Capability Class (3 or greater is considered to have poor revegetation potential), available water capacity (low water capacity is considered to have poor revegetation potential), and/or slopes (greater than 8 percent is considered to have poor revegetation potential).

The majority of the Project area consists of existing, permanently graveled areas; impacts on native soils would be limited to the non-graveled portions of the Third Berth (impacts associated with the portion of access road 7 that would be on an elevated trestle within the Third Berth are accounted for in the acreage associated with the Third Berth) and staging area 5. Within the Third Berth approximately 26.7 acres of native soils would be impacted as part of the Project. While all of staging area 5 was previously authorized for use as a staging area for the Sabine Pass Liquefaction Project Modification (Docket No. CP13-2-000), the previous authorization was for temporary use. In addition, only a portion of staging area 5 has been graveled for use on the Sabine Pass Liquefaction Project. As SPLNG intends to permanently convert the entirety of staging area 5 to industrial use for the Project, we have considered impacts on soils within the entirety of staging area 5 in this analysis.

Construction of the Project would require removal of soils (dredging) for the Third Berth. Other fill materials would be brought via trucks to stabilize the area where permanent structures are proposed. SPLNG intends to import approximately 92,350 cubic yards of rip-rap (with 23,350 cubic yards delivered via truck and 69,000 cubic yards delivered via barge), 8,300 cubic yards of compacted gravel and crushed rock, and 1,300 cubic yards of concrete. To this date, SPLNG has not selected a supplier for the Project fill material. SPLNG confirmed that the selected supplier would follow the current EPA/COE *Evaluation of Dredged Material Proposed for Discharge in Waters of the U.S.* requirements with regards to contaminants. SPLNG would minimize the potential for imported fill to spread invasive species by monitoring the Project area to identify invasive species. If invasive species are observed in the Project area, they would be treated by removal and/or spraying with habitat-appropriate herbicide by a licensed professional.

2.1 Hydric Soils and Compaction

Hydric soils are formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part. Soils that are artificially drained or protected from flooding (e.g., by levees) are still considered hydric if the soil in its undisturbed state would meet the definition of a hydric soil. Generally, hydric soils are those soils that are poorly and very poorly drained (USDA, 2018a). About 121.2 acres (37 percent) of the soils that would be affected by construction and operation of the Project (not including those that are existing permanent graveled areas) are considered hydric. Hydric soils are susceptible to rutting and compaction. SPLNG would minimize compaction with measures contained in the FERC Plan and Procedures and its ESMP.

The majority of the Project area consists of existing, permanently graveled areas (existing compaction); therefore, new permanent impacts from the Project are not anticipated in these areas. New access roads and the remainder of staging area 5 would be surfaced with compacted crushed rock during construction and paved with asphaltic concrete for use during operations. Compaction of native soils and the addition of new impervious surfaces can affect overland flow patterns and subsurface hydrology; however, these effects would be highly localized.

2.2 Erosion and Revegetation

None of the soils within the Project area are considered highly susceptible to erosion by water or wind. However, to further minimize or avoid potential impacts due to soil erosion and sedimentation, SPLNG would utilize erosion and sedimentation control methods described in the FERC Plan and Procedures and its ESMP. During construction, the effectiveness of temporary erosion and sediment control devices would be monitored by SPLNG's EI until construction is complete and permanent erosion control devices are installed, as necessary, to prevent erosion of soils during operation.

All of the Project impacts on areas that are currently vegetated (Third Berth) or were previously approved for temporary use (staging area 5) would be permanently converted to open water or industrial use. Therefore, none of the Project areas would be allowed to revegetate. Permanently impacted areas would be stabilized with surface cover, such as gravel, which would also minimize the potential for erosion.

2.3 Soil Contamination

Based on a review of publicly available EPA data, no contaminated sites, including Superfund sites, leaking underground storage tanks, or brownfield properties are within or adjacent to the proposed Project area (EPA, 2018a; Louisiana Department of Environmental Quality [LDEQ], 2015; 2017; LDNR, 2018a). If contaminated or suspect soils (e.g., hydrocarbon contamination) are identified during dredging operations, the applicable resource agencies would be notified, and work in the area of the suspected contamination would be halted until the type and extent of the contamination was determined. The type and extent of contamination and local, state, and federal regulations would determine the appropriate mitigation for these areas.

2.4 Conclusion

Based on adherence to measures contained in the FERC Plan and Procedures, we conclude that impacts on soils due to construction and operation of the SPLNG Third Berth Project would be permanent but not significant.

3.0 WATER RESOURCES AND WETLANDS

3.1 Groundwater

The Project would be underlain by the Coastal Lowlands aquifer system. This aquifer system underlies most of the Gulf Coastal Plains, extending from southern Texas to the Florida panhandle, and consists mostly of Miocene Epoch and younger unconsolidated deposits that lie above and coastward of the Vicksburg-Jackson confining unit. The deposits extend to the land surface and recharge occurs through infiltration of rainfall in outcrop areas. The Coastal Lowlands aquifer system is one of the most extensively utilized aquifer systems in the southern

U.S., yielding large amounts of water for agricultural, commercial, industrial, and public/domestic supplies (Renken, 1998).

The mapped hydrologic unit underlying the Project area is the Chicot aquifer, which is bounded on the west by the Sabine River, on the south by the Gulf of Mexico, on the east by the Atchafalaya River, and on the north by the Red River (EPA, 2001). The Chicot aquifer is the principal source of fresh groundwater in the Project region. Additionally, this aquifer is classified as an EPA-designated Sole Source Aquifer under Section 1424(e) of the Safe Drinking Water Act (EPA, 2001). However, the southwestern portion of Cameron Parish, where the Project facilities are located, does not contain fresh, potable groundwater within the confining unit of the aquifer. The closest area overlaying fresh groundwater in proximity to the Project is north of Sabine Lake, approximately 17.5 miles northeast of access road 1 (LDNR, 2018a).

A review of the LDNR SONRIS and information obtained from the LDEQ confirmed there are no wellhead protection areas in the vicinity of the Project. Additionally, based on a review of water well registration data from SONRIS, there are no groundwater withdrawal areas within a 0.5-mile radius of the Project (LDNR, 2018a).

Due to the shallow nature of the perched groundwater table, construction of the Project could affect groundwater, but any effects would be temporary, and flow patterns would return to pre-construction conditions once activities cease. All water required for construction of the Project would be obtained from an existing waterline at the SPLNG Terminal, which is supplied by the City of Port Arthur. Port Arthur obtains water from surface waters; therefore, there would be no impacts on groundwater resources as a result of water utilized for construction. All water required for operation of the Project would be obtained from a different existing waterline at the SPLNG Terminal that is supplied by Cameron Parish Water Works, District 10. The Cameron Parish Water Works, District 10 obtains water from the Chicot aquifer. Although the Project would result in a permanent increase in water use of approximately 21,600 gallons per day during operations, this volume is minor compared with the 7.74 million gallons withdrawn daily from the Chicot aquifer in Cameron Parish (Louisiana Groundwater Resources Commission, 2012). Therefore, water use during operation would not result in a significant impact on groundwater resources.

Based on a review of federal and state databases, there is no known groundwater contamination in the immediate vicinity of Project areas (EPA, 2019a, 2018a; LDEQ, 2015, 2017). If contaminated groundwater is encountered during construction of the Project, SPLNG would implement measures outlined in the Project-specific SPCC Plan.

An accidental spill of fuel or hazardous material during refueling or maintenance of construction equipment could affect groundwater if not cleaned up appropriately. Soils impacted from spills could continue to leach contaminants to groundwater long after the spill has occurred. To minimize the risk of potential fuel or hazardous material spills, SPLNG would implement the measures in its Project-specific SPCC Plan during construction and SPC-SPCC Plan during operation, which include spill prevention measures, reporting protocols, mitigation measures, and cleanup methods to reduce potential impacts should a spill occur.

3.2 Surface Water

The Project would be located within the Sabine Lake watershed (Hydrologic Unit Code [HUC] 12040201), and would be constructed along the Sabine Pass, which is the southern-most terminus of the Sabine-Neches Waterway. SPLNG conducted field surveys of the Project site and identified two surface waterbodies that would be affected. The location and classification of these waterbodies are depicted on figures B.3.2-1 and B.3.2-2. Impacts on these waterbodies are presented in table B.3.2-1.

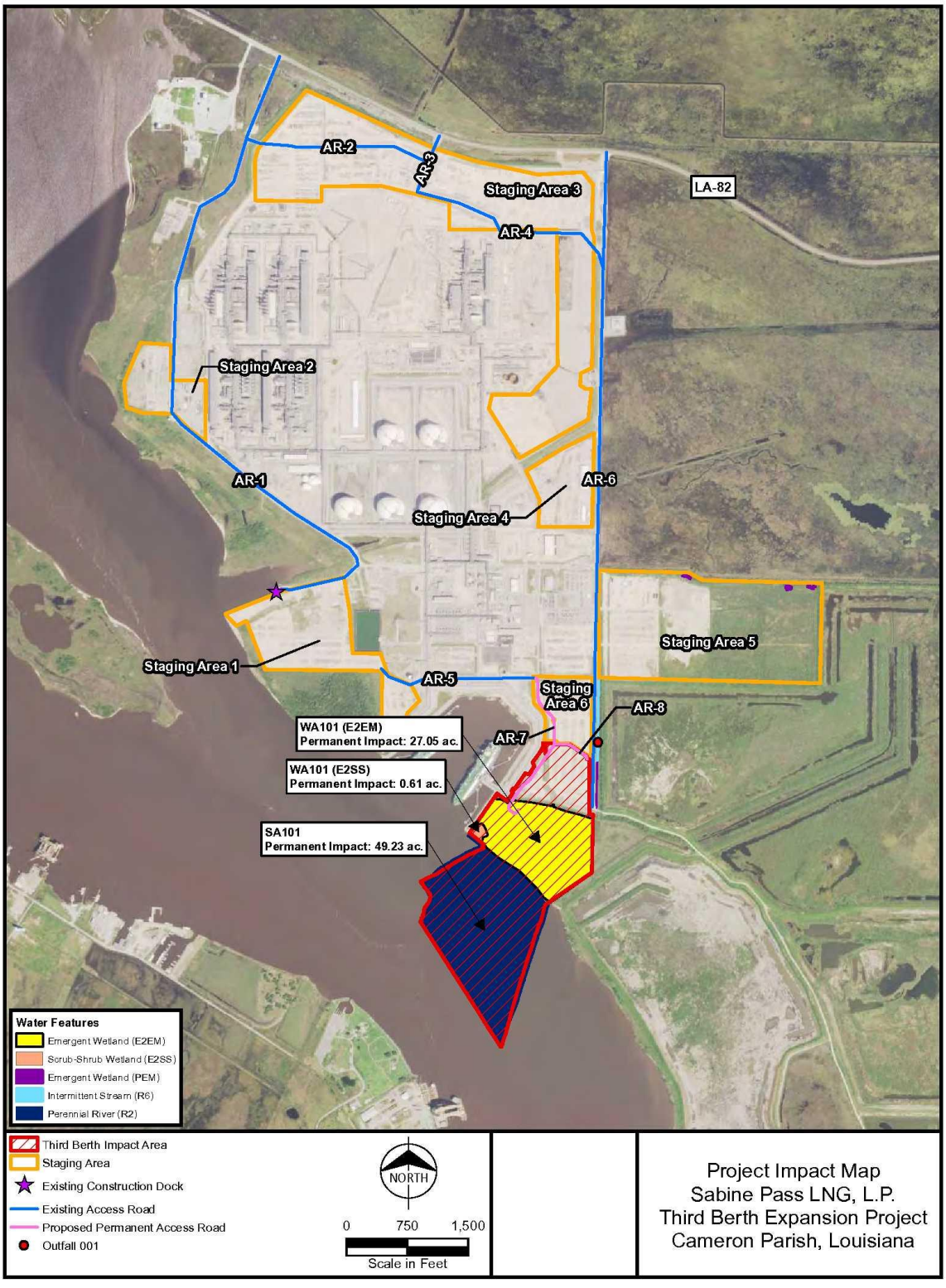

Figure B.3.2-1 Third Berth Expansion Project Wetland and Waterbody Impact Map

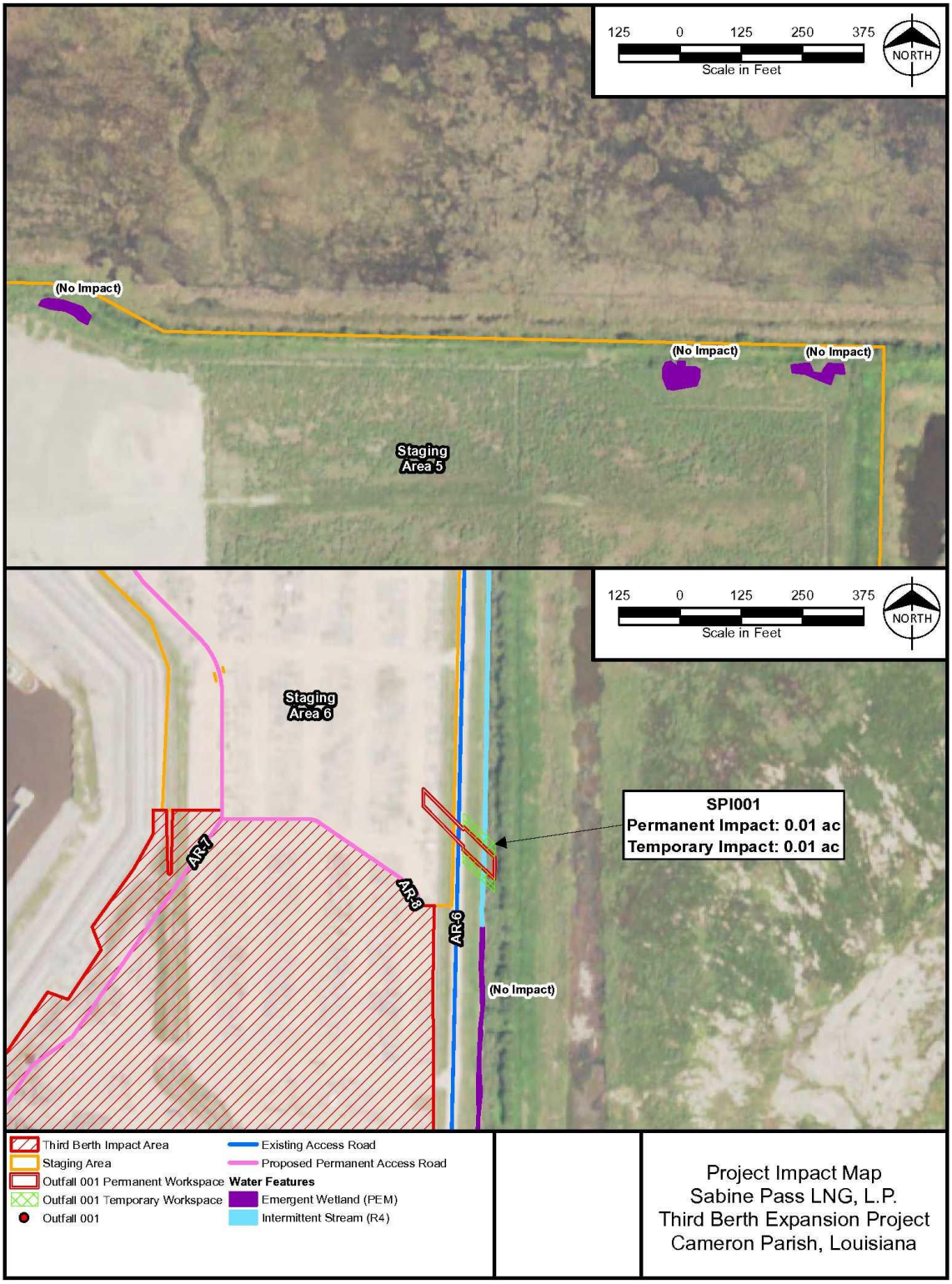

Figure B.3.2-2 Third Berth Expansion Project Wetland and Waterbody Impact Detail Map

Table B.3.2-1
Surface Waterbodies Affected by the SPLNG Third Berth Expansion Project

Facility	Waterbody ID	Waterbody Type [a]	Construction Impacts (acres) [b]	Operation Impacts (acres)
Third Birth	SA101 (Sabine Pass)	P	49.23	49.23
Outfall 001	SPI101	I	0.02	0.01
Project Totals			**49.25**	**49.24**

[a] P = perennial; I = intermittent
[b] Construction impacts are inclusive of operation impacts.
[c] A portion of access road 7 would be elevated on the trestle within the Third Birth; therefore, waterbody impacts associated with this access road are accounted for in the impacts presented for the Third Birth.

According to the 2016 Final Water Quality Inventory: Integrated Report generated by the LDEQ and the 2014 Texas Integrated Report generated by the Texas Commission on Environmental Quality (TCEQ), Sabine Pass is considered an impaired waterbody in accordance with Section 303(d) of the CWA due to elevated levels of fecal coliform, bacteria, and PCB in fish tissue (LDEQ, 2016; TCEQ, 2014). The LDEQ identifies the supported designated uses for Sabine Pass as primary contact recreation, secondary contact recreation, fish and wildlife propagation, and shellfish production, while the TCEQ identifies the supported designated uses for Sabine Pass as recreation, aquatic life, and general uses. Oyster propagation is currently not a supported designated use for Sabine Pass according to the LDEQ. No other 303(d) listed waterbodies are present on the Project site (LDEQ, 2016; TCEQ, 2014). The proposed activities associated with the proposed Project is not anticipated to contribute to the further impairment of Sabine Pass by fecal coliform, bacteria, or PCBs.

A study by the National Oceanic and Atmospheric Administration (NOAA) assessed sediment toxicity and chemical contamination in Sabine Lake and surrounding waterbodies, including Sabine Pass. The study determined that toxicity of the sediments within this region were not significantly different from controls, and that sediment quality in the Sabine Lake area was not severely degraded (Long, 1999).

3.2.1 Dredging and Dredge Material Placement

As described in section A.6.1, construction of the Project would require a new berth pocket to be dredged from land located adjacent and southeast of the two existing marine berths at the SPLNG Terminal. Dredging activities would permanently alter the depth of Sabine Pass within the footprint of the Third Birth to minus 46 feet NAVD 88. SPLNG estimates that a total of approximately 3.6 million y^3 of dredged material would be generated during construction of the Project. During operations, it is anticipated that approximately 495,000 y^3 of dredge material would be removed from the Third Berth annually as part of ongoing maintenance dredging.

SPLNG conducted a dredge plume propagation analysis to assess potential turbidity levels and the extent that suspended solids would travel during Project dredging. Based on the results of this model, it is anticipated that a majority of the sediments that become suspended

during the dredging activities would settle within the dredging footprint as opposed to migrating to adjacent areas. The observed mean total suspended solids (TSS) concentration from dredging operations within Sabine Pass is anticipated to be less than 5 milligrams per liter (mg/l), and approximately 60 mg/l in the vicinity of the dredging operation. Maximum TSS values of 140 mg/l would likely occur at the innermost part of the slip and would gradually decrease to 20 mg/l at the entrance to the Third Birth (Moffatt & Nichol, 2018). The concentration of suspended sediments within both the Third Birth and Sabine Pass is anticipated to return to background levels within 24 hours of completing the dredging activities. It is also anticipated that any residual suspended sediments from the dredging activities would eventually be flushed from the berth by tidal currents and shipping traffic. Therefore, dredging activities would only result in temporary and minor impacts on surface water resources. In addition, SPLNG applied for authorization from the COE to dredge and/or fill waters of the United States under Section 404 of the CWA and Section 10 of the Rivers and Harbors Act (see discussion in section B.3.3). SPLNG would be required to implement the measures incorporated into the COE permit, including any special requirements or procedures that may further minimize impacts on water quality as a result of dredging.

SPLNG would dispose of dredged material in either an approved mitigation site or a DMPA located southwest of the Third Birth (see section B.3.3). The material would be transported to SPLNG's proposed Louisiana Bayou Mitigation Area and Louisiana Point DMPA via temporary discharge pipelines located within Sabine Pass. SPLNG would contain material placed within the Louisiana Bayou Mitigation Area by proposed shoreline protection areas. Turbidity within the shoreline protection areas would be temporarily elevated as material is placed. Elevated turbidity levels would be contained and temporary until suspended sediment settles. SPLNG modeled the dispersion and accumulation of sediments associated with the disposal of material at the Louisiana Point DMPA. Based on the results of this model, it is anticipated that the mean TSS concentrations would be close to background levels and ranged from 200 to 2,000 mg/l near the Louisiana Point DMPA. TSS concentrations are anticipated to reduce significantly once the placement of dredged material has been completed. However, the sediment could be re-suspended due to the action of currents and waves, and subsequently transported either offshore or downcoast of the Louisiana Point DMPA. SPLNG would be required to adhere to all applicable permit conditions regarding placement of dredge material. Impacts on water quality as a result of the placement of dredged material in the mitigation site and DMPA would be temporary and minor.

3.2.2 Stormwater Runoff

Stormwater discharges from construction of the Project would be exempt from stormwater permitting, which is consistent with EPA's Policy Act of 2005, Final Rule: Amendments to the Storm Water Regulations for Discharges Associated with Oil and Gas Construction Activities (EPA, 2006); and as granted by Section 402(I)(2) of the CWA; 33 USC § 1342(l)(2). SPLNG would employ proper erosion and sediment control devices during construction in accordance with a Project-specific ESMP as well as the FERC Plan and Procedures. SPLNG would also implement measures outlined in the Project-specific SPCC Plan

to minimize spill-related impacts on stormwater during construction. Implementation of these measures would prevent and minimize impacts on surface waterbodies as a result of stormwater runoff.

Stormwater runoff from the existing SPLNG Terminal is managed onsite through a series of surface water drainages and impoundments and is discharged via four LPDES permitted stormwater outfalls. The Project would relocate Outfall 001 to cross under access road 6 on the north side of the Third Berth. Stormwater from the SPLNG Terminal would flow through the Outfall 001 structure and into an intermittent waterbody. Following the completion of construction, SPLNG would implement measures in their ESMP such as best management practices, facility inspections, and stormwater monitoring to avoid and minimize the release of pollutants from the SPLNG Terminal via stormwater runoff. SPLNG would also adhere to all requirements of the existing LPDES permit.

A LNG spill collection system would be installed for the collection of any spills or leaks of LNG during operations. All containment areas would drain via trenches to an impoundment basin for retention of spilled materials. The spill impoundment basin would be equipped with water pumps for emptying the collected stormwater. In accordance with 49 CFR 193.2173 requirements, the stormwater removal system would have adequate capacity to remove water at a rate equal to 25 percent of the maximum predictable collection rate from a storm of 10-year frequency and one-hour duration. The basin water pumps would discharge the stormwater collected in the spill impoundment basin to the clean stormwater drainage system. The proposed LNG spill collection system would avoid the discharge of LNG to surface waters during operations.

3.2.3 Water Use

The proposed Project is not within a source water protection area, and there are no public water supply surface water intakes located within three miles of the Project (LDEQ, 2001; Molieri, 2018).

An existing SPNLG Terminal waterline that is supplied by the City of Port Arthur would be used as the source water for dust suppression and hydrostatic testing during construction. The City of Port Arthur obtains water from surface waters such as the Neches River, the Lower Neches Valley Authority Canal, the Terminal Reservoir, and the Port Arthur Reservoir. The volume of water to be utilized for dust suppression and hydrostatic testing (40,000 gallons) would be minimal and would not result in a significant impact on surface waters in the Project area.

During operation of the Project, approximately 21,600 gallons per day of treated and potable water supplies would be obtained from a second existing SPLNG Terminal waterline that is supplied by the Cameron Parish Waterworks, District 10. The Cameron Parish Waterworks, District 10 obtains water from the Chicot aquifer; therefore, the additional water utilized for operations of the Project would not impact surface water resources.

The firewater system would utilize water from the existing firewater storage pond. Precipitation is the main source of water for the storage pond, with back-up water during periods of drought/necessity supplied from Cameron Parish Water Works, District 10. Therefore, the proposed firewater system would not require the use of additional surface water resources.

3.2.4 Hydrostatic Testing

Prior to being placed into service, the firewater, wastewater/storm sewer lines, and potable/utility waterlines would be hydrostatically tested to ensure their structural integrity. A total of approximately 40,000 gallons of water would be used for hydrostatic testing. All water would be obtained from the SPLNG Terminal's existing waterline.

Hydrostatic test water would be discharged over an eight-month period to the existing stormwater management system and not to existing surface waters. No chemicals would be added to the hydrostatic test water before or after testing, and energy dissipation devices would be used to control the flow rate in order to minimize erosion and scouring. The hydrostatic test water discharge would be conducted in accordance with all federal and state rules, regulations, and permits. Therefore, the discharge of hydrostatic test water would have no significant impacts on the water quality of surface waterbodies.

3.2.5 Vessel Traffic

During operation of the Project, there would be an anticipated increase in marine vessel traffic utilizing the SPLNG Terminal from the currently authorized 400 LNGCs per year up to 580 LNGCs per year. The proposed Third Birth would provide the necessary facilities for mooring and loading the additional LNGCs. It is anticipated that the additional 180 LNGCs arriving at the Third Birth would discharge ballast, and would intake and discharge cooling water, while at berth. The discharge of ballast and cooling water could have potential impacts on surface water quality, including changes in pH, salinity, and water temperature, as discussed below. Permits and authorities covering the discharge of ballast water are described in section B.4.2.2. The increased potential for spills is also discussed in section B.4.2.2.

Ballast Water

Ballast water discharged from LNGCs while at the marine berth would consist of open-ocean water collected during ballast water exchange performed during transoceanic shipping (see section B.4.2.2). The route travelled by LNGCs arriving at the Project and the location of the open-ocean source of ballast water would vary depending on each carrier's itinerary prior to reaching the Third Birth. The Gulf of Mexico Fishery Management Council (GMFMC) classifies the Sabine Lake estuary as a mixing zone, where saline Gulf waters mix with freshwater inflows from Sabine Lake and its tributaries. The average mean salinity of the Sabine Lake estuary is approximately six part per thousand (ppt) but can range from 0.5 to 25.0 ppt (GMFMC, 1998). Open ocean seawater typically averages about 35 ppt (Science Daily, 2018). Discharge of ballast water may result in a temporary increase in water salinity within the Third Birth; however, the discharged water would quickly disperse and return to ambient levels.

Ballast water would not be anticipated to significantly impact water temperature or pH in the marine berth. As ballast water is stored in the LNGC hull below the water line, ballast water temperatures would be similar to ambient water temperatures. The pH of ballast water would reflect the open-ocean conditions at the source of the last ballast water exchange prior to arriving at the LNG terminal. The average pH of the oceans near the surface, within the range where ballast water would be taken in by LNG carriers, is about 8.1 (Sciencing.com, 2018). The average pH in Sabine Pass was measured at 8.2 (TCEQ, 2019); therefore, no impacts on pH are anticipated as a result of the discharge of ballast water within the Third Birth.

Cooling Water

The LNGCs would re-circulate water to cool their engines while loading LNG at the Third Birth. While at the berth, the LNGCs' engines primarily run on generators, which do not require the engine to be run at full power. Therefore, proportionately less cooling water would be required during this type of operation than while the LNGC is under way. The cooling water flow rate and volume of water required for cooling would vary depending on the time the vessel is at berth and the type of vessel.

Cooling water discharge would be expected to have no effect on the salinity or pH of the water since it would be withdrawn and discharged from the same sources in the Third Birth. The heat exchange system on LNGCs is such that the water that passes through the vessel and is discharged typically 3 degrees Celsius warmer than the intake water source (Caterpillar, 2012). Due to the relatively small temperature differences and the relatively small volume of discharge compared to the total water within Sabine Pass, any discharged cooling water that is warmer than the ambient water would diminish shortly after the discharge. Therefore, impacts on water quality as a result of cooling water intake and discharge would be intermittent and minor.

3.2.6 Conclusion

Construction and operation of the Project would temporarily decrease water quality within the vicinity of the site as a result of dredging activities, stormwater runoff, and discharge of hydrostatic test water. Impacts on surface waters and water quality associated with dredging activities would be minimized through the implementation of measures outlined in the COE and LDNR authorizations. Through the implementation of SPLNG's ESMP and Project-specific SPCC Plan, and our Procedures, potential impacts resulting from stormwater runoff or the discharge of hydrostatic test water would be adequately minimized or avoided, and not significant. In addition, impacts on water quality resulting from ballast and cooling water discharge would be temporary and minor, only affecting a relatively small area in the vicinity of the marine berth. Additional potential impacts from ballast and cooling water discharges are included in section B.4.2.2.

3.3 Wetlands

Wetlands are areas that are inundated or saturated for a sufficient duration or frequency to provide hydrologic and soil conditions conducive to a specialized assemblage of plant species.

Wetlands provide valuable natural services, including flood control, water filtration, wildlife habitat, and outdoor recreational opportunities.

After reviewing FWS National Wetlands Inventory maps, SPLNG conducted field surveys using methods set forth within the 1987 COE Wetland Delineation Manual and the Regional Supplement (November 2010) to locate and delineate wetlands within the Project areas. Each wetland identified during the delineation was described using the Cowardin classification system (Cowardin et al., 1979).

SPLNG's surveys identified one estuarine intertidal emergent (E2EM) wetland, one estuarine intertidal scrub-shrub (E2SS) wetland, and three palustrine emergent wetlands within the Project workspace. The locations of these wetlands are depicted on figures B.3.2-1 and B.3.2-2. Wetlands impacted by the Project are listed in table B.3.3-1.

Table B.3.3-1
Wetlands Impacted by the SPLNG Third Berth Expansion Project

Facility	Wetland ID	Wetland Classification [a]	Construction Impacts (acres) [b]	Operation Impacts (acres)
Third Birth [c, d]	WA101	E2EM	27.05	27.05
	WA101	E2SS	0.61	0.61
Project Totals			**27.66**	**27.66**

N/A = Not Applicable; Project component would not impact wetlands.

[a] E2EM = estuarine intertidal emergent; E2SS = estuarine intertidal scrub-shrub
[b] Construction impacts are inclusive of operation impacts.
[c] Impacts on the palustrine emergent wetlands located within staging area 5 would be avoided during construction.
[d] A portion of access road 7 would be elevated on the trestle within the Third Birth; therefore, wetland impacts associated with this access road are accounted for in the impacts presented for the Third Birth.

Two wetlands totaling about 27.7 acres would be permanently impacted by the construction of the Third Birth. SPLNG would mitigate for the permanent loss of these two wetlands through the purchase of mitigation credits from Louisiana's In-Lieu Fee Program. In addition, dredge material would be placed at the Louisiana Point DMPA to enhance and protect the existing shoreline. The purchase of mitigation credits and the beneficial use of dredge material would be completed by SPLNG in accordance with the COE and LDNR authorizations.

SPLNG would minimize impacts on wetlands located adjacent to the Project through the implementation of the measures outlined in the FERC Procedures and SPLNG's Project-specific SPCC Plan. In a letter dated June 10, 2019, LDWF recommended that SPLNG install adequate erosion and sediment control measures around Project areas that require land-based earthwork to avoid sedimentation and other potential impacts on adjacent wetlands. SPLNG confirmed that they would implement these measures. SPLNG would also utilize sediment controls, such as silt fence, to avoid impacts on wetlands located within staging area 5. SPLNG stated that Project activities associated with staging area 6 would not impact open water or wetlands.

Based on SPLNG's plan to mitigate for the permanent loss of wetlands and the implementation of our Procedures, the Project-specific SPCC Plan during construction, and SPC-SPCC Plan during operation, we determine that construction and operation of the Project would not have significant impacts on wetlands.

4.0 VEGETATION, WILDLIFE, AND THREATENED AND ENDANGERED SPECIES

4.1 Vegetation

The proposed Project site is within the Southeastern Mixed Forest Province and the Eastern Gulf Prairies and Marshes section. This section predominantly supports mid to tall grass grasslands. Species consist of little bluestem (*Schizachyrium scoparium*), indiangrass (*Sorghastrum nutans*), switchgrass (*Panicum virgatum*), big bluestem (*Andropogon gerardi*), and occasional areas of live oak (*Quercus virginiana*). Poorly drained areas along the coast support freshwater and saltwater marsh vegetation of sedges, rushes, saltgrass, and cordgrass. Natural vegetation has been cleared on 40 percent of the Eastern Gulf Prairies and Marshes section for agricultural crops (USDA, 2018b).

The Project area has been and continues to be significantly modified from its natural condition, beginning in the 1940s when the COE constructed levees around the parcel to contain dredge disposal. Staging area 5 was also cultivated for agricultural purposes prior to its use for a project staging area (approved under Docket No. CP13-2-000 for the Sabine Pass Liquefaction Project Modification). While aerial imagery of staging area 5 indicate that a portion of the site is vegetated, SPLNG stated that the entirety of staging area 5 (with the exception of the three palustrine emergent wetlands that would be avoided) would be developed for industrial use as part of the Sabine Pass Liquefaction Project Modification (CP13-2-000) prior to the start of the Third Berth Expansion Project. Construction and operation impacts on vegetation within the Project site are presented in table B.4.1 and are further discussed below.

Table B.4.1-1
Vegetation Impacted by the SPLNG Third Berth Expansion Project

Facility	Wetland Classification [a]	Construction Impacts (acres) [b]	Operation Impacts (acres)
Third Birth	E2EM	27.05	27.05
	E2SS	0.61	0.61
Project Totals		**27.66**	**27.66**

N/A = Not Applicable; Project component would not impact wetlands.

[a] E2EM = estuarine intertidal emergent; E2SS = estuarine intertidal scrub-shrub
[b] Construction impacts are inclusive of operation impacts.

The Third Berth would be constructed adjacent to the SPLNG Terminal's existing marine berth in an area delineated as industrial, E2EM, and E2SS wetland. The E2EM wetland is

comprised of an herbaceous layer of saline tolerant plants dominated by bulrushes (*Schoenoplectus spp.),* saltgrass (*Distichlis spicata*), and saltwort (*Batis maritima*). E2SS wetlands are dominated by Jesuit's bark (*Iva frutescens*). Other shrub species noted in the area include groundseltree (*Baccharis halimifolia*) and Chinese tallow (*Triadica sebifera*). No submerged vegetation is present within the proposed Project footprint. Construction of the Third Berth would result in the permanent conversion of industrial and estuarine habitats to open water. As discussed in section B.3.3, SPLNG would be required to mitigate for permanent loss of wetlands as part of its Section 404 permit. Therefore, it is anticipated that a comparable amount of wetland vegetation would be created and/or enhanced through SPLNG's required wetland mitigation efforts.

Staging areas 1, 2, 3, 4, and 6 would not require site improvements as these staging areas are existing and entirely within the SPLNG Terminal. Staging area 5 is a previously authorized temporary workspace for the Sabine Pass Liquefaction Project Modification (CP13-2-000). The western half of staging area 5 is currently stabilized with rock base for use as laydown and parking. The eastern half of the staging area has been previously disturbed and is dominated by herbaceous vegetation including little bluestem, switchgrass, and bulrushes (*Typha* spp.). SPLNG was previously authorized to clear the entirety of staging area 5 for use on CP13-2-000; however, as of the writing of this EA, the area has not been entirely cleared. SPLNG stated that they anticipate clearing, grading, and graveling the area as part of the Sabine Pass Liquefaction Project Modification and that it will be industrial prior to use on the Third Berth Expansion Project.

Construction and operation of the Project would permanently remove vegetation within the Project workspaces. The vegetated areas within the Third Berth would be dredged and converted to open water. Due to the amount of vegetation that would be cleared for the Project, the availability of similar vegetation within the region, and SPLNG's proposed wetland mitigation, we conclude that impacts on vegetation would be permanent and minor.

4.2 Wildlife and Aquatic Resources

4.2.1 Terrestrial Wildlife

The Southeastern Mixed Forest Province supports a diverse fauna composed of a mixture of species common in neighboring biotic provinces. The Project would be within the Eastern Gulf Prairies and Marshes section which supports large fauna of herbivores and carnivores that include manatee (*Sirenia*), coyote (*Canis latrans*), and river otter (*Lontra canadensis*). Smaller herbivores include swamp rabbit (*Sylvilagus aquaticus),* fulvous harvest mouse (*Reithrodontomys fulvescens*), eastern wood rat (*Neotoma floridana*), and nutria (*Myocastor coypus*). Common birds of freshwater marshes, lakes, ponds, and rivers include reddish egret (*Egretta rufescens*), white-faced ibis (*Plegadis chihi*), white-fronted goose (*Anser albifrons*), and olivaceous cormorant (*Phalacrocorax brasilianus*). Reptiles and amphibians include American alligator (*Alligator mississippiensis*), Gulf coast salt marsh snake (*Nerodia clarkia*), Gulf coast toad (*Incilius valliceps*), diamondback terrapin (*Malaclemys terrapin*), Mediterranean gecko (*Hemidactylus turcicus*), and the Texas horned lizard (*Phrynosoma cornutum*) (USDA, 2018b).

Based on land use categories and vegetative characteristics, the Project area can be characterized by four basic habitat types: open water, herbaceous upland, estuarine wetland, and industrial; each of which, with the exception of industrial areas, may support a distinct assemblage of wildlife species. Analysis of habitat types, rather than individual species, provides an ecologically meaningful method of evaluating Project-related impacts to wildlife resources. An overview of the wildlife resources in each of the habitat types within the Project-area is provided below. Impacts on aquatic resources are further discussed in section B.4.2.2.

A wide variety of vertebrate species may utilize open water habitats at the Project site. Non-fish vertebrates that may occur within open water habitat at the Project site include American alligators (*Alligator mississipiensis*), marine turtles, river otters (*Lontra canadensis*), nutria (*Myocastor coypus*), West Indian manatees (*Trichechus manatus*), bottlenose dolphins (*Tursiops truncatus*), various duck species, herons, gulls, sandpipers, and other shore birds.

Estuarine wetlands (brackish marsh) are characterized by emergent, hydrophytic vegetation that grows in mesohaline conditions, typically as a result of tidal flooding. These 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, nesting birds, raptors, mammals, reptiles, and amphibians. Approximately 735 species of birds, finfish, amphibians, shellfish, reptiles, and mammals utilize this habitat (Bartlett, 2015).

The herbaceous uplands in the Project area are within staging area 5 and consist of previously disturbed habitat adjacent to industrial activities. Wildlife typical of this habitat type would include more human commensal species such as raccoons, as well as some generalist species including garter snake, turkey vulture, and killdeer.

The primary impacts of construction and operation of the Project on wildlife resources would be the permanent loss of wildlife habitat within the Project site and noise during construction.

Impacts on wildlife from construction of the Project would include displacement, stress, and direct mortality of some limited mobility species such as small mammals, amphibians, and reptiles. Larger and more mobile species would likely relocate to nearby suitable habitat. Construction noise impacts on wildlife would be greatest during pile driving activities, which are expected to occur over 11 months.

The acreage of wildlife habitat lost due to the proposed Project (table 3.2-1) is not expected to significantly impact the faunal resources of the area. Construction of the Third Berth would result in loss of coastal marsh habitat, but SPLNG would beneficially use the 3.6 million y^3 of dredge material to create a mitigation site resulting in the creation or enhancement of similar areas of wildlife habitat. Additionally, the proposed Project site would be fully encompassed by areas that provide similar and ample habitats for wildlife displaced during and after construction of the proposed facilities. Wildlife habitat types that would be impacted by the Project are presented in table B.4.2-1

Table B.4.2-1 Habitats Affected by Construction and Operation of the SPLNG Third Berth Expansion Project			
Project	**Habitat Type[1]**	**Habitat Affected (acres)**	
		Construction/ Temporary	**Operation/Permanent**
Third Berth	Open Water (Perennial river)	49.23	49.23
	Industrial	13.36	13.36
	Estuarine Wetlands	27.66	27.66
Outfall 001	Industrial	0.20	0.12
	Open Water (intermittent stream)	0.01	0.01
Existing Staging Areas	Industrial	272.48	80.16
Existing Access Roads (6)	Industrial	11.24	0
Permanent Access Roads [a]	Industrial	1.02	1.02
Total		**375.20**	**171.56**
[a] A portion of Access Road 7 would be elevated on the trestle within the Third Berth. Acreages for this portion of Access Road 7 have been accounted for as part of the acreages associated with the Third Berth.			

To further minimize impacts on habitat and wildlife, SPLNG would implement the measures outlined in our Plan and Procedures, their Project-specific SPCC Plan (construction), SPC-SPCC Plan (operation), ESMP, and LDWF's June 10, 2019 letter to FERC (as applicable) during construction and operation.

Operation of Project facilities would involve frequent berthing of large ships and an increase in large-vessel traffic in Sabine Pass Channel, but such activities are already common in the vicinity of the proposed Project. Impacts on wildlife as a result of increased vessel traffic is further discussed in sections B.4.2.2 and B.4.2.3.

SPLNG would also install new facilities and structures that would require proper lighting for operations and safety purposes, including column-mounted lights, stanchion-mounted lights, and pendant lights, as further discussed in section B.9.0. SPLNG has indicated that each light would consist of instant re-strike high-pressure sodium lights with down-shields installed to reduce upward illumination, light spill, and glare to minimize visual disturbances of the surrounding wildlife and environment (including ships navigating the Sabine Pass Channel). As the Project is an expansion of an existing industrial facility, the lighting necessary for the Project would be an incremental addition to the overall light pollution in the area. Wildlife in the area have likely either become acclimated to lighting at the SPLNG Terminal or would avoid it. Therefore, we conclude that wildlife would not be significantly impacted by the additional lighting associated with the Project.

4.2.2 Aquatic Resources

The Sabine Pass Channel and the adjacent estuarine wetlands within the Project site support a variety of aquatic resources. Bottom sediments in the Sabine Pass Channel are fine

and consist of sand, silt and clay materials (COE, 2006). The water column is turbid, due to the high sediment load of inflowing waters and disturbance of bottom sediments by wind-action and vessel traffic. Maintenance dredging of the Sabine Pass Channel near the Project site is completed on 3-year cycles and yields approximately 1.9 million y^3 of material per cycle (COE, 2011a). The GMFMC classifies the Sabine Lake estuary as a Mixing Zone (salinity of 0.5-25 ppt), where saline Gulf waters mix with freshwater inflows from Sabine Lake and its tributaries, producing an annual average salinity of 6 ppt (GMFMC, 1998).

Aquatic fauna in the Sabine Basin has changed since the opening of the Sabine Pass Channel, converting it from a freshwater system, similar to that which is currently present in the upper Neches and Sabine Rivers, to a saline/brackish system typical of Galveston Bay and other Texas estuaries (FWS, 2016). Despite on-going maintenance dredging and ship traffic, Sabine Pass Channel supports a wide variety of shellfish and finfish species. Commercial finfish harvest is insignificant in the area, but recreational fishing is an important industry, with 500,000 man-hours of recreational fishing estimated annually (Blackburn et al., 2001). Species commonly targeted by anglers include spotted seatrout (*Cynoscion nebulosus*), flounder (*Paralichthys lethostigma*), red drum (*Sciaenops ocellatus*), gafftopsail catfish (*Bagre marinus*), sand seatrout (*Cynoscion arenarius*), sheepshead (*Archosargus probatocephalus*), southern flounder (*Paralichthys lethostigma*), and black drum (*Pogonias cromis*). The annual value to the Texas economy from sales of goods and services associated with recreational fishing in the Sabine Lake estuary has been estimated at $42.3 million (Ropicki et. al., 2016; Green et al., 2002). A few oyster reefs are found in the southern portion of Sabine Lake and Sabine Pass Channel (GMFMC, 1998; COE, 2012), but molluscan shellfish harvesting is prohibited in the Sabine Lake system by the Texas Department of Health (Texas Department of State Health Services, 2018). Louisiana has designated Sabine Lake as a "Public Oyster Area." However, no harvesting is currently allowed due to water quality issues, as further discussed in section B.3.2 (COE, 2012).

Estuarine species potentially occurring within the Project area include menhaden, shrimps, crabs, and sciaenids. True-estuarine fishes, which inhabit estuaries throughout their entire life, that are likely to occur within the Project area include killifishes (*Fundulus* spp.), sheepshead minnow (*Cyprinodon variegatus*), mosquito fish (*Gambusia affinis*), inland silverside (*Menidia beryllina*), striped mullet (*Mugil cephalus*), Atlantic croaker (*Micropogonias undulatus*), spot (*Leiostomus xanthurus*), hardhead catfish (*Arius felis*), silver perch (*Bairdiella chrysoura*), hogchoker (*Trinectes maculatus*), puffer (*Sphoeroides parvus*), and ladyfish (*Elops saurus*). The estuarine organisms in the Project area provide an important food source for other, non-estuarine dependent fishes, including coastal pelagic marine fishes and freshwater fishes (Patillo et al., 1997).

Impacts on aquatic resources within the Project area would primarily occur as a result of dredging and pile driving during construction and increased ship traffic during operation.

Dredging

The Project would dredge 3.6 million y^3 of material for construction of the Third Berth. Approximately 27.7 acres of estuarine wetlands, 13.4 acres of industrial land, and 49.2 acres of existing open water habitat would be dredged for the Project. Dredged material would be utilized to develop a selected mitigation site, as further discussed in section B.3.3.

Dredging of the Third Berth would be accomplished by the use of cutter suction dredges that would employ both hydraulic and mechanical excavation. Although dredging itself may not occur 24 hours per day, activities associated with dredging (repositioning the equipment, maintenance, etc.) would occur 24 hours per day, seven days a week. Mechanical and hydraulic dredging activities would overlap, with mechanical and hydraulic dredging anticipated to last 210 days 270 days, respectively.

Dredging activities would temporarily increase noise, turbidity, and sedimentation within the water column, which could reduce light penetration and the corresponding primary production of aquatic algae and phytoplankton. Increased turbidity and sedimentation could also adversely affect fish eggs and juvenile fish survival, benthic community diversity and health, foraging success, and suitability of spawning habitat. Further, sediments in the water column could be deposited on nearby substrates, burying aquatic macroinvertebrates. Impacts on aquatic resources due to increased turbidity and sedimentation would vary by species.

The results of modeling conducted by SPLNG indicate that turbidity in the area would return to background levels within 24 hours inside the Third Berth and at the channel. Therefore, approximately one day would be required for the plume material to be dispersed or settled. The maximum sediment accumulation after 2 months of dredging estimated by the model is about 2.5 millimeters across the slip and channel entrance. It would be expected that any residual sediments from dredging would eventually be flushed from the berth by tidal currents and shipping traffic. However, due to the elevated turbidity levels as a result of continuous dredging of the Third Berth for 270 days, we anticipate that the majority of more mobile species would avoid the Project area until dredging is complete. Less mobile species, such as benthic invertebrates that are not directly removed during dredging, could be killed through sediment deposition outside of the Third Berth dredge area.

SPLNG performed acoustical modeling and analysis of potential underwater sound levels due to hydraulic dredging. The underwater noise thresholds for injury and behavioral disturbance for fish are the same as those described for pile driving in the following section. Based on the estimates of underwater sound that would occur during dredging, behavioral disturbance of fish would occur within 96 feet of the dredge and injury would occur within 89 feet (see table B.4.2-3).

Use of the cutter head dredge generally reduces turbidity when compared to other dredging methods, thus minimizing the extent of increased turbidity in the Project area. Based on existing conditions at the Project site, as well as the minimization and mitigation measures proposed by SPLNG, impacts on aquatic resources as a result of dredging are not anticipated to be significant.

Pile Driving

Although several different types of Project activities would produce underwater sound, pile driving would generate the underwater sound levels with the greatest potential to result in injury and/or behavioral disturbance of fish. Many other underwater noises are produced by construction activities that increase ambient noise levels, but these are generally not harmful to fish (underwater sound impacts on sea turtle and marine mammals are discussed in sections B.4.5.1 and B.4.5.3, respectively). Different species in the same environment may respond to noise differently, with effects ranging from physical to physiological to behavioral, which may be evidenced by decreased auditory sensitivity, loss of hearing, behavioral changes (primarily avoidance which can increase energy expenditure and thus reduce fitness), or by masking acoustic cues that are important for evading predators or anthropogenic hazards (e.g., vessels, fishing equipment).

Potential impact thresholds for fish were determined using a spreadsheet that was developed by National Marine Fisheries Service (NMFS) as a tool for assessing the potential effect on fish exposed to elevated levels of underwater sound produced during pile driving (Stadlar and Woodbury, 2009), as well as the California Department of Transportation's *Technical Guidance for Assessment and Mitigation of the Hydroacoustic Effects of Pile Driving on Fish* (ICF Jones and Stokes, 2012). Together, these guidance documents establish pressure thresholds for injury and behavioral disturbance for fish during pile driving activities. NMFS uses 150 decibels (dB) referenced to 1 micro Pascal (re 1 μPa) as the threshold for behavioral effects on fish species citing that noise levels in excess of 150 dB re 1 μPa can cause temporary behavior changes (startle and stress) that could decrease a fish's ability to avoid predators (NMFS, 2018). Table B.4.2-2 identifies the underwater sound thresholds for the onset of injury in fish.

Approximately 116 piles over an estimated 9-month period would be installed. Piles would be installed for 10 hours per day, six days per week. Table B.8.2-2 presents a summary of SPLNG's expected pile driving schedule for the Project.

Marine piles would be driven by vibratory pile drivers and finished with impact pile drivers and may use either land-based or floating pile-driving rigs. 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 that is being used. In discussing the impacts of sound on aquatic resources, it is important to note the difference in sound intensity in air versus water. Sound in water and sound in air are both waves that move similarly and can be characterized the same way; however, the differences in density and sound speed (the speed at which the sound wave travels through the medium, in this case air or water) result in a different reference pressure in air than in water.

Table B.4.2-2 Underwater Sound Thresholds for Fish		
Functional Hearing Group	**Underwater Sound Thresholds [b]**	
	Behavior Disturbance Threshold	**Injury Threshold**
Fish ≥ 2 grams [a]	150 dB RMS	187 dB SEL_{cum}
Fish < 2 grams [a]	150 dB RMS	183 dB SEL_{cum}
Fish All sizes [a]	150 dB RMS	206 dB Peak

[a] From California Department of Transportation's *Technical Guidance for Assessment and Mitigation of the Hydroacoustic Effects of Pile Driving on Fish* (ICF Jones and Stokes, 2012).

[b] dB = decibel
Peak = peak sound pressure
RMS = root mean-square sound pressure
SEL_{cum} = cumulative sound exposure level

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 Bing-Sawyer, 2002; Popper et al., 2006). Underwater sound pressure levels generated by pile driving could affect sea turtles, fish, and marine mammals by causing decreased auditory sensitivity, loss of hearing, behavioral changes (primarily avoidance which can increase energy expenditure and thus reduce fitness), or by masking acoustic cues that are important for evading predators or anthropogenic hazards (e.g., vessels, fishing equipment).

SPLNG would implement the following measures to reduce impacts on aquatic resources during pile driving:

- use of soft starts, gradually increasing the intensity of pile driving activities, to allow marine life to leave the area;
- use of vibratory hammers for the majority of in-water pile driving, with diesel impact hammers used to proof pile installation and minimize impact energy to the extent feasible in order to lower underwater sound pressure levels; and
- use of cushion blocks between the pile and the hammer or bubble curtains to minimize the noise generated while driving the pile.[7]

The maximum anticipated distances to the behavior and injury thresholds for fish during in-water pile driving of the 54-inch-diameter steel piles are presented in table B.4.2-3 and were calculated assuming implementation of the mitigation measures identified. Dredging activities would also result in increased underwater noise. Hydraulic cutterhead dredges typically have a sound pressure level at 1 meter ranging from 172 dB to 185 dB re 1 µPa (Central Dredging Association, 2011). For the purposes of this analysis, SPLNG assumed a cutterhead dredge

[7] As identified by SPLNG in their July 3, 2019 responses to our June 14, 2019 Environmental Information Request, which are available on the FERC eLibrary website at https://elibrary.ferc.gov/idmws/search/fercadvsearch.asp under accession number 20190703-5150.

would be operating in the soft substrates characteristic of the Project site, with an underwater sound pressure level of 172 dB re 1 µPa at 1 meter.

Table B.4.2-3

Calculated Distances to Underwater Noise Thresholds from Dredging and Mitigated In-water Pile Driving

Activity	Marine Fauna	Distance from Source in which Threshold would be Exceeded [a]		
		Injury due to Peak Pressure [b]	Injury due to Accumulated Sound Exposure (SEL_{cum}) [c]	Behavioral Disturbance (RMS) [d]
Impact pile driving	Fish ≥ 2 grams	13 feet	1,221 feet	7,065 feet
	Fish < 2 grams		1,522 feet	
Vibratory pile driving	Fish ≥ 2 grams	< 1 foot	127 feet	328 feet
	Fish < 2 grams		772 feet	
Dredging	Fish ≥ 2 grams	N/A	48 feet	96 feet
	Fish < 2 grams		89 feet	

[a] Source NMFS, 2018
[b] Peak = peak sound pressure
[c] SEL_{cum} = cumulative sound exposure level
[d] RMS = root mean-square sound pressure

Based on the distances presented in table B.4.2-3, the in-water pile driving and dredging could result in injury and behavior disturbance to fish species (and other aquatic species including marine mammals) that remain in the Project area after the soft-starts. To ensure that actual underwater noise from pile driving is not significantly greater than predicted noise and that impacts on fish and other aquatic species is appropriately minimized, SPLNG committed to perform underwater sound level measurements during the initial in-water test piling phase. Sound levels would be measured at appropriate distances during the initial test piling to quantify the underwater sound levels due to the pile driving. SPLNG would then compare the sound levels used in the underwater noise evaluation to ensure that they are consistent with the anticipated levels. SPLNG has not committed to providing the results of the underwater sound levels measured during the initial test piling to FERC or the NMFS. Therefore, **we recommend that:**

- **Following the completion of the initial in-water test piling phase and prior to initiating construction pile driving activities, SPLNG should file with the Secretary of the Commission (Secretary), for review and approval of the Director of the Office of Energy Projects (OEP), the results of its underwater sound level measurements and any additional mitigation measures that it would implement to reduce noise to predicted levels. The test results and any associated mitigation should also be filed with the NMFS.**

Through the implementation of the proposed mitigation measures as well as our recommendation, we conclude that impacts on fish from pile driving would not be significant.

Spills

During construction and operation, hazardous materials resulting from spills or leaks could have adverse impacts on aquatic resources. Impacts from hazardous materials would be caused by either the physical nature of the material (e.g., physical contamination and smothering) or by its chemical components (e.g., toxic effects and bioaccumulation). These impacts would depend on the depth and volume of the spill, as well as the properties of the material spilled. To prevent spills and leaks, SPLNG would implement its Project-specific SPCC Plan during construction and SPC-SPCC Plan during operation, which outline potential sources of releases at the site, measures to prevent a release, and initial responses in the event of a spill. Increased vessel traffic during construction and operation of the Project would also result in an increased potential for spills of hazardous materials; however, all ships are required to maintain a Shipboard Oil Pollution Emergency Plan (SOPEP) to minimize impacts on aquatic resources. Given the impact minimization and mitigation measures described above, we conclude that the probability of a spill of hazardous materials is small and any resulting impacts on aquatic resources would be temporary and not significant.

Hydrostatic Test Water

Hydrostatic testing for the project is proposed for firewater, wastewater/storm sewer lines and potable/utility water lines. A total of approximately 40,000 gallons of water would be used for hydrostatic testing. Water supplied by the SPLNG Terminal's existing waterline would be the source water used for dust suppression during construction.

Hydrostatic test water would be discharged over an eight-month period to the existing stormwater management system and not to existing surface waters. No chemicals would be added to the hydrostatic test water before or after testing, and the discharge would be tested for total suspended solids, oil and grease, and pH prior to discharge in accordance with the LPDES Hydrostatic Test Wastewater Discharge Permit requirements; therefore, no adverse impacts on aquatic resources from hydrostatic testing would be anticipated.

Lighting

For safety and security purposes, the marine facilities at the Third Berth would require additional lighting. To avoid attracting aquatic species that rely on light for movement and feeding patterns, SPLNG would minimize over-water lighting to the extent necessary to carry out marine operations. Lighting for the Third Berth would be similar to approved lighting currently in place for the existing SPLNG Terminal marine berths and other marine facilities in the area. Therefore, we conclude that impacts on aquatic resources from lighting would not be significant.

Vessel Traffic

Potential impacts on aquatic resources resulting from increased vessel traffic include shoreline erosion and resuspension of sediments, ballast water discharges, cooling water discharges, and increased noise levels.

Impacts on aquatic resources resulting from shoreline erosion and resuspension of sediments would primarily be limited to increased turbidity. Impacts on aquatic resources from increased turbidity would be similar to that discussed for dredging but would be on a smaller scale. The wake from large vessels transiting the Sabine Pass Channel and the Third Berth could also result in shoreline erosion. SPLNG would install rock revetment slope protection to prevent erosion of the shoreline within the Third Berth. The increased potential for shoreline erosion along the Sabine Pass Channel as LNGCs approach or depart the SPLNG Terminal would be consistent with the existing ship traffic in the channel and the intended use of the Sabine Pass Channel. The addition of 180 LNGCs per year would be an incremental increase in the overall annual ship traffic within the Sabine Pass Channel. Additional information regarding marine traffic is presented in section B.7.4.2.

Support vessels involved in the general construction activities would include tenders, barges, and tugs. Typical levels for construction and maintenance ships range from 150 to 180 dB re 1 µPa root mean-square sound pressure (RMS) (Protection of the Marine Environment of the North-East Atlantic, 2009). SPLNG expects that use of these vessels would be sporadic with long periods of inactivity, similar to the existing water craft and activities in the channel. The frequency of LNGCs would increase as a result of the Project and it is anticipated that more mobile aquatic species would temporarily leave the area. Noise levels from the additional LNGCs during operation would be consistent with the existing ship traffic calling on the SPLNG Terminal. In general, underwater noise from construction support vessels and additional LNGCs would not be expected to cause a significant impact on aquatic resources.

Ballast Water

The effects of ballast water discharges on ambient water quality parameters including temperature, pH, dissolved oxygen, and salinity are described in section B.3.2.5. Ballast water is stored below the ship's hull; as a result, the temperature of the discharged water is not expected to deviate substantially from ambient water temperature.

Operationally, the LNGCs would be discharging bulk ballast with only two pumps running at a maximum discharge rate of 6,000 m^3/hour (cubic meters per hour) (1,585,205 gallons/hour). The time to discharge the complete ballast volume would be approximately 15 hours and would be fully aligned with the loading of the LNGC for stability, draft and trim purposes. Therefore, the average discharge rate would equate to approximately 4,100 m^3/hour (1,083,223 gallons/hour). Ballast water discharges would mix with waters in the Third Berth and then would be circulated into the waters of the Sabine Pass Channel through natural river flows and tidal actions.

Ballast discharge could impact water quality, fish, and other aquatic organisms. The general characteristics of the discharged ballast water would be very similar to that of the water pumped aboard each LNGC during the mandatory ballast water exchange operation. The location, weather, and existing tidal/current conditions where this ballast water exchange would take place would determine the unique characteristics of the ballast seawater aboard each LNG carrier upon its arrival at the marine berth. Discharge of ballast water could result in temporary

and localized changes in salinity, dissolved oxygen, and temperature which could have minor impacts on aquatic species in the vicinity. Ballast discharge could also result in the introduction of nonindigenous aquatic species which could also impact fish and other aquatic organisms.

Ballast water would be discharged near the bottom of the Third Berth where dissolved oxygen levels are generally lower. Depending on the oxygen levels present in both the ballast and ambient water at the time of discharge, aquatic resources present in the vicinity of the discharge point could be exposed to dissolved oxygen levels considered unhealthy for aquatic life. More mobile species such as fish would likely temporarily relocate from the area. Whereas, less mobile species such as mollusks may experience increased stress or death if dissolved oxygen levels were to remain low. Changes in salinity and temperature would similarly be anticipated to return to background levels within proximity of the LNGC. Due to the quantity of ballast water that would be discharged and the ability of most species to move over short distances to more suitable conditions, we have determined that the impact of ballast water on aquatic resources resulting from changes in dissolved oxygen levels, salinity, and temperature would be localized and not significant.

A primary environmental concern regarding ballast water discharge is the potential for the introduction of non-native species in the ecosystem. Ballast water may contain a diverse assemblage of marine organisms that may be non-native to a vessel's destination port. Non-native species may threaten to outcompete and exclude native species, which may affect the overall health of an ecosystem, cause algal blooms and hypoxic conditions, and/or affect all trophic levels resulting in a decline in biodiversity.

The Coast Guard's ballast water management regulations (33 CFR 151.2025 and 46 CFR 162) established a standard for the allowable concentration of living organisms in ships' ballast water discharged into waters of the U.S. The Coast Guard also established engineering requirements and an approval process for ballast water treatment systems installed on ships. All ships calling on U.S. ports must either carry out open sea exchange of ballast water or ballast water treatment, in addition to fouling and sediment management and document these activities in the ship's log book. In 2017, the International Convention for the Control and Management of Ships' Ballast Water and Sediments developed measures that must be implemented to minimize the potential for introduction of non-native species through ballast water. These measures have since been adopted by the International Maritime Organization and are required to be implemented in all ships engaged in international trade. While the open sea exchange of ballast water has been used in the past and reduces the potential for non-native species introductions, on-board ballast water treatment systems are more effective at removing potential non-native species from ballast water. There are two different standards that ships must meet. All new ships must meet the "D-2" performance standard, which establishes the maximum number of viable organisms allowed to be discharged in ballast water. Conformity with the D-2 standard requires ships to utilize on-board ballast water treatment systems. Existing ships that do not currently have on-board ballast water treatment systems must continue to, at a minimum, conduct open sea exchanges of ballast water ("D-1" standard). Eventually, all ships will be required to conform with the D-2 standard. The timetable for conformity with the D-2 standard

for existing ships is based on the date of the ship's International Oil Pollution Prevention Certificate renewal survey, which occurs every five years (International Maritime Organization, 2017). Therefore, most ships calling on the Project, estimated to begin in 2023 at the earliest, would be expected to have conformed to D-2 standards.

Ships are required to keep logs documenting their open water ballast exchanges or ballast water treatment to comply with the Coast Guard's regulations. With the implementation of these mandatory practices required by the Coast Guard and the International Maritime Organization, we conclude that impacts on aquatic resources as a result of the potential introduction of non-native species through ballast water discharge would be negligible.

Cooling Water

While at the marine berth, ship cooling water would be withdrawn and discharged below the water line on the sides of the ship through screened water ports, also known as "sea chests." Water intakes would result in the impingement and entrainment of small fish and ichthyoplankton (fish larvae and eggs). While screens on the sea chests would minimize these impacts, it is anticipated that most of the entrained or impinged organisms would not survive.

The Third Berth would be sized to accommodate LNGCs that range in capacity from 125,000 m^3 to 180,000 m^3. LNGCs calling at the SPLNG Terminal would include steam turbine, dual fuel diesel electric propulsion, and M-type electronically controlled gas injection (MEGI) type vessels. While at the berth, the LNGCs would not require engines to be run at full power. Therefore, proportionately less cooling water would be required during loading than while the LNGC is under way. During maneuvering and while berthed, cooling water would be circulated through the LNGC at an average flow rate of 3,000 m^3/hr (792,516 gallons/hr). The volume of water discharged by LNGCs would be relatively small compared to the total volume of water within the Third Berth. Approximately 60,000 m^3 (15,850,323 gallons) of seawater would be transferred at the Third Berth per vessel per visit, which would equal approximately 2.5 percent of the total Third Berth volume.

Cooling water return temperatures can vary widely depending on the type of LNGC and mode of operation. Cooling water discharged at the Project berth while in port-mode could range from between 1.5 degrees Celsius (ºC) and 4.3 degrees C greater than ambient temperatures (Caterpillar, 2007; 2011; 2012). However, cooling water discharges modeled for a proposed LNG facility in Warrenton, Oregon, using a more conservative estimate for temperature of discharge water (6 – 9 ºC above ambient) found that discharge water from 213,000 m^3 capacity vessels raised the temperature of the receiving water by 0.3 ºC at a distance of 4.2 to 5.6 meters from the discharge port. At 14 to 21 meters from the discharge port the cooling water/receiving water mixture cooled to 0.14 ºC above ambient temperature. The mixing time for the cooling water/receiving water mixture to achieve 0.14 ºC above ambient temperature was approximately 15 to 30 seconds (Oregon LNG, 2008).

Due to the relatively small temperature differences and the relatively small volume of discharge compared to the total water within the Sabine Pass Channel, any discharged cooling

water that is warmer than the ambient water would diminish shortly after discharge and would not be anticipated to significantly impact aquatic resources.

4.3 Essential Fish Habitat

The Magnuson-Stevens Fisheries Conservation and Management Act (MSA) (Public Law 94-265, as amended through October 11, 1996) was established, along with other goals, to promote the protection of Essential Fish Habitat (EFH) during the review of projects to be conducted under federal permits and licenses, or other authorities that affect or have the potential to affect such habitat. EFH is defined in the MSA as those waters and substrates necessary to fish for spawning, breeding, feeding, or growth to maturity. Federal agencies that authorize, fund, or undertake activities that may adversely affect EFH must consult with NMFS.

Although absolute criteria have not been established for conducting EFH consultations, NMFS recommends consolidated EFH consultations with interagency coordination procedures required by other statutes, such as NEPA, the Fish and Wildlife Coordination Act, and the ESA, 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 EA or 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 Assessment 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, NMFS 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 NMFS. The action agency may notify NMFS 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. For any conservation recommendation that is not adopted, the action agency must explain its reason to NMFS for not following the recommendation.

Specific habitats include all estuarine water and substrate (mud, sand, shell and rock) and all associated biological communities, such as sub-tidal vegetation (seagrasses and algae) and the adjacent inter-tidal vegetation (marshes and mangroves). EFH represents areas of high economic importance due to the dependence of recreational and commercial fisheries directly and indirectly associated with these areas. Of the fish species considered by NMFS to potentially occur within the Project area, EFH habitat for these species consists of tidally influenced waters (estuarine water column) and tidally influenced marsh. SPLNG consulted with NMFS on July 11, 2018 regarding species and life stages with EFH in the Project area. Table B.4.3-1 provides a list of managed EFH species in the Project area, habitat preference, and life stage when they may be expected to occur.

Table B.4.3-1
Managed EFH Species Likely to Occur in the Project Area

Species		Life Stage		Habitat Type
Common Name	**Scientific Name**	**Juvenile**	**Adult**	
White shrimp	*Litopenaeus setiferus*	X		Estuarine emergent wetlands, soft bottom
Brown shrimp	*Farfantepenaeus aztecus*	X		Estuarine emergent wetlands, soft bottom
Gray snapper	*Lutjanus griseus*		X	Estuarine emergent wetlands, soft bottom
Lane snapper	*Lutjanus synagris*	X		Soft bottom
Red drum	*Sciaenops ocellatus*	X	X	Estuarine emergent wetlands, soft bottom
Spanish mackerel	*Scomberomorus maculates*	X	X	Estuarine emergent wetlands, soft bottom

As described in section B.4.2.2, construction of the Project would result in temporary increases in noise, turbidity, and sedimentation within the estuarine water column. Impacts on managed species during construction and operation of the Project would be similar to those described above for aquatic resources (see section B.4.2.2). Construction of the Project would result in the permanent conversion of 26.8 acres existing estuarine emergent wetland EFH to soft bottom EFH. In addition, 49.2 acres of existing soft bottom EFH (within the Sabine Pass Channel) would be temporarily disturbed and deepened; however, following the completion of the Project this area would continue to serve as soft bottom EFH. SPLNG would mitigate impacts on estuarine emergent wetlands through beneficial use.

Dredging activities would result in the removal of the existing mud substrates, in turn removing the existing benthic community. In addition, sediments resuspended in the water column during dredging and other construction activities would be redeposited on nearby substrates, potentially smothering immobile fish eggs and larvae as well as benthic invertebrates. Dredging activities could also cause mortality of larval and juvenile shrimp as well as fish species in the immediate vicinity of the cutterhead of the dredge. Impacts on soft bottom habitat would be greatest if dredging occurs during a period of peak larval abundance in early spring or summer. Increased turbidity associated with dredging would also impact the estuarine water

column, temporarily reducing habitat quality through localized increases in suspended sediment and nutrient levels and decreases in dissolved oxygen. These impacts are anticipated to be short-term but could have localized effects on movement and foraging of managed fish species within the estuarine water column habitat.

Ship traffic associated with construction and operation of the Project could affect the estuarine water column within the Sabine Pass Channel and the Third Berth. Impacts on water quality may occur due to resuspension of suspended solids, discharge of ballast water, and intake and discharge of cooling water. However, the Sabine Pass Channel was specifically created to provide deep water access for maritime commerce and support high levels of deep draft ship traffic. Therefore, impacts on the estuarine water column as a result of increased ship traffic are not anticipated to be significant.

In addition to the initial dredging within the Third Berth, SPLNG would also conduct periodic maintenance dredging of the maneuvering basin. SPLNG anticipates that maintenance dredging would be necessary every year. Impacts on EFH as a result of maintenance dredging would be similar to that discussed above for the initial dredging activities associated with the Project and would not result in a change in EFH type. Therefore, impacts on EFH as a result of maintenance dredging would not be significant.

4.4 Migratory Birds

Migratory birds follow broad routes called flyways between breeding grounds in the north and wintering grounds in 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. The proposed Project site is on the border of the Central Flyway and the Mississippi Flyway, an important pathway for migratory birds, with many coastal and marine species using the coastlines of Louisiana and Texas during migration (FWS, 2019). The vegetation communities within the Project area provide potential habitat for a wide variety of migratory bird species including songbirds, waterbirds, and raptors. Migratory birds are federally protected under the MBTA. The MBTA (16 USC 703-711) as amended, implements protections for many native migratory game and non-game birds, with exceptions for the control of species that cause damage to agricultural or other interests. The MBTA prohibits the take of any migratory bird or their parts, nest, and eggs, where "take" means to "pursue, hunt, shoot, wound, kill, trap, capture, or collect." In addition to the MBTA, the Bald and Golden Eagle Protection Act provides additional protection to bald and golden eagles. Bald eagles could occur in the Project area year-round. While suitable foraging habitat is available in and around the Project site, no suitable nesting habitat is present.

Executive Order 13186 requires all federal agencies undertaking activities that may negatively affect migratory birds to take a prescribed set of actions to further implement the MBTA, and directs federal agencies to develop a memorandum of understanding with the FWS that promotes the conservation of migratory birds. FERC entered into a MOU with the FWS in March 2011 (MOU-FWS). The focus of the MOU-FWS is on avoiding or minimizing adverse

impacts on migratory birds and strengthening migratory bird conservation through enhanced collaboration between the two agencies.

Though all migratory birds are afforded protection under the MBTA, both Executive Order 13186 and the MOU-FWS require that Birds of Conservation Concern and federally listed species be given priority when considering effects on migratory birds. Birds of Conservation Concern are a subset of MBTA-protected species identified by FWS as those in the greatest need of additional conservation action to avoid future listing under the ESA. Executive Order 13186 states that emphasis should be placed on species of concern, priority habitats, key risk factors, and that particular focus should be given to addressing population-level impacts. According to the FWS Information for Planning and Consultation online database, 46 species of migratory birds of particular concern may be found in the Project area as indicated in table B.4.3-1.

Table B.4.4-1

Migratory Bird Species Potentially Occurring in SPLNG Third Berth Expansion Project

Common Name	Scientific Name
American Golden-plover	(*Pluvialis dominica*)
American Oystercatcher	(*Haematopus palliates*)
Bald Eagle	(*Haliaeetus leucocephalus*)
Black Rail	(*Laterallus jamaicensis*)
Black Scoter	(*Melanitta nigra*)
Black Skimmer	(*Rynchops niger*)
Black-legged Kittiwake	(*Rissa tridactyla*)
Bonaparte's Gull	(*Chroicocephalus philadelphia*)
Brown Pelican	(*Pelecanus occidentalis*)
Buff-breasted Sandpiper	(*Calidris subruficollis*)
Clapper Rail	(*Rallus crepitans*)
Common Loon	(*Gavia immer*)
Common Tern	(*Sterna hirundo*)
Double-crested Cormorant	(*Phalacrocorax auritus*)
Great Black-backed Gull	(*Larus marinus*)
Gull-billed Tern	(*Gelochelidon nilotica*)
Herring Gull	(*Larus argentatus*)
Hudsonian Godwit	(*Limosa haemastica*)
King Rail	(*Rallus elegans*)
Le Conte's Sparrow	(*Ammodramus leconteii*)
Least Tern	(*Sterna antillarum*)
Lesser Yellowlegs	(*Tringa flavipes*)
Long-billed Curlew	(*Numenius americanus*)
Long-tailed Duck	(*Clangula hyemalis*)
Magnificent Frigatebird	(*Fregata magnificens*)
Marbled Godwit	(*Limosa fedoa*)
Nelson's Sparrow	(*Ammodramus nelsoni*)
Northern Gannet	(*Morus bassanus)*

Table B.4.4-1 Migratory Bird Species Potentially Occurring in SPLNG Third Berth Expansion Project	
Common Name	**Scientific Name**
Parasitic Jaeger	(*Stercorarius parasiticus*)
Pomarine Jaeger	(*Stercorarius pomarinus*)
Prothonotary Warbler	(*Protonotaria citrea*)
Red-breasted Merganser	(*Mergus serrator*)
Reddish Egret	(*Egretta rufescens*)
Ring-billed Gull	(*Larus delawarensis*)
Royal Tern	(*Thalasseus maximus*)
Seaside Sparrow	(*Ammodramus maritimus*)
Semipalmated Sandpiper	(*Calidris pusilla*)
Short-billed Dowitcher	(*Limnodromus griseus*)
Sprague's Pipit	(*Anthus spragueii*)
Surf Scoter	(*Melanitta perspicillata*)
Swallow-tailed Kite	(*Elanoides forficatus*)
Whimbrel	(*Numenius phaeopus*)
White-winged Scoter	(*Melanitta fusca*)
Willet	(*Tringa semipalmata*)
Wilson's Plover	(*Charadrius wilsonia*)
Yellow Rail	(*Coturnicops noveboracensis*)
Source: FWS, 2018a	

Colonial waterbirds, a subset of migratory birds, generally 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).[8] No colonial waterbird rookeries have been identified in the Project area. In a letter dated May 15, 2018, the FWS recommended that SPLNG survey the Project area prior to commencing construction activities to ensure that no rookeries are present. If rookeries are present in the Project area, the FWS recommended that SPLNG maintain buffers around the rookeries ranging from 650 feet to 1,000 feet, depending on the species and train Project personnel in the identification of colonial nesting birds and their nests. We requested that SPLNG commit to implementing the measures recommended by FWS. To date, SPLNG has not committed to implementing these measures. Therefore, **we recommend that**:

- **<u>Prior to construction</u>, SPLNG should file with the Secretary documentation of correspondence with the FWS regarding the results of pre-construction rookery surveys and measures that SPLNG would implement in the event that rookeries are**

[8] 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 (e.g., least terns) will nest in developed areas, many waterbirds (e.g., great blue heron and great egrets) are wary of human activity.

identified within the Project area, for review and written approval by the Director of OEP.

Habitat for migratory birds exists within a wide range of conditions adjacent to the SPLNG Terminal, including marsh, coastal areas, and woodlands; however, the Project would impact only a small area of marsh habitat adjacent to the existing marine berth. Construction and operation of the Third Berth would not be anticipated to affect migratory birds in the area due to the relatively minor impacts on undisturbed terrestrial habitat. Previous comments from FWS regarding impacts on migratory birds at the SPLNG Terminal expressed concerns with regard to the effects of "lighting, communication, and/or flare towers associated with the operation of the LNG terminal…" Lighting for the Third Berth would be consistent with the previously approved lighting at the existing berth at the SPLNG Terminal, and no communications towers or additional flares are proposed as part of the Project. Birds in the area have either become acclimated to activities at the SPLNG Terminal or would avoid it. SPLNG correspondence with FWS via email on June 21, 2018 concluded no suitable nesting habitat occurs in the Project area. No issues have been identified with the proposed facilities and no additional mitigation has been recommended. Therefore, we conclude that the Project would not result in significant impacts on migratory birds.

4.5 Special Status, Threatened, and Endangered

Federal agencies are required under Section 7 of 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 endangered or threatened species, or result in the destruction or adverse modification of the designated critical habitat of a federally listed species.

As the lead federal agency authorizing the Project, FERC is required to consult with the FWS and/or NMFS, to determine whether federally listed threatened or endangered 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. In accordance with Section 380.13(b) of FERC's Order 603, however, the project sponsor is designated as FERC's non-federal representative for purposes of initial coordination and informal consultation with the FWS and the NMFS. In compliance with ESA, SPLNG has been assisting FERC in meeting its Section 7 obligations by conducting informal consultations with the FWS and NMFS about species under their jurisdictions that would be potentially affected by the Projects. In addition, SPLNG also consulted with TPWD, LDWF, and reviewed publicly available resources.

4.5.1 Federally Listed Species

Sixteen species are federally listed as threatened or endangered (T&E) with potential to occur in the proposed Project area, including three birds, one fish, five marine reptiles, five marine mammals, one shark, and one ray (see table B.3.4-1). Impacts on T&E species were assessed for the Project site as well as the proposed placement of dredge material for mitigation at the Louisiana Point DMPA. The listed fish species, the Gulf sturgeon, is not known to occur west of the Mississippi River. As a result, we have determined that the Project would have no

effect on Gulf sturgeon and this species is not discussed further. In addition, the oceanic whitetip shark would occur only along the LNGC transit routes. This species does not spend time at the surface, minimizing the potential for vessel strikes. Therefore, we have determined that the Project would have no effect on the oceanic whitetip shark and this species is not discussed further.

SPLNG would utilize EIs during all phases of construction. The EIs would be trained to identify T&E species. In addition, all construction staff would receive general environmental training that would include awareness of the potential for T&E species thought to occur in the area. If any T&E species were observed in the immediate Project area during active construction, the EIs, along with the SPLNG environmental leads, would determine if there was a need for any special avoidance or minimization measures. The EIs also have stop work authority in the instance of T&E occurrence.

Table B.4.5-1 Federally Listed Species within the Project Area				
Species	**Status**	**Preferred Habitat**	**Effect Determination**	**Justification**
Birds				
Black rail (*Latterallus jamaicensis*)	Proposed Threatened	Salt, brackish, and freshwater marshes.	Not likely to jeopardize the continued existence	Suitable habitat is present within the Project area.
Piping plover (*Charadrius melodus*)	Threatened	Beaches, mudflats, and sandflats.	Not likely to adversely affect Not likely to result in the adverse modification of designated critical habitat	Suitable habitat is not present in the Project area; however, critical habitat is present at the Louisiana Point DMPA.
Red Knot (*Calidris canutus rufa*)	Threatened	Shoreline habitat.	Not likely to adversely affect	Suitable habitat is present within the Project area.
Fish				
Gulf sturgeon (*Acipenser oxyrinchus desotoi)*	Threatened	Marine systems with muddy to sandy bottoms and seagrass habitats.	No effect	Suitable habitat is not present in the Project area.
Marine Reptiles				
Kemp's Ridley sea turtle (*Lepidochelys kempii*)	Endangered	Gulf and bay systems.	Nesting: No effect Foraging: Not likely to adversely affect	Species does not nest in the Project region. Suitable foraging habitat is present within the Project area.
Loggerhead sea turtle (*Caretta caretta)*	Threatened	Gulf and bay systems.	Nesting: No effect Foraging: Not likely to adversely affect	Species does not nest in the Project region. Suitable foraging habitat is present within the Project area.
Green sea turtle (*Chelonia mydas*)	Threatened	Gulf and bay systems, shallow water seagrass beds, jetties, and open water.	Nesting: No effect Foraging: Not likely to adversely affect	Species does not nest in the Project region. Suitable foraging habitat is present within the Project area.
Hawksbill sea turtle (*Eretmochelys imbricata*)	Endangered	Gulf and bay systems, warm, shallow waters, especially in rocky marine environments, jetties and coral reefs.	Nesting: No effect Foraging: Not likely to adversely affect	Species does not nest in the Project region. Suitable foraging habitat is not present in the Project area, but is present in the open Gulf of Mexico in the vicinity of transiting LNGCs.

Table B.4.5-1 Federally Listed Species within the Project Area				
Species	**Status**	**Preferred Habitat**	**Effect Determination**	**Justification**
Leatherback sea turtle (*Dermochelys coriacea*)	Endangered	Gulf and bay systems.	Nesting: No effect Foraging: Not likely to adversely affect	Species does not nest in the Project region. Suitable foraging habitat is not present in the Project area, but is present in the open Gulf of Mexico in the vicinity of transiting LNGCs.
Marine Mammals				
West Indian manatee (*Trichechus manatus*)	Threatened	Occasional visitor to Texas/ Louisiana waters. Inhabits warm, shallow coastal waters, estuaries, bays, rivers, and lakes.	Not likely to adversely affect	Suitable habitat is present within the Project area.
Fin Whale (*Balaenoptera physalus*)	Endangered	Deep waters of the continental shelf.	Not likely to adversely affect	Suitable habitat is not present in the Project area, but is present in the open Gulf of Mexico in the vicinity of transiting LNGCs.
Sei Whale (*Balaenoptera borealis*)	Endangered	Deep waters of the continental shelf.	Not likely to adversely affect	Suitable habitat is not present in the Project area, but is present in the open Gulf of Mexico in the vicinity of transiting LNGCs.
Sperm Whale (*Physeter macrocephalus*)	Endangered	Deep waters of the continental shelf.	Not likely to adversely affect	Suitable habitat is not present in the Project area, but is present in the open Gulf of Mexico in the vicinity of transiting LNGCs.
Gulf of Mexico Bryde's Whale (*Balaenoptera edeni*)	Proposed Endangered	Deep waters of the continental shelf.	Not likely to adversely affect	Suitable habitat is not present in the Project area, but is present in the open Gulf of Mexico in the vicinity of transiting LNGCs.
Sharks and Rays				
Oceanic Whitetip Shark (*Carcharhinus longimanus*)	Threatened	Tropical and subtropical open ocean with water depths greater than 600 feet.	No effect	Species occurs within the Gulf of Mexico; however, it does not spend time at the surface, minimizing the potential for vessel strikes.
Giant Manta Ray (*Manata birostris*)	Threatened	Tropical, subtropical, and temperate oceanic waters near productive coastlines.	Not likely to adversely affect	Suitable habitat is not present in the Project area, but is present in the open Gulf of Mexico in the vicinity of transiting LNGCs.

Table B.4.5-1 Federally Listed Species within the Project Area				
Species	**Status**	**Preferred Habitat**	**Effect Determination**	**Justification**
Source: FWS, 2018a; NMFS, 2019a; 2019b; 2019c; LDWF, 2018a; TPWD, 2018				

Birds

Black Rail

The black rail was proposed for listing by the USFWS as a threatened species under the ESA on October 9, 2018. One of four species of black rail, the eastern black rail lives in salt, brackish, and freshwater marshes in as many as 36 states, in addition to multiple territories and countries in Central and South America. Primary threats to the eastern black rail include habitat loss due to continued alteration and loss of wetland habitats, land management practices that result in fire suppression (or inappropriately timed fire application that may cause direct mortalities), grazing, haying and mowing, and impounding of wetlands (FWS, 2018b). The USFWS is proposing a rule under the ESAs Section 4(d) that would tailor protections for the eastern black rail. These protections include prohibiting certain activities in known eastern black rail habitat during critical time periods, such as nesting and brooding seasons, and post-breeding flightless molt periods.

Suitable habitat for the black rail is present within affected estuarine wetlands. In addition, FWS recommended that SPLNG conduct Project activities within black rail habitat outside of the breeding and flightless molt periods (i.e., mid-March through September) to the greatest extent possible. We requested that SPLNG commit to implementing the FWS recommendations. To date, SPLNG has not committed to implementing these recommendations, nor have they provided documentation of correspondence with the FWS regarding alternative measures that could be implemented to minimize impacts on black rails. Therefore, **we recommend that:**

- **Prior to construction, SPLNG should file with the Secretary, for review and written approval by the Director of OEP, measures that it would implement to minimize impacts on the black rail. SPLNG should also file documentation of correspondence with the FWS regarding these measures.**

With the implementation of our recommendation, as well as SPLNG's required mitigation of wetlands (black rail habitat), we have determined that the Project is not likely to jeopardize the continued existence of the black rail.

Red Knot

Red knots nests in the far north, well above the Arctic Circle and its winter range includes shorelines around the world, south to Australia and southern South America. Outside of breeding season, it is found primarily in intertidal, marine habitats, especially near coastal inlets, estuaries, and bays. Its diet includes mollusks, insects, green vegetation, and seeds. In migration

and winter, the red knot feeds on small invertebrates that live in the mud of the intertidal zone, especially small mollusks, marine worms, and crustaceans. On dry sand and its tundra breeding grounds, the red knot forages by sight, picking items from the ground surface. On tidal flats, it forages by probing the mud with its bill, finding food items by touch (National Audubon Society, 2018a). The red knot is federally listed as threatened under the ESA. The red knot may be found in the Project area during spring and fall migrations (April-May and September-October), but it prefers shoreline habitats. No suitable habitat is present in the Project area; however, suitable habitat is present within the Louisiana Point DMPA. As the dredge material placed in the Louisiana Point DMPA would be utilized to create and enhance red knot habitat, we have determined that the Project is *not likely to adversely affect* the red knot. No designated critical habitat for the red knot would be impacted by the Project.

Piping Plover

The piping plover is listed as threatened. Shorebird hunting during the early 1900s caused the first known major decline of piping plovers (Bent, 1929). Since then, loss or modification of habitat resulting from commercial, residential, and recreational developments, dune stabilization, damming and channelization of rivers (eliminating sandbars, encroachment of vegetation, and altering water flows), and wetland drainage have further contributed to the decline of the species. Additional threats include human disturbances through recreational use of habitat, and predation of eggs. Piping plovers typically inhabit shorelines of oceans, rivers, and inland lakes. Nest sites include sandy beaches, especially where scattered tufts of grass are present; sandbars; causeways; bare areas on dredge-created and natural alluvial islands in rivers; gravel pits along rivers; silty flats and salt-encrusted bare areas of sand, gravel, or pebbly mud on interior alkali lakes and ponds. On the wintering grounds, these birds use beaches, mudflats, sandflats, dunes, and off-shore spoil islands.

No suitable habitat is present in the Project area; however, suitable habitat is present within the Louisiana Point DMPA. As the dredge material placed in the Louisiana Point DMPA would be utilized to create and enhance red knot habitat, we have determined that the Project is *not likely to adversely affect* the piping plover.

Designated critical habitat (wintering) for the piping plover is present at the Louisiana Point DMPA. SPLNG consulted with FWS regarding the potential impacts of dredge material placement on piping plover critical habitat on July 5, 2018. FWS indicated that the placement of dredge material to create and/or enhance piping plover habitat was acceptable. Therefore, we conclude that the Project would result in *no adverse modification* of designated critical habitat for piping plovers.

Marine Reptiles

The FWS and NMFS share jurisdiction under the ESA for sea turtles; the FWS has jurisdiction over sea turtles on land (terrestrial habitat) and the NMFS has jurisdiction over sea turtles in marine and estuarine waters. Sea turtles are almost exclusively aquatic (occurring within marine and estuarine waters), with terrestrial habitat use only occurring when adult females come to shore to lay eggs.

Kemp's Ridley Sea Turtle

Kemp's Ridley sea turtles are federally listed as endangered. Although it does not nest in Louisiana, the estuarine and offshore waters of Louisiana are considered important foraging areas for this species and they have been documented in Sabine Lake (FWS, 2018c). During the non-breeding season, Kemp's Ridley sea turtles prefer warm bays, shallow coastal waters, tidal rivers, estuaries, and seagrass beds (LDWF, 2018b) with substrates of sand and mud (FWS, 2018c). Juvenile Kemp's ridley sea turtles are generally found in Louisiana's coastal waters from May through October, whereas adults are common during the spring and summer near the mouth of the Mississippi River. In the winter, Kemp's ridley sea turtles typically move offshore to deeper, warmer waters, but some of the deep-water channels and estuaries in Louisiana might provide important thermal refuge (LDWF, 2018b). NMFS identified April and May as months when Kemp's ridley sea turtles are believed to be most abundant at the SPLNG Terminal (NMFS, 2004).

Adults are primarily shallow-water benthic feeders that specialize on portunid crabs (FWS, 2018c). Other food items include shrimp, snails, bivalves, sea urchins, jellyfish, sea stars, fish, and occasionally marine plants (Pritchard and Marquez, 1973; Georgia Aquarium, 2018). Juveniles typically feed on *Sargassum* species and associated infauna (FWS and NMFS, 1992).

Loggerhead Sea Turtle

The loggerhead sea turtle is federally listed as threatened. The loggerhead sea turtle favors warm temperate and sub-tropical regions (NMFS and FWS, 1991a) and is widely distributed in tropical and subtropical seas (Rebel, 1974; Ross, 1982). This species typically occurs over the continental shelf, and in bays, estuaries, lagoons, creeks, and mouths of rivers, but has been found as far as 500 miles offshore (NMFS and FWS, 1991a). In the continental U.S., loggerhead sea turtles' nest along the Atlantic coast from Florida to as far north as New Jersey (Musick, 1979) and sporadically along the Gulf Coast (NMFS and FWS, 1991a). Nesting occurs primarily on barrier islands adjacent to continental landmasses in warm-temperate and sub-tropical waters (NMFS and FWS, 1991a). Nest sites are typically located on open sandy beaches above the mean high tide and seaward of well-developed dunes.

Adults occupy a variety of habitats, ranging from turbid bays to clear waters of reefs, whereas subadults occur mainly in nearshore and estuarine waters (NMFS and FWS, 1991a). Hatchlings move directly to sea after hatching, and often float in masses of sargassum (NMFS and FWS, 1991a). Loggerhead sea turtles' diet consists of a wide variety of benthic and pelagic food items. Crabs and mollusks make up the majority of the adult loggerhead's diet, although they will also feed opportunistically on dead fish (Rebel, 1974; Savannah River Ecology Laboratory, 2018).

The probability of the loggerhead sea turtle nesting in the Project area would be very low due to a lack of suitable nesting habitat (i.e., sandy beaches). Because loggerhead sea turtles are known to occur in turbid bays, there is a moderate probability of this species occurring within the Sabine Lake estuary and, more specifically, the Project site. In addition, loggerhead sea turtles

and floating *Sargassum* that serves as critical habitat for juveniles may occur along the LNGC transit routes.

Green Sea Turtle

The green sea turtle is federally listed as threatened. Green sea turtles have a circumglobal distribution in tropical and sub-tropical waters (NMFS and FWS, 1991b). In the U.S., this species occurs in the Atlantic around the Virgin Islands, Puerto Rico, and along the Atlantic and Gulf coasts of the continental U.S. from Massachusetts to Texas (NMFS and FWS, 1991b). Green sea turtles utilize shallow estuarine habitats and other areas with an abundance of marine algae and seagrasses, their principal food sources (Bartlett and Bartlett, 1999).

Terrestrial habitats are limited to nesting sites, which are typically located on high-energy beaches with deep sand and little organic content (NMFS and FWS, 1991b). Hatchlings often float in masses of sea plants (e.g., sargassum) in convergence zones, using coral reefs and rocky outcrops near feeding pastures as resting areas (NMFS and FWS, 1991b). Adult green turtles typically inhabit shallow bays and estuaries where seagrasses, their principal food source, grow (Bartlett and Bartlett, 1999). There is some probability that this species could occur in the vicinity of the Project. However, as no seagrasses are present in the Project area occurrence would likely be limited to transient individuals. In addition, no suitable nesting habitat is present in the Project area.

Leatherback Sea Turtle

The leatherback sea turtle is a circumglobal species that is known to occur farther north and south than other sea turtles. The leatherback sea turtle rarely leaves the deep waters of the Gulf of Mexico but occasionally occurs along the Louisiana coast (LDWF, 2019). Leatherback sea turtles are the most migratory and wide-ranging species of all sea turtles. Leatherback sea turtles primarily live in the open ocean and move into coastal waters only during the reproductive season (TPWD, 2019). The leatherback sea turtle prefers deep waters up to 4,200 feet in depth (National Park Service [NPS], 2015). They nest on coastal beaches and barrier islands. Within the U.S. nesting occurs almost exclusively within Florida (Florida Fish and Wildlife Conservation Commission, 2019). Individuals undergo long distance migrations between foraging and breeding grounds. Leatherback sea turtles feed primarily on soft-bodied animals such as jellyfish and sea squirts; however, they have also been known to consume urchins, crustaceans, fish, and floating seaweed (TPWD, 2019).

Because of this species' preference for open ocean habitat outside of the reproductive season, it is unlikely that this species occurs within the Project area. However, the leatherback sea turtle may occur along LNGC transit routes within the Gulf of Mexico.

Hawksbill Sea Turtle

The hawksbill sea turtle (a federal and state-listed endangered species) inhabits coastal reefs, bays, rocky areas, estuaries, and lagoons at depths up to 70 feet. Hatchlings may be found in the open sea floating on masses of marine plants, while juveniles, subadults, and adults may be found near coral reefs (i.e., their primary foraging area). They prefer to feed on invertebrates

such as sponges, mollusks, and sea urchins, although they are omnivorous. Hawksbills come ashore to nest and prefer undisturbed, deep sand beaches. Preferred beaches may range from high-energy to small pocket beaches bounded by crevices of cliff walls with woody vegetation near the waterline (NMFS, 2004; COE, 2003). The greatest threat to this population has been the harvest of turtles to supply the tortoise shell market and stuffed turtle curios. It is also used to manufacture leather, oil, perfume, and cosmetics.

Hawksbill sea turtles are circumtropical and occur in the tropical and subtropical areas of the Atlantic, Pacific, and Indian Oceans. Nesting sites are known along the Yucatan Peninsula of Mexico, the U.S. Virgin Islands, Puerto Rico, and the Florida Keys. This species is rarely seen in Louisiana (LDWF, 2004). As such, Hawksbill sea turtles within the Project region, would primarily be located along the LNGC transit routes.

Conclusion

Due to the potential presence of sea turtles within the Project area and along vessel transit routes, the Project could directly affect sea turtles as a result of dredging, pile driving, and LNGC and other marine vessel transit (e.g., construction barges and tugboats). Potential effects from the Project would primarily be limited to impacts on green, Kemp's ridley, and loggerhead turtles because of their more common presence within coastal portions of the Gulf of Mexico. Potential impacts on sea turtles and measures SPLNG would implement to avoid and minimize these impacts are described below.

Although unlikely, sea turtles could be injured or killed during dredging activities through contact with or entrainment in the dredge. The potential for injury of or mortality to sea turtles as a result of dredging is primarily limited to hopper dredging, which entrain turtles and other marine species because of the large suction tubes used to extract bottom sediments. However, sea turtles easily avoid hydraulic cutterhead dredges due to the slow movement of the dredge (COE, 2013). For this reason, the NMFS recommends the use of non-hopper dredges, particularly during sea turtle nesting and hatching periods (COE, 2011b).

Another potential impact on sea turtles from dredging could be habitat degradation through a temporary decrease in water quality during and immediately following dredging activities. Dredging activities suspend sediments in the water column, creating increased total suspended solids and turbidity, increased dissolved nutrient levels, and decreased dissolved oxygen levels within the waters surrounding the dredging activity. The magnitude and spatial extent of these water quality effects varies widely depending on site conditions (e.g., background water and sediment quality, tidal exchange) and the dredging method used. Proposed use of a hydraulic cutterhead dredge would minimize turbidity in the vicinity of the dredge activities because the turbid water is siphoned into the temporary pipeline along with the substrate.

Installation of 116 in-water piles over 9 months would be necessary for construction of the Third Berth. Underwater sound pressure levels generated by pile driving could affect sea turtles by causing decreased auditory sensitivity; loss of hearing; behavioral changes such as avoidance, which can increase energy expenditure, reducing overall fitness; or by masking acoustic cues that are important for evading predators or anthropogenic hazards (e.g., vessels,

fishing equipment). NMFS has developed guidelines for determining sound pressure level thresholds for sea turtles (NMFS, 2018). SPLNG utilized these guidelines to determine the sound pressure level thresholds for sea turtles presented in table B.4.5-2. Avoidance behavior has been observed in sea turtles in response to seismic signals at levels between 166 and 179 dB (McCauley et al., 2000).

Table B.4.5-2
Underwater Sound Thresholds for Sea Turtles

Functional Hearing Group	Underwater Sound Thresholds [a]			
	Vibratory Pile Driving – Behavioral Disturbance [b]	Vibratory Pile Driving – Injury	Impact Pile Driving – Behavioral Disturbance [b]	Impact Pile Driving – Injury
Sea Turtles	166 dB RMS	180 dB RMS	166 dB RMS	180 dB RMS

[a] Source: NMFS, 2018.
[b] The root mean square exposure level is the square root of the average sound pressures over the duration of a pulse and represents the effective pressure and intensity produced by a sound source.

Although sea turtles would be expected to largely avoid the Project area during pile driving activities, the potential exists for sea turtles to be injured during the first several strikes of the pile driving hammer. The distances at which the thresholds presented in table B.4.5-2 would be expected to occur are presented in table B.4.5-3.

Table B.4.5-3
Calculated Distances to Underwater Noise Thresholds for Sea Turtles from Dredging and Mitigated In-water Pile Driving

Activity	Distance from Source in which Threshold would be Exceeded	
	Injury (RMS)	Behavioral Disturbance (RMS)
Impact pile driving	71 feet	606 feet
Vibratory pile driving	3 feet	28 feet
Dredging	1 foot	8.2 feet

As presented in table B.4.5-3, injury to sea turtles during pile driving would occur within 71 feet and 3 feet for impact and vibratory pile driving, respectively, and within 1 foot during dredging. These are relatively small impact radii, and it seems unlikely that sea turtles would be this close to the pile driving activities, especially due to the movement of the tender vessels, barges, and other activities associated with setting up and preparing for pile driving. However, behavioral disturbances may occur up to 606 feet from impact pile drivers. SPLNG would reduce impacts on sea turtles as well as other marine species from pile driving by implementing the measures outlined in section B.4.2.2 for fish, including soft starts. The distances from pile driving in which sound thresholds would be exceeded were calculated based on the use of mitigation measures such as cushion blocks and bubble curtains. Therefore, we have included a recommendation in section B.4.2.2 to ensure that actual underwater noise levels do not exceed predicted levels.

Potential impacts on sea turtles resulting from increased vessel transit include injury or mortality due to vessel strikes, and accidental leaks or spills of hazardous materials. During

construction and operation of the Project, barges, support vessels, and LNGCs would call on the SPLNG Terminal, increasing ship traffic within the Sabine Pass Channel and Gulf of Mexico. Increased marine traffic could result in collisions with sea turtles. However, SPLNG would provide ship captains with the NMFS Southeast Region's *Vessel Strike Avoidance Measures and Reporting for Mariners* (2008). As discussed in section B.4.2.2, to minimize the potential for a spill, leak, or accidental release of hazardous substances, each LNG carrier would maintain a SOPEP to minimize impacts in the event of a petroleum release.

While sea turtles could occur within the Project area, they are more likely to occur near Louisiana Point DMPA. SPLNG consulted with NMFS on September 25, 2018 regarding minimization measures that should be implemented for placement of dredged material within the Louisiana Point DMPA. NMFS confirmed that, due to the potential presence of Kemp's ridley sea turtles in the area during April and May, SPLNG would be required to adhere to a timing restriction on the use of the DMPA. SPLNG confirmed that they would implement this measure during dredging.

FERC requested that SPLNG commit to implementing the NMFS 2006 *Sea Turtle and Smalltooth Sawfish Construction Conditions* during construction of the Project to further minimize impacts on sea turtles. SPLNG has not committed to implementing these measures. Therefore, **we recommend that**:

- **<u>During construction of the Project</u>, SPLNG should implement the measures outlined in the NMFS 2006 *Sea Turtle and Smalltooth Sawfish Construction Conditions*.**

As of the writing of this EA, consultations have not been completed with NMFS (see our recommendation below). Based on the implementation of the mitigation measures outlined above and our recommendations, we conclude that the Project is *not likely to adversely affect* sea turtles in the marine environment. Further, as no suitable nesting habitat occurs in the Project area and sea turtles are not known to nest in the Project area, we conclude that the Project would have *no effect* on nesting sea turtles.

There is potential for vessels to divide floating *Sargassum* designated as critical habitat for loggerhead sea turtles in the Gulf of Mexico (Designated Critical Habitat Unit LOGG-S-02). However, these impacts would be temporary and the *Sargassum* habitat would continue to serve as developmental and foraging habitat for loggerhead sea turtles. In addition, LNGC transit could also result in the accidental release of hazardous materials to *Sargassum* habitat. Implementation of the SOPEP would substantially reduce the potential for degradation of designated critical habitat for loggerhead sea turtles. Therefore, we conclude that the Project would result in *no adverse modification* of designated critical habitat for loggerhead sea turtles.

Marine Mammals

West Indian Manatee

Manatees listed as threatened under the ESA and are also protected under the Marine Mammal Protection Act. Manatees are found in rivers, estuaries, and coastal areas of the tropical and subtropical New World from the southeastern United States coast along Central America and the West Indies to the northern coastline of South America. They occur mainly in larger rivers and brackish water bays. Preferred habitats include areas near the shore featuring underwater vegetation like seagrass and eelgrass. They also require freshwater drinking sources. They prefer submerged vegetation, such as turtle and manatee grass, but will feed on floating and emergent plants as well. They feed along grass bed margins with access to deep water channels, where they flee when threatened (FWS, 2018d).

West Indian manatees may occur as transient individuals in Louisiana during the summer months (LDWF, 2018c). Human activities, including collisions with boats and barges, entrapment in flood control structures, poaching, habitat loss, and pollution are the primary causes for decline of the species. To minimize impacts to the species, the FWS recommended conservation measures to be included in all contracts, plans, and specifications for in-water work in areas where the species may occur. SPLNG would implement Standard Manatee Conditions for In-water Activities (FWS, 2011) during Project construction, which contains the FWS recommendations, and would include it in all contractor bid packages. The proposed Project area does provide habitat conditions required by the West Indian manatee; therefore, any manatees in the area would be expected to be transient. With implementation of the conservation measures recommended by the FWS and our recommendation regarding pile driving (see section B.4.2.2), we conclude that the Project is *not likely to adversely affect* the West Indian manatee.

Sperm Whale

The sperm whale is a toothed whale that inhabits the deeper waters of the world's oceans throughout the year, where they feed primarily on squid and other deep-sea creatures. Migrations are not as distinct as other species and are thought to primarily follow food resources (NMFS, 2010a). Sperm whales are present in the northern Gulf of Mexico in all seasons but are more common during the summer months (NMFS, 2010a). The sperm whale is the only federally listed whale that is known to commonly occur in the Gulf of Mexico (NMFS, 2012) and the only whale with a measurable injury rate due to vessel strikes in the Gulf of Mexico (NMFS, 2008). Sperm whales have potential to occur along the LNGC transit routes but would not occur near the Project area. As discussed in section B.4.5.3, vessel strikes would be minimized by the LNGCs implementing measures outlined in the NMFS *Vessel Strike Avoidance Measures and Reporting for Mariners* (2008). In addition, LNGCs would be required to maintain a SOPEP to minimize impacts on aquatic resources from spills. Therefore, we have determined that the Project is *not likely to adversely affect* sperm whales.

Baleen Whales

Baleen whales, including the fin whale, sei whale, and the Gulf of Mexico Bryde's whale that was recently proposed for listing, are listed by NMFS as occurring within the southeast region. These whales are not commonly found in the Gulf of Mexico but could occur within the area during migrations or other movements (NMFS, 2012). Feeding is not expected in or around the Gulf of Mexico as these species usually feed on zooplankton and small fish aggregations during summer months in the northern Atlantic Ocean (NMFS, 2010b; 2011). Calving and breeding grounds have not been identified for these species in the Gulf of Mexico. Impacts on federally listed baleen whales would be minimized through the implementation of measures similar to those discussed above for the sperm whale. Therefore, we have determined that the Project is *not likely to adversely affect* federally listed baleen whales.

Rays

Giant Manta Ray

The giant manta ray was listed as threatened under the Endangered Species Act in 2018. The giant manta ray occurs worldwide in tropical, subtropical, and temperate oceans. This species is migratory and seasonally visits productive coastlines in oceanic island groups and near offshore pinnacles and seamounts to feed on zooplankton and small fish (NMFS, 2019b). Giant manta rays do not occur in the Sabine Pass Channel, but may be present in the Gulf of Mexico along the LNGC transit routes. Impacts on giant manta rays would be minimized through the implementation of measures similar to those discussed above for whales and sea turtles. Therefore, we have determined that the Project is *not likely to adversely affect* federally listed giant manta rays.

Conclusion

A variety of measures have been proposed by SPLNG that would minimize impacts on federally listed species, including but not limited to, species-specific guidance from FWS and NMFS, measures to minimize noise from pile driving, use of a cutterhead dredge, timing restrictions, and implementation of NMFS-issued guidance that outlines collision avoidance measures to be implemented in order to minimize impacts on marine mammals and sea turtles. However, because consultations with the FWS and NMFS are ongoing, **we recommend that**:

- **SPLNG should not begin construction activities until:**

  a. the FERC staff receives comments from the FWS and the NMFS regarding the proposed action;

  a. the FERC staff completes ESA consultation with the FWS and NMFS; and

  b. SPLNG has received written notification from the Director of OEP that construction or use of mitigation may begin.

4.5.2 State-listed Species

There are 11 state-listed T&E species identified by either TPWD or LDWF as potentially occurring in the Project area, 8 of which are also federally listed and discussed in section B.4.5.1. TPWD also lists the interior least tern and smalltooth sawfish that, while federally listed, do not occur in the Project region and are not discussed further. In addition to the federally listed species discussed above, LDWF and TPWD also lists the brown pelican as endangered.

Brown pelicans rely on marine predators such as sharks and dolphins, to force schools of fish to the surface where they can be caught. They are sensitive to human disturbances and will breed only in areas with enough food to support the breeding colony. Roosting and resting sites, where brown pelicans can dry their feathers and rest without disturbance, also are important. Brown pelicans' nest in colonies in areas where risk of predation from land predators is low, usually on isolated islands (Cornell Lab of Ornithology, 2018). They build large bulky nests on the ground or on island cliffs or low trees, such as mangroves (National Audubon Society, 2018b).

Suitable nesting habitat is not present in the Project area. While brown pelicans may forage along the Sabine Pass Channel and near the Louisiana Point DMPA, they would likely avoid the areas during construction activities. As the Project would not result in the loss of suitable nesting habitat or otherwise adversely impact brown pelicans, we have determined that impacts on brown pelicans would not be significant.

4.5.3 Marine Mammals

SPLNG would conduct in-water pile driving of 116 piles over 9 months and dredging over 9 months. In addition, the number of LNGCs utilizing the SPLNG Terminal would increase from the permitted 400 per year up to 580 per year, for export and import combined. A number of marine mammals are commonly observed in the Gulf of Mexico. Some species have a greater affinity for coastal, inshore waters, while others are more commonly observed offshore in deeper, pelagic waters. Species such as the northern right whale have been documented only rarely in the Gulf of Mexico. Other species are also commonly observed in shipping channels in Texas and Louisiana, the most common and prolific being the bottlenose dolphin. Marine mammal movements and migrations are often related to both the physical and biological attributes of the ocean, with animals avoiding extreme temperatures and following food sources. The productivity of EFH also attracts higher trophic levels, such as marine mammals. Enacted in October 21, 1972, the Marine Mammal Protection Act serves to protect all marine mammals, both in coastal waters and on the high seas. Twenty-nine species of marine mammals, including the West Indian manatee, have been observed in the Gulf of Mexico and are listed in table B.4.5-4.

Bottlenose dolphins (*Tursiops truncatus*) are the most common marine mammal that occurs throughout the inshore and nearshore waters of the Louisiana Gulf Coast. Bottlenose dolphins could be affected by dredging and pile driving activities at the Project site.

NMFS recently developed the *Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing* for marine mammal disturbance thresholds (NMFS, 2018). The bottlenose dolphin is classified by NMFS as a mid-frequency cetacean. The underwater noise thresholds developed by NMFS for mid-frequency cetaceans are presented in table B.4.5-5.

Table B.4.5-4
Marine Mammals that Have Been Observed in the Gulf

Common Name	Scientific Name
North Atlantic Right Whale	*Eubalaena glacialis*
Humpback Whale (Mexico Distinct Population Segment)	*Megapetra novaeangliae*
Fin Whale	*Balaenoptera physalus*
Sei Whale	*Balaenoptera borealis*
Minke Whale	*Balaenoptera acutorostrata*
Blue Whale	*Balaenoptera musculus*
Sperm Whale	*Physeter macrocephalus*
Dwarf Sperm Whale	*Kogia simus*
Pygmy Sperm Whale	*Kogia breviceps*
Killer Whale	*Orcinus orca*
Pygmy Killer Whale	*Feresa attenuate*
Goose-Beaked Whale	*Ziphius cavirostris*
Gervais' Beaked Whale	*Mesoplodon europaeus*
Blainville's Beaked Whale	*Mesoplodon densirostris*
Sowerby's Beaked Whale	*Mesoplodon bidens*
Bryde's Whale	*Balaenoptera edeni*
Short-finned Pilot Whale	*Globicephala macrorhynchus*
False Killer Whale	*Pseudorca crassidens*
Melon-headed Whale	*Peponocephala electra*
Atlantic Spotted Dolphin	*Stenella frontalis*
Pantropical Spotted Dolphin	*Stenella attenuate*
Striped Dolphin	*Stenella coeruleoalba*
Clymene Dolphin	*Stenella clymene*
Spinner Dolphin	*Stenella longirostris*
Bottlenose Dolphin	*Tursiops truncates*
Risso's Dolphin	*Grampus griseus*
Fraser's Dolphin	*Lagenodelphis hosei*
Rough-toothed Dolphin	*Steno bredanensis*
West Indian Manatee	*Trichechus manatus*

Table B.4.5-5 Underwater Sound Thresholds for Marine Mammals				
Functional Hearing Group	**Underwater Sound Thresholds [b]**			
	Vibratory Pile Driving – Behavioral Disturbance [a]	**Vibratory Pile Driving – Injury [b, c]**	**Impact Pile Driving – Behavioral Disturbance [a]**	**Impact Pile Driving – Injury [d, e]**
Marine Mammals (mid-frequency cetaceans) Temporary Threshold Shift [d]	120 dB RMS	178 dB SEL_{cum} 224 dB Peak	160 dB RMS	170 dB SEL_{cum} 224 dB Peak
Marine Mammals (mid-frequency cetaceans) Permanent Threshold Shift [d]	120 dB RMS	198 dB SEL_{cum} 230 dB Peak	160 dB RMS	185dB SEL_{cum} 230 dB Peak

[a] Source: NMFS, 2018.
[b] The root mean square exposure level is the square root of the average sound pressures over the duration of a pulse and represents the effective pressure and intensity produced by a sound source.
[c] The cumulative sound exposure level is the energy accumulated over multiple strikes or continuous vibration over a period of time.
[d] Peak sound pressure level is the largest absolute value of instantaneous sound pressure.
[e] The injury threshold is the general level for temporary or permanent threshold shift onset for mid-frequency cetaceans as identified by NMFS (2016). Threshold shifts are influenced by the frequency of noise received and a cumulative sound exposure exceeding this level may not cause a threshold shift if outside the range of hearing.

SPLNG calculated the anticipated distances at which the thresholds presented in table B.4.5-5 would be expected to occur. These distances are presented in table B.4.5-6 and indicate that the thresholds would be exceeded at locations close to the pile driving activities, even with the implementation of noise mitigation measures, such as bubble curtains or cushion blocks.

Table B.4.5-6 Calculated Distances to Underwater Noise Thresholds for Marine Mammals from Dredging and Mitigated In-water Pile Driving			
Activity	**Distance from Source in which Threshold would be Exceeded**		
	Permanent Injury	**Temporary Injury**	**Behavioral Disturbance**
Impact pile driving	80 feet	800 feet	1,522 feet
Vibratory pile driving	6 feet	127 feet	32,800 feet
Dredging	< 0.1 feet	2 feet	9,606 feet

Based on the NMFS guidance (2016), thresholds for permanent and temporary injury to marine mammals are anticipated to be exceeded within 80 feet and 800 feet of the in-water pile driving activities, respectively. Behavioral thresholds would be exceeded for up to 6.2 miles (i.e., 32,800 feet) from pile driving activities; therefore, an incidental take authorization from NMFS may be required. During dredging activities, thresholds for permanent and temporary injury to marine mammals are anticipated to be exceeded within 0.1 feet and 2 feet, respectively. This indicates that injury from dredging noise is extremely unlikely. Behavioral thresholds for dredging would be exceeded within 1.8 miles (i.e., 9,606 feet). Although bottlenose dolphins would be expected to largely avoid the Project area during pile driving activities, the potential exists for bottlenose dolphins to be injured during the first several strikes of the pile driving hammer if they are in proximity to the pile-driving area.

SPLNG would reduce the potential for impacts on bottlenose dolphins during the first several strikes of the pile driving hammer by using soft starts to the pile driving to ensure that any dolphins have ample time to leave the injury radius before full pile driving commences. In addition, we have included a recommendation in section B.4.2.2 to ensure that underwater noise levels are not greater than predicted. However, the potential still exists for bottlenose dolphins and other marine mammals to be injured during pile driving activities, and SPLNG has not completed consultations with NMFS regarding pile driving activities. Therefore, **we recommend that:**

- **Prior to construction, SPLNG should file with the Secretary, for review and written approval by the Director of OEP, mitigation measures to avoid or further minimize take of marine mammals during in-water pile driving, developed in consultation with NMFS.**

Increased marine traffic could potentially affect marine mammals through vessel strikes and spills of hazardous materials, as well as impacts related to the vessels' usage of ballast and cooling water. Impacts resulting from spills of hazardous materials and ballast and cooling water exchanges would be similar to that discussed in section B.4.2.2 for fisheries resources.

Vessel traffic can result in strikes with marine species, which can cause mortality or injury events, increased stress levels, or avoidance of the area by marine species. Due to their preference for offshore waters and their relative rarity in Louisiana waters, the occurrence of whales within the Project area would be limited to the portion of the LNGC transit route through the Gulf of Mexico. In general, LNGCs move slowly and make more noise than other vessels, allowing them to be more easily avoided by highly mobile wildlife. To minimize potential for vessel strikes, LNGCs would adhere to the *Vessel Strike Avoidance Measures and Reporting for Mariners* (2008). SPLNG would further minimize impacts on manatees through the implementation of the FWS Standard Manatee Conditions for In-water Activities (2011) during construction of the Project. Based on the implementation of the measures outlined above and our recommendations, we conclude that the Project would not significantly impact marine mammals.

5.0 CULTURAL RESOURCES

Section 106 of the National Historic Preservation Act, as amended, requires FERC to consider the effect of its undertakings on properties listed, or eligible for listing, on the National Register of Historic Places, and to afford the Advisory Council on Historic Preservation an opportunity to comment. SPLNG, as a non-federal party, is assisting us in meeting our obligations under Section 106 of National Historic Preservation Act and implementing regulations at 36 CFR 800.

5.1 Survey Results and Consultation

We sent copies of our NOI for the Project to a wide range of stakeholders, including the Advisory Council on Historic Preservation, Louisiana Department Division of Archaeology, Texas Historical Commission, and federally recognized Indian tribes (tribes) that may have an

interest in the Project area. The NOI stated that we use the NOI to initiate consultations with State Historic Preservation Officers (SHPO)[9] and to solicit their views and those of other government agencies, interested tribes, and the public on the Projects' potential effects on historic properties.

The NOI was sent to 10 tribes, including the Coushatta Tribe of Louisiana, Caddo Nation, Chitimacha Tribe, Alabama-Coushatta Tribe of Texas, Alabama-Quassarte Tribal Town, the Choctaw Nation of Oklahoma, Jena Band of Choctaw Indians, Mississippi Band of Choctaw Indians, and Tunica-Biloxi Indian Tribe. On May 31, 2018 in response to the NOI, the Choctaw Nation of Oklahoma filed a letter with FERC stating that the Project is located within an area that is of historic interest to the tribe and stated that they wish to exercise their right to enter into government-to-government consultation with FERC. The Choctaw Nation of Oklahoma requested additional information about the Project. SPLNG provided the requested information on June 5, 2018. Following SPLNG's filing of their Application with FERC, the Choctaw Nation of Oklahoma filed an additional letter dated January 24, 2019 requesting the same information that was previously provided by SPLNG.

In addition, SPLNG sent Project information to six tribes (Caddo Nation, Chitimacha Tribe of Louisiana, Choctaw Nation of Oklahoma, Coushatta Tribe of Louisiana, Jena Band of Choctaw Indians, and Tunica-Biloxi Indians of Louisiana). A summary of SPLNG's correspondence is provided in table B.5.1-1.

Table B.5.1-1
SPLNG's Coordination with Federally Recognized Tribes

Native American Entity	Date of Submittal	Date of Response
Caddo Nation	February 23, 2018 Original Project Introduction letter	No response received
	March 20, 2018 Follow-up phone call to initiate contact	No response received
	April 24, 2018 Revised Project Footprint Letter	No response received
Chitimacha Tribe of Louisiana	February 23, 2018 Original Project Introduction letter	No response received
	March 20, 2018 Follow-up phone call to initiate contact	No response received
	May 17, 2018 Sent Revised Project Footprint Letter	No response received
Choctaw Nation of Oklahoma	NA	May 31, 2018 Additional information requested from FERC

[9] In Louisiana and Texas, the SHPO is part of the Louisiana Division of Archaeology and Texas Historical Commission, respectively.

Table B.5.1-1 SPLNG's Coordination with Federally Recognized Tribes		
Native American Entity	**Date of Submittal**	**Date of Response**
	June 5, 2018 Requested information submitted	No response received
Coushatta Tribe of Louisiana	February 23, 2018 Original Project Introduction letter	No response received
	March 20, 2018 Follow-up phone call to initiate contact	No response received
	April 24, 2018 Revised Project Footprint Letter	No response received
Jena Band of Choctaw Indians	February 23, 2018 Original Project Introduction letter	April 4, 2018 No properties affected
	March 20, 2018 Follow-up phone call to initiate contact	No response received
	April 24, 2018 Revised Project Footprint Letter	No response received
Tunica-Biloxi Indians of Louisiana	February 23, 2018-Original Project Introduction letter	No response received
	March 20, 2018 Follow-up phone call to initiate contact	No response received
	April 24, 2018 Revised Project Footprint Letter	No response received

SPLNG obtained concurrence from the Louisiana SHPO for previous Projects at the SPLNG Terminal and surveys conducted adjacent to the SPLNG Terminal. Other concurrences were requested and received for the use of additional areas within the previously surveyed SPLNG Terminal. A summary of these investigations and concurrences, which include the areas that would be affected by the Project, are summarized in table B.5.1-2.

Table B.5.1-2 Summary of SPLNG's Cultural Resource Surveys and Consultations				
Submittal	**Date of SHPO Submittal**	**Date of SHPO Concurrence**	**Corresponding FERC Docket Number**	**Corresponding SPLNG Third Berth Expansion Project Location**
Request for Comments Regarding Dredge Material Placement Plan	April 5, 2004	April 29, 2004	CP04-47-000	Third Berth Area and other marine dredged areas
Phase I Cultural Resources Survey for the Sabine Pass Liquefied Natural Gas Terminal and Pipeline Project, Cameron Parish, Louisiana	August 27, 2004	January 12, 2005	CP04-47-000	Existing access roads 1, 5, and 6, new permanent access roads 7 and 8, Staging Areas 1, 2, 4, and 6
Request for clearance for construction and operation of the Phase II Project facilities	June 13, 2005	July 6, 2005	CP05-396-000	Portions of the Third Berth Area adjacent to existing berth

Table B.5.1-2 Summary of SPLNG's Cultural Resource Surveys and Consultations				
Submittal	**Date of SHPO Submittal**	**Date of SHPO Concurrence**	**Corresponding FERC Docket Number**	**Corresponding SPLNG Third Berth Expansion Project Location**
Request for clearance for construction and operation of the Export facilities	September 29, 2008	November 18, 2008	CP04-47-001 & CP05-396-001	Discharge of ballast water for LNGCs
Request for clearance for construction and operation of the Liquefaction Project Facilities (Stage 1 and 2, Liquefaction Trains 1 through 4)	June 17, 2010	July 2, 2010	CP11-72-000	A portion of staging area 3 and access roads 2 and 3
Phase 1 Cultural Resources Consult for the temporary Workspace off of Light House Road	July 20, 2011	August 24, 2011	CP11-72-000	Staging area 5
Request for clearance for construction and operation of the Liquefaction Expansion Project facilities (Stage 3, Liquefaction Trains 5 and 6)	July 15, 2013	August 13, 2013	CP13-552-000	A portion of staging area 3, and access road 4
Request for clearance for road connection for the Sabine Pass Liquefaction Project	November 18, 2013	November 21, 2013	CP11-72-000 CP13-2-000	A portion of access road 2
SPLNG Third Berth Expansion Project (LA)	February 23, 2018	March 27, 2018	PF18-3-000	Entire Third Berth Project Area (all project components)
SPLNG Third Berth Expansion Project (TX)	April 2, 2018	April 30, 2018	PF18-3-000	Entire Third Berth Project Area (all project components)
SPLNG Third Berth Expansion Project at the Sabine Pass LNG Terminal – Outfall 001	July 26, 2018	August 27, 2018	PF18-3-000	Outfall 001
SPLNG Third Berth Expansion Project – New Third Berth Area	October 3, 2018	November 5, 2018	PF18-3-000	Revised Third Berth Area
Potential Wetland Mitigation Areas	November 14, 2018	January 9, 2019	CP19-11-000	Louisiana Point DMPA

SPLNG conducted cultural resources surveys and reviewed indirect effects on aboveground resources within the project area of potential effect (APE). No traditional cultural properties or properties of religious or cultural importance to Indian tribes have been identified in the Project area. No archaeological or architectural sites have been identified in the direct APE. The majority of the Project area was assessed in conjunction with the previously approved projects at the SPLNG Terminal and the results have been reported to the SHPO for review. SPLNG received concurrence from the Louisiana SHPO on March 27, 2018, agreeing that no known historic properties would be affected. On July 26, 2018, SPLNG submitted an additional

letter to Louisiana SHPO regarding the need to alter the existing stormwater drainage system to support the Project. On August 27, 2018, Louisiana SHPO concurred with SPLNG's recommendation that the addition of Outfall 001 would not affect any known historic properties. SPLNG modified the Third Berth layout subsequent to the March and July 2018 concurrence from Louisiana SHPO; therefore, SPLNG submitted a revised Project footprint to the Louisiana SHPO for review October 3, 2018. The Louisiana SHPO concurred with SPLNG's recommendation that no historic properties would be affected on November 5, 2018.

SPLNG received concurrence from the Texas SHPO for a small portion of the marine area of potential affect that is located within Texas waters. SPLNG submitted a recommendation that no historic properties would be affected by the Project on April 2, 2018. The Texas SHPO concurred in a letter dated April 30, 2018. SPLNG notified the Texas SHPO on October 3, 2018 that the revised Project footprint was submitted to the Louisiana SHPO.

SPLNG modified the Project footprint and determined that the modification would have no effect on historic properties. SPLNG submitted a request for concurrence with this determination to the Louisiana SHPO on November 14, 2018. Concurrence from Louisiana SHPO was received on January 9, 2019. SPLNG has not filed comments from the Texas SHPO.

5.2 Unanticipated Discovery Plan

In the event that unanticipated finds are uncovered during Project construction, SPLNG would implement the procedures outlined in its Unanticipated Discovery Plan. We have reviewed the Unanticipated Discovery Plan and find it acceptable.

5.3 Conclusion

SPLNG conducted cultural resources surveys and reviewed indirect effects on aboveground resources within the Project APE. No traditional cultural properties or properties of religious or cultural importance to Indian tribes have been identified in the Project area. No archaeological or architectural sites have been identified in the direct APE. SPLNG recommended that the Project would have no effects on historic properties and this was submitted to the Louisiana SHPO on November 14, 2018. Concurrence from Louisiana SHPO was received on January 9, 2019. SPLNG has not filed comments from the Texas SHPO.

Therefore, **we recommend that**:

- **SPLNG should <u>not begin</u> Project construction activities and/or use of staging, storage, or temporary work areas and new or to-be-improved access roads <u>until</u>:**

  a. SPLNG files with the Secretary:

  1) remaining cultural resources survey report(s);

  2) site evaluation report(s) and avoidance/treatment plan(s), as required; and/or

  3) comments from the Texas SHPO.

b. the Advisory Council on Historic Preservation is afforded an opportunity to comment if historic properties would be adversely affected; and

c. the FERC staff reviews and the Director of OEP approves the cultural resources reports and plans, and notifies SPLNG in writing that treatment plans/mitigation measures (including archaeological data recovery) may be implemented and/or construction may proceed.

All materials filed with the Commission containing location, character, and ownership information about cultural resources must have the cover and any relevant pages therein clearly labeled in bold lettering: "CUI//PRIV- DO NOT RELEASE."

6.0 LAND USE, RECREATION, AND VISUAL RESOURCES

6.1 Land Use

Land use classification was compiled from field surveys, USGS 7.5-quadrangle maps, and high-quality aerial photographs. Land within the Project area is classified into the following categories based on dominant land use and vegetative cover:

- Industrial/commercial: existing and approved facilities at the SPLNG Terminal and existing paved roads;
- open water: unvegetated bodies of water including a perennial river and intermittent stream; and
- wetland: mix of E2EM and E2SS.

Construction of the Third Berth would affect a total of about 375.2 acres of land, of which 171.6 acres would be maintained for operation. All land within the SPLNG Terminal is classified as either existing industrial/commercial land used for the existing and approved facilities or open water and wetlands (Table 6.1-1). The southern portion of the Third Berth would be located in an area that consists of dredged fill material comprised of very soft clays to reach the current grade El +2 feet to +3 feet (NAVD 88). The northern portion of the proposed Third Berth was previously improved with fill material consisting of fat clays and crushed limestone to reach the current grade El +6 feet to +9 feet.

The majority of the SPLNG Terminal and overlapping Project areas are considered industrial/commercial land use types. These areas are disturbed and are devoid of vegetation or consist of impervious surfaces. Industrial land affected by construction and operation of the Project would be limited to previously approved areas and existing permanent access roads. This land is currently paved with impervious materials and the majority would remain as such during and following construction; with the exception of impact areas for the proposed Third Berth; which would be converted to open water.

The SPLNG Terminal is located on the eastern shore of Sabine Pass Channel, the southern-most terminus of the Sabine-Neches Waterway. This waterway is a routinely

maintained/dredged ship channel with depths greater than -40 feet NAVD 88. Tidal exchange between marine and estuarine systems occurs through the Sabine Pass Channel, which has been extensively modified for navigational purposes. The Gulf Intracoastal Waterway enters the Sabine-Port Arthur canal just south of Port Arthur, Texas, and exits via the Sabine River. Bayous discharging into the Sabine-Neches canal and river system include Adams Bayou, Cow Bayou, and Taylor Bayou. All of these bayous have been dredged along their lower reaches. The open water land use category also includes an intermittent stream which provides conveyance to stormwater discharges (Outfall 001).

Dredging for the proposed Third Berth would impact the Sabine Pass Channel and adjacent E2EM and E2SS wetlands. Impacts would be permitted and mitigated under the terms of the COE Section 404 Permit and Louisiana Coastal Use Permit. Impacts on shipping traffic would be minimized through coordination with the Coast Guard. Section B.3.3 provides additional information regarding the permanent conversion of wetlands to open water for the proposed Third Berth.

Table B.6.1-1

Detailed Summary of Land Use Affected by Project Construction and Operation (acres)

Facility	Indus./Comm.	Open Water [e]	Wetland [f]	Open Land	Total
Construction					
Third Berth	13.36	49.23	27.66	-	90.25
Outfall 001	0.20	0.01	-	-	0.21
Staging Areas					
Staging Area 1	35.27	-	-	-	35.27
Staging Area 2	15.48	-	-	-	15.48
Staging Area 3	113.13	-	-	-	113.13
Staging Area 4	15.79	-	-	-	15.79
Staging Area 5 [a]	80.16	-	-	-	80.16
Staging Area 6	12.65	-	-	-	12.55
Subtotal	**272.48**	**-**	**-**	**-**	**272.48**
Access Roads					
Access Road 1 [b]	4.04	-	-	-	4.04
Access Road 2 [b]	1.04	-	-	-	1.04
Access Road 3 [b]	0.33	-	-	-	0.33
Access Roads 4 [b]	1.22	-	-	-	1.22
Access Road 5 [b]	0.91	-	-	-	0.91
Access Road 6 [b]	3.7	-	-	-	3.70
Access Road 7 [c, d]	0.80	-	-	-	0.80
Access Road 8 [c]	0.22	-	-	-	0.22
Subtotal	**12.26**	-	-	**-**	**12.26**
Construction Total	**298.30**	**49.24**	**27.66**	**-**	**375.20**
Operation					
Third Berth	13.36	49.23	27.66	-	90.25
Outfall 001	0.12	0.01	-	-	0.13
Staging Area 5	80.16	-	-	-	80.16
Access Road 7 [c, d]	0.80	-	-	-	0.80
Access Road 8 [c]	0.22	-	-	-	0.22
Operation Total	**94.66**	**49.24**	**27.66**	**-**	**171.56**

[a] Wetlands identified within Staging Area 5 would be avoided by Project construction.
[b] Construction and operation acreages for existing access roads are based on a proposed 20-foot width.
[c] Construction and operation acreages for new permanent access roads (Access Roads 7 and 8) are based on a proposed 20-foot width.
[d] A portion of Access Road 7 would be elevated on the trestle within the Third Berth. Acreages for this portion of Access Road 7 have been accounted for as part of the acreages associated with the Third Berth.
[e] Open water impacts include impacts to a perennial river and intermittent stream.
[f] Wetland impacts include E2EM and E2SS.

6.2 Existing Residences and Planned Development

There are no residences within 50 feet of the SPLNG Terminal. The nearest residences are 7,100 feet away, across the Sabine Pass Channel in Sabine Pass, Texas. SPLNG consulted with Cameron Parish regarding planned residential or commercial developments that might be affected by or occur within 0.25 mile of the SPLNG Terminal. No planned residential or commercial developments were identified.

6.3 Recreation and Special Interest Areas

The proposed Project would not be located within 0.25 mile of landfills (LDEQ, 2018). No national or state forests are within 0.25 mile of the proposed Project (USFS, 2018; LDWF, 2018d, e, f). Likewise, the Project would not cross any state-owned lands (LDNR, 2018a). However, the State of Louisiana does own the water bottom within the Sabine Pass Channel. SPLNG is working with the Louisiana State Land Office to amend its existing Water Bottom Lease. SPLNG stated that it will file the 2nd Amendment to the Water Bottom Lease No. 566 once received from the Louisiana State Land Office.

Much of the coastal marsh in the immediate vicinity of the SPLNG Terminal is privately owned and may be used for fishing, wildlife viewing, and other non-consumptive uses; as well as for seasonal use for hunting. There are public boat ramps on both the Texas and Louisiana sides of the SH 82 Sabine Pass Bridge. These are approximately 1.5 miles north of the LNG storage tanks, as well as 0.5 mile south of the existing marine berth near the Sabine Pass Battleground State Historic Park in Texas. These public boat ramps would not be affected by construction or operation of the proposed Project at the SPLNG Terminal.

Currently, Natural Gas Pipeline of America, LLC (NGPL) and Port Arthur LNG/Port Arthur Pipeline are also proposing to utilize Staging Area 2 and Duck Blind Road for proposed projects (refer to section B.10.2 for additional information regarding these projects). SPLNG has entered into a consent agreement with NGPL that would allow for surface lease with the landowner and temporary use of specified areas within Staging Area 2.[10] NGPL would use a portion of Duck Blind Road during construction and NGPL would communicate and coordinate with SPLNG on the delivery of equipment, material and other construction activities. Multiple discussions were held with Port Arthur LNG and Port Arthur Pipeline during the first quarter of 2019. The Parties continue to work toward finalizing a binding agreement.

The Third Berth and turning basin would be constructed within and adjacent to a federally maintained shipping channel. The SPLNG Terminal, including the loading berths, is a secure site with restricted access. Recreational and commercial fishing activities are prohibited within the secured footprint of the SPLNG Terminal facilities, of which the Third Berth and turning basin would be included. The completed Third Berth would be a maintained industrial shipping berth and would not provide optimum fisheries habitat. Construction of the Project

[10] SPLNG currently leases the property from a private landowner.

would allow LNG vessel traffic to increase from 400 to 580 vessels per year which would account for approximately a 0.25 percent increase in annual vessel traffic within the Sabine-Neches Waterway (Sabine Neches Navigation District [SNND], 2018). However, this increase in vessel traffic is not expected to significantly affect water quality or upstream/downstream recreational fishing.

No State or National Parks are located within 0.25 mile of the proposed Project (Louisiana Department of Culture, Recreation, and Tourism, 2018; NPS, 2018a). No nature preserves protected by The Nature Conservancy (The Nature Conservancy, 2018) are located within 0.25 mile of the proposed Project.

No registered natural landmarks are located within 0.25 mile of the proposed Project (NPS, 2018b; NPS, 2018c) and no streams listed on the Nationwide Rivers Inventory would be affected by the proposed Project (National Wild and Scenic Rivers System, 2018; NPS, 2018d).

The proposed Project would not affect or be within 0.25 mile of any trails designated under the National Trails System or wilderness areas designated under the Wilderness Act (NPS, 2018c; National Recreation Trails Program, 2013; University of Montana, 2018).

6.4 Contaminated or Hazardous Waste Sites

No hazardous waste sites or leaking underground storage tanks are located within 0.25 mile of the proposed Project (EPA, 2016; EPA, 2018b; LDEQ, 2018).

6.5 Coastal Zone Management

The Project is located within the Louisiana Coastal Zone and is subject to permitting requirements pursuant to the Louisiana State and Local Coastal Resources Management Act and in accordance with the federal Coastal Zone Management Act. The Louisiana Coastal Zone boundary is established in Louisiana Revised Statutes Article 49, §214.24. The western and eastern boundaries are the Louisiana borders with Texas and Mississippi, respectively. The southern boundary is the state zone located approximately three miles offshore. The inland boundary meanders from Texas to Mississippi and encompasses all of Cameron Parish. This boundary is scientific-based, using a wide variety of parameters, including but not limited to, tidal influence, sheet flow, soils, salinity, vegetation, fish and wildlife, topography, geology, geography, economy and recreation (LDNR, 2018b).

The Coastal Zone Management Program is administered by the Office of Coastal Management of the LDNR. The Project would be entirely located within the Louisiana Coastal Zone boundary with the exception of existing Project areas located above the five-foot above mean sea level contour. The LDNR, Office of Coastal Management is responsible for permitting associated with activities occurring within the Louisiana Coastal Zone. The Project application for Coastal Zone was placed on Public Notice on May 15, 2019, by the LDNR Office of Coastal Management. To date, only one comment was received by the Louisiana Department of Wildlife and Fisheries on May 22, 2019. On June 4, 2019, LDNR Office of Coastal Management issued a letter requesting additional information on the mitigation

alternatives analysis. On June 12, 2019, SPLNG provided responses to the LDNR Office of Coastal Management. SPLNG continues to consult with LDNR Office of Coastal Management to obtain Coastal Use Permit. Therefore, SPLNG submitted a Joint Permit Application for a Coastal Use Permit to the Office of Coastal Management in October 2018. The Commission may not authorize construction until the Coastal Zone Management Act consistency determination is rendered. Therefore, **we recommend that:**

- **Prior to construction, SPLNG should file with the Secretary a copy of the LDNR's Coastal Zone Management Act consistency determination for the Project.**

6.6 Visual Resources

The existing SPLNG Terminal is located in an undeveloped part of Cameron Parish where the nearest residences and schools with potential views of the SPLNG Terminal are located over one mile away. Potential public viewpoints include public boat ramps on both sides of the SH 82 bridge north of the SPLNG Terminal site, the community of Sabine Pass, the Sabine Pass Battleground State Historical Park, the J.D. Murphree Wildlife Management Area, and the Texas Point National Wildlife Refuge on the west side of Sabine Pass Channel. The primary Project components that would have a visual impact on surrounding areas are the proposed Third Berth LNG loading facilities. These new facilities would be installed adjacent to the existing marine berth and would be similar in size and appearance.

The Project includes new facilities and structures that would require proper lighting for operations and safety purposes. Each light would consist of instant re-strike high-pressure sodium lights with down-shields installed to reduce upward illumination, light spill, and glare to minimize visual disturbances of the surrounding wildlife and environment (including ships navigating the Sabine Pass River Channel). During construction, light plants would provide lighting during early hours and late hours of the work shifts, particularly during winter months.

SPLNG consulted with FWS and they indicated that the shoreline at the Third Berth would not provide suitable habitat for nesting birds and therefore potential impacts on migratory birds would be minimal.

Lighting for the Third Berth would be similar to approved lighting currently in place for the existing SPLNG Terminal marine berth and other marine facilities in the area. Since the Third Berth would provide minimal fisheries habitat, SPLNG does not anticipate that lighting required for construction and operation of the Third Berth would significantly affect marine resources in the area.

Construction and operation of the Project facilities would be visible or partially visible to motorists using SH 82 which is part of the Creole Natural Trail All-American Road, a 180-mile collection of highways near Lake Charles, Louisiana designated as a national scenic byway (Federal Highway Administration, 2018). Construction and operation of the Project facilities would also be visible or partially visible to boaters in the Sabine Pass Channel, and residents or visitors in Sabine Pass, Texas and surrounding areas. Although the terrain is generally flat and

vegetation relatively low-profile, views of the SPLNG Terminal are intermittent to motorists on SH 82, users of the boat ramps, and the community of Sabine Pass due to the configuration of the roadways, existing vegetation, and other industrial development along the Texas shoreline of the Sabine Pass Channel. Further, visual impact on the surrounding area during construction and operation of the Project would be minimal since the new facilities would be viewed in conjunction with the existing LNG tanks, marine berth, and facilities already in operation at the SPLNG Terminal site. These existing facilities are now part of the visual environment such that the addition of the Third Berth would have no appreciable effect on the aesthetics of the area.

7.0 SOCIOECONOMICS

Socioeconomics is an evaluation of the basic conditions (attributes and resources) associated with the human environment, particularly the population and economic activity within a region. Economic activity generally encompasses regional employment, personal income, and revenues and expenditures. Impacts on the fundamental socioeconomic components can influence other issues such as regional housing availability and provision of community services. All data presented in this section represents the most current data available at the writing of this EA.

This section addresses several different factors that could affect the quality of life and economy in the area surrounding the Project where employees might live, shop, and use public resources. These factors include public services such as fire, police, and medical facilities; educational facilities; and environmental justice.

The socioeconomic analysis for the proposed Project examines data from Cameron Parish and Jefferson County, as well as Port Arthur, Texas, where the majority of the Project workforce is anticipated to reside during construction and operation.

7.1 Population, Economy, and Employment

Table B.7.1-1 provides a summary of current and projected populations of the affected counties and Port Arthur, Texas.

Table B.7.1-1
Existing population and Demographic Conditions

Demographic	Louisiana	Cameron Parish, LA	Texas	Jefferson County, TX	Port Arthur, TX
2018 Population Estimate	4,659,978	6,968	28,701,845	255,001	55,498 (2017)
2018 Population Density (persons per square mile)	104.9	5.3	96.3	287.9	699.8
Population Change Since 2010 (percent)	2.8	1.5	14.1	1.1	UA
Projected Population Change from 2020 to 2030 (percent)	4.9	-7.2	13.4	1.0	-1.6

Source: U.S. Census Bureau, 2018; World Population Review, 2019; Blanchard, 2007; Potter and Hoque, 2014; Texas Demographic Center, 2019; Van Zandt, 2012.

Table B.7.1-1 Existing population and Demographic Conditions					
Demographic	**Louisiana**	**Cameron Parish, LA**	**Texas**	**Jefferson County, TX**	**Port Arthur, TX**
UA = Data unavailable					

While populations rose in both Cameron Parish and Jefferson County, the increase between 2010 and 2018 were at slower rates than the States of Louisiana and Texas, respectively. Populations in both states are expected to continue to increase, while populations in Jefferson County and Cameron Parish are expected to either remain relatively stable or decrease over the next decade (Blanchard, 2007; Potter and Hoque, 2014; Texas Demographic Center, 2019). The city of Port Arthur, Texas, which is the closest large municipality to the Project, had a population of 55,498 in 2017 (World Population Review, 2019). Similar to the population trends exhibited by Jefferson County, the population of Port Arthur, Texas is expected to remain stagnant over the next decade (Van Zandt, 2012).

Table B.7.1-2 presents income and employment conditions for Cameron Parish, Louisiana and Jefferson County, Texas, as well as the major municipalities closest to the Project.

Table B.7.1-2 Existing Income and Employment Conditions in the Project Area					
Income Characteristic	**Louisiana**	**Cameron Parish, LA**	**Texas**	**Jefferson County, TX**	**Port Arthur, TX**
2017 Estimate: Per Capita Income (dollars)	26,205	29,681	28,985	25,370	18,417
2017 Estimate: Population Below Poverty Level (percent)	19.6	8.7	16.0	19.4	30.7
2017 Estimate: Civilian Labor Force	2,188,424	3,215	13,473,957	112,595	21,209
2017 Estimate: Unemployment Rate (percent)	7.2	3.0	5.8	6.5	9.2
Major Industry	EH&SS [a]	EH&SS [a]	EH&SS [a]	EH&SS [a]	Construction
Manufacturers' Shipments, 2012 ($1000)	271,191,050	0	702,603,073	80,760,488	D [b]
Wholesale Trade Sales, 2012 ($1000)	86,300,969	29,928	1,129,150,714	2,450,990	D [b]
Retail Sales, 2012 ($1000)	61,396,364	28,323	356,116,376	3,968,309	865,822
Accommodation and Food Service Sales, 2012 ($1000)	11,697,949	1,364	54,480,811	485,461	86,422
Source: U.S. Census Bureau, 2018. [a] EH&SS = Education, health care, and social services [b] Suppressed to avoid disclosure of confidential information					

Education, healthcare, and social services were the biggest industry in both Cameron Parish and Jefferson County, while construction was the biggest industry in Port Arthur, Texas.

In 2017, Texas had a lower unemployment rate (5.8 percent,) than the national average of 6.6 percent, while Louisiana had a higher unemployment rate (7.2 percent) (U.S. Census Bureau, 2018). Unemployment rates within both Cameron Parish (3.0 percent) and Jefferson County (6.5 percent) were also lower than in the state and national averages, while unemployment in Port Arthur, Texas (9.2 percent,) was higher than the state and national averages. The percentage of population below the poverty level in Cameron Parish (8.7 percent) was lower than the state average (19.6 percent), while the percentage of population below the poverty level in both Jefferson County and Port Arthur (19.4 and 30.7 percent, respectively) were higher than the state average (16.0 percent). The per capita income in 2017 exhibited a similar trend with higher than state averages in Cameron Parish and lower than state averages in both Jefferson County and Port Arthur.

Projected employment during construction and operation of the Project is summarized in table B.7.1-3. The Project would have an estimated total construction payroll of $95 million over the 31-month construction period. Expenditures associated with the purchase of materials, equipment, and services in the region would generate economic activity and support employment and income elsewhere in the economy through the multiplier effect, which occurs as initial changes in demand affect the local economy and generate indirect and induced impacts.

SPLNG would employ approximately 380 full-time staff during peak construction of the Project. Local workers (currently residing within a 50-mile commuting distance of the work site) are expected to account for approximately 39 percent of the construction workforce for the duration of the Project. The remaining construction workforce would consist of non-local workers. Non-local workers would temporarily relocate to the Project vicinity for the duration of their employment. Some workers would possibly commute home on weekends, depending on the location of their primary residence. Very few, if any, of the non-local workers employed during the construction phase would be expected to permanently relocate to the Project area.

Between 2 and 3 permanent full-time staff would be employed by SPLNG during operations of the Project. Relocation of operational staff to the Project area would be expected to be limited, because a large, skilled workforce exists in the region, primarily due to the existing presence of the local refining and petrochemical sectors as well as training programs at local colleges.

Table B.7.1-3
Summary of Estimated Peak Construction and Operational Workforce

Parameter	Project
Average Construction Workforce	220
Peak Construction Workforce (craft workers)	300
Peak Construction Workforce (supervisory staff)	80
Peak Construction Workforce Hired Locally	150
Peak Construction Workforce (non-local)	230
Estimated Construction Payroll	$95 million
Duration of Construction	31 months
Additional Operation Workforce	2 to 3

7.2 Housing

Part of the construction workforce would be hired and/or contracted locally, and they would likely commute to and from their homes to work each day. The remaining construction workforce is assumed to permanently reside further than commuting distance from the Project sites and would be expected to temporarily relocate to the Project vicinity for the duration of their employment; possibly commuting home on weekends, depending on the location of their primary residence.

Housing resources are summarized by county and nearby communities in table B.7.2-1. These estimates suggest that rental housing would be available in Cameron Parish and Jefferson County, with a substantial number of units available for rent in Port Arthur, Texas, which would be located within commuting distance of the proposed Project. Additional units classified for seasonal, recreational, or occasional use may also be available (table B.7.2-1).

Table B.7.2-1
Temporary Housing Units Available in the Project Vicinity

Demographic	Louisiana	Cameron Parish, LA	Texas	Jefferson County, TX	Port Arthur, TX
2017 Estimate: Number of Vacant Housing Units	293,419	1,123	1,180,967	13,696	4,115
2017 Estimate: Rental Vacancy Rate (percent)	8.3	14.5	7.6	7.3	7.9
2010 Estimate: Number of Vacant Housing Units for Seasonal, Recreational, or Occasional Use	42,253	779	208,733	973	299
2017 Estimate: Number of Renter Occupied Housing Units	600,183	272	3,579,373	35,839	8,918
2018 Number of Hotels/Motels	1,875	7	8,625	96	29
2018 Number of Campgrounds and RV Parks	342	17	619	47	30

Sources: U.S. Census Bureau, 2018; HotelMotels.info, 2018; Cameron Parish Tourist Commission, 2018; Yellow Pages, 2018; Roverpass, 2018

The vacant rental housing, motels/hotels, and RV parks in the Project vicinity would be sufficient to accommodate the estimated peak non-local workforce during construction. Since many workers are expected to room with each other to lower costs, and peak construction months would be limited, the available housing is expected to be considerably more than needed. Due to the number of non-local workers and the high availability of temporary housing, we

conclude that construction of the Project would have a minor, temporary impact on housing in the affected area.

Operation of the Project would result in a limited number of non-local workers permanently relocating to the affected area. However, even if all operation personnel were non-local, an adequate number of housing units would be available. Therefore, we conclude that operation of the Project would have a negligible, but permanent impact on the local housing market.

7.2.1 Displacement of Residences and Businesses

The Project facilities would be primarily located within or immediately adjacent to industrial land associated with the existing SPLNG Terminal, and there are no existing or planned residential developments within 0.25 of the Project. Therefore, we conclude that construction and operation of the Project would be not displace residences or businesses.

7.3 Public Services

This section describes the community and public services available within the affected area, including schools, emergency response and medical facilities, and fire and police departments. Construction of the Project could result in increased demand for public services. Table B.7.3-1 provides a summary of local community services in the Project area.

Table B.7.3-1
Public Service Data for the Project Vicinity

Parish/County/City, State	Number of Public Schools	Number of Police Departments	Number of Fire Departments (by type)	Number of Hospitals [a]	Number of Hospital Beds
Cameron Parish, LA	4	1	3 (Volunteer)	1	49
Jefferson County, TX	74	7	6 (Career) / 4 (Volunteer)	4	1,001
Port Arthur, TX	17	1	1 (Career)	2	456
Totals	**95**	**9**	**7 (Career) / 7 (Volunteer)**	**7**	**1,506**

Sources: Public School Review, 2018; USACops, 2018; Fire Department Directory, 2018; Louisiana Hospital Inform, 2018; American Hospital Directory: Texas, 2018

[a] Hospitals do not include rehabilitation, long-term, and psychiatric hospitals.

Health care demands during the Project construction phase would include emergency medical services to treat injuries resulting from construction accidents such as slips, trips, and falls. Medical facilities within the Project vicinity would be sufficient to absorb any increase in demand by the temporary construction workforce, with minimal cost to the local governments. The addition of 380 full-time workers during construction of the Project would have a negligible effect on hospitals.

Construction-related demands on local agencies could include increased enforcement activities associated with issuing permits for vehicle load and width limits, local police assistance during construction at road crossings to facilitate traffic flow, and emergency medical services to treat injuries resulting from construction accidents. We conclude that construction of the Project would have only minor and temporary negative impacts on the local police and fire services.

The Project would be located within the Cameron Parish School District; however, it is anticipated that a majority of construction workers with families would reside in Port Arthur, Texas, which is located within the Port Arthur Independent School District. Table B.7.3-2 lists the number of public schools and provides detailed information on the school districts and school enrollment that would be within the Project vicinity. During the 2018-2019 school year, there were 10,088 students enrolled in 20 schools located within the two school districts (Public School Review, 2018).

Table B.7.3-2
School Districts and School Enrollment in the Project Vicinity

Parish/County/School District	Total in District		Sub-Total by Grade		
	Number of Schools	School Enrollment	Grades	Number of Schools	School Enrollment
Cameron Parish, Louisiana					
Cameron Parish School District	3	600	PK-12	3	600
Jefferson County, Texas					
Port Arthur Independent School District	17	9,488	PK	1	429
			PK-2	1	386
			PK-5	6	4,114
			3-5	1	359
			6-8	2	1,581
			6-12	2	516
			9	1	608
			9-12	1	NA
			10-11	1	3
			10-12	1	1,492
Totals	**20**	**10,088**		**20**	**10,088**

Source: Public School Review, 2018.
PK = Pre-Kindergarten

A small portion of non-local workers temporarily relocating to the Project area could be accompanied by their families. The potential addition of a limited number of students in the Project vicinity would not be expected to affect existing average student/teacher ratios in any one location. The addition of about 380 full-time workers during construction and 2 to 3 workers during operation of the Project would have a negligible effect on the local school systems, because the local workers would be hired from the local/regional labor pool and a small number of non-local workers would relocate with families.

7.4 Transportation and Traffic

7.4.1 Land Transportation and Traffic

Construction traffic would access the Project site primarily from the Port Arthur, Texas area via SH 82. Once at the site, construction traffic would utilize the SPLNG Terminal main entrance road (Lighthouse Road or access road 6), which parallels the eastern boundary of the

property. Material deliveries to the site would be via truck using the same access point as construction traffic. Heavy material delivers to the site would be via barge to the on-site construction dock, or via SH 27 to SH 82 from Holly Beach, Louisiana.

There would be an increase in heavy truck traffic and workforce traffic to the Project site during construction. SPLNG estimates an average of 8 to 12 deliveries via truck per day during construction, with a peak of 18 to 23 trips per day. A similar number of small, two-axle truck deliveries would also be expected during construction. Heavy material delivery would be via barge to the on-site construction dock, or via SH 27 to SH 82 from Holly Beach, Louisiana. It is anticipated that the material delivery vehicles would not exceed the load capacity of either the public roads or the SH 82 bridge. Workers would access the Project site via a combination of personal vehicles and busses. SPLNG estimates an average of 20 to 30 personal vehicles and four to eight busses would be used to access the site per day, with a peak of 60 to 80 personal vehicles and 10 to 12 busses per day.

Based on available traffic count data, construction of the Project is not expected to significantly impact traffic flow on SH 82, as the estimated peak volume of vehicles entering the facility off of SH 82 represents a daily increase of approximately 7 percent. This is based on the existing annual average daily traffic of 1,897 vehicles per day traveling the stretch of SH 82 near the existing SPLNG Terminal (Louisiana Department of Transportation and Development, 2018). The increase in traffic would be temporary and represents a relatively small increase in existing traffic on the surrounding roadways.

Operation of the facility would require an increase of 2 to 3 permanent employees. Assuming these workers would each commute to work in their own vehicles, the addition of these vehicle trips per day would be equivalent to 0.1 percent of existing traffic volumes as measured on SH 82 near the existing SPLNG Terminal. Therefore, the increase in traffic associated with the operation of the Project would be minor and not significant.

7.4.2 Marine Transportation and Traffic

Barges would be utilized during construction to transport equipment and materials to the existing construction dock located on-site, thus reducing the impact of material deliveries on the area road networks. Barges would access the Project site via the Gulf Intracoastal Waterway and the Sabine Pass and Port Arthur Ship Channels. SPLNG anticipates that the number and type of barge deliveries that occur during construction would be as follows: four barges for sheet pile material, two barges for trestle and mooring and breasting dolphins, 56 barges for stone and rip rap, five barges for precast girders and planks, and three barges for construction cranes. Assuming that barges are transported in pairs, approximately 35 voyages would be required to deliver the listed materials for construction. The number of deliveries to the Project site that would occur via barges is not expected to affect existing marine transportation patterns.

Operation of the Project would result in an anticipated increase in the maximum marine vessel traffic from the currently-authorized 400 LNGCs per year up to 580 LNGCs per year. No additional security vessels would be added to support the additional ship calls for the Project. In lieu of a Project-specific transportation plan for marine traffic, SPLNG developed a preliminary

WSA, which addresses overall traffic patterns, waterway conditions, and safety and security matters for the proposed LNGC traffic in conjunction with other existing and potential future marine traffic. SPLNG submitted the WSA to the Coast Guard in January 2018 as part of a request for a LOR confirming that the increase of up to 180 LNGCs per year would not significantly impact the waterway. In a letter dated May 21, 2019, the Coast Guard issued the LOR for the Project, which stated that the Sabine Pass Channel is considered suitable for the increased LNGC traffic associated with the Project in accordance with the guidance in the Coast Guard Navigation and Vessel Inspection Circular 01-2011.

For the additional 180 LNGCs, SPLNG would follow the current procedures and regulations that are applicable to escort a LNGC calling at the existing Berths 1 and 2. For inbound/outbound transit of each LNGC, the Coast Guard has delegated authority to the local Sheriff's department to complete any security escort activity. The Sheriff's department would provide the escort for the last 30 minutes of each LNGC transit inbound and the first 20 minutes of each LNGC transit outbound. The security vessel would not escort the LNGC for the entire duration of the transit inbound or outbound. Historical site experience has shown that these very limited duration "security vessel escorts" for LNGC inbound/outbound transit activity would occur about 80 percent of the time.

7.5 Property Values

Although property values could be affected by the construction and operation of the Project, the exact impact on a regional level is unknown. Ultimately, a potential purchaser would make an offer to purchase based on his or her own values, which may or may not take the LNG terminal into account. Since the Project would result in the modification of an existing facility, property values are not anticipated to be affected by the Project.

7.6 Tax Revenues

SPLNG estimates that the Project would bring an influx of jobs and tax money to the Project area. Both the materials purchased during construction as well as the goods and services purchased by construction staff would be subject to sales tax. Therefore, SPLNG anticipates that the tax revenue generated during construction of the Project would be $13 million.

During operations, SPLNG anticipates that the purchase of equipment or materials would be expected to generate approximately $15 million in sales tax. The estimated average annual property taxes attributable to the operation of the Project for the subsequent twenty years (i.e., year 11 through year 31) would be approximately $2 million per year.

7.7 Environmental Justice

For projects with major aboveground facilities, FERC regulations (18 CFR 380.12(g)(1)) direct us to consider the impacts on human health or the environment of the local populations, including impacts that would be disproportionately high and adverse for minority and low-income populations.

The EPA's Environmental Justice Policies (which are directed, in part, by Executive Order 12898: Federal Action to Address Environmental Justice in Minority Populations and Low-Income Populations) focus on enhancing opportunities for residents to participate in decision making. The EPA (2019b) states that Environmental Justice involves meaningful involvement so that: "(1) potentially affected community residents have an appropriate opportunity to participate in decisions about a proposed activity that would affect their environment and/or health; (2) the public's contributions can influence the regulatory agency's decision; (3) the concerns of all participants involved would be considered in the decision-making process; and (4) the decision-makers seek out and facilitate the involvement of those potentially affected."

In accordance with the Executive Order 12898, all public documents and notices for the Project were made readily available to the public during our review of the Project. SPLNG notified the various landowners and stakeholders located in the vicinity of the Project and held an open house on April 17, 2018 to provide information to interested parties. As discussed in section A.5.0, FERC staff also conducted outreach efforts such as mailing the NOI to about 120 parties notifying them of the Project.

The Council on Environmental Quality (CEQ) also has called on federal agencies to actively scrutinize a number of important issues with respect to environmental justice (CEQ, 1997). As part of our NEPA review, we have evaluated potential environmental justice impacts related to the Project taking into account the following:

- the racial and economic composition of affected communities;
- health-related issues that may amplify project effects on minority or low-income individuals; and
- public participation strategies, including community or tribal participation in the NEPA process (CEQ, 1997).

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. According to USC 689(3), low-income populations are defined as a geographic area represented by a census tract or equivalent county division where the poverty rate is 20 percent or greater. Therefore, low-income populations for this analysis were determined to be those with 20 percent or greater of the population living below the poverty threshold or when the percent of the population in the affected area living below the poverty threshold is substantially greater than the percent of the population living below the poverty threshold in the larger area of the general population (e.g., county or parish).

In accordance with these guidelines, we prepared an environmental justice analysis for the Project utilizing a three-step approach to conduct our review. These steps are:

- determine the existence of minority and low-income populations;
- determine if resource impacts are high and adverse; and
- determine if the impacts fall disproportionately on environmental justice populations.

To develop a more accurate understanding of the racial and ethnic characteristics of the communities in the immediate vicinity of the Project facilities, data were used from census block groups, as opposed to the larger geographic areas included in census tract and county level data. The EPA's Environmental Justice Screening and Mapping Tool was utilized, in part, to confirm the presence of census block groups that contain minority and low-income populations (EPA, 2018c). In this analysis, the minority and low-income population percentages in the States of Texas and Louisiana and the Project-area counties were compared to the respective percentages within the census block groups intersected by a 2.0-mile radius around the Project. These census block groups comprised the affected community based on the potential environmental impact.

Table B.7.7-1 and figure B.7.7-1 provide an overview of the racial composition and economic characteristics of the population in the block groups within a 2-mile radius of the Project.

Table B.7.7-1
Minority Populations and Low-Income Population Information for the Census Block Groups Within 2 Miles of the Project

State / County / Census Tract Block Group	Total Population	White (%)	Hispanic or Latino origin (of any race) (%)	African American (%)	Asian (%)	Some Other Race (%) [a]	Total Minority Population (%)	Percent Below Poverty Level
State of Louisiana	4,531,570	59.0	5.0	32.0	1.7	2.3	41.0	19.6
Cameron Parish	6,797	91.3	5.5	2.8	0.3	0.1	8.7	8.7
Census Tract 9702.01, Block Group 2	119	94.1	0.0	0.0	1.7	4.2	5.9	10.1
State of Texas	27,419,612	42.8	38.9	11.7	4.5	2.1	**57.2**	16.0
Jefferson County	238,304	41.8	19.5	33.7	3.6	1.4	**58.2**	19.4
Census Tract 116, Block Group 1	1,076	87.2	7.7	5.0	0.0	0.1	12.8	10.0

Sources: U.S. Census Bureau, 2017

[a] The Other Race category is inclusive of census respondents identifying as American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander; and/or Some Other Race.

Bold values indicate a percentage that exceeds thresholds defined in text, and is an environmental justice population.

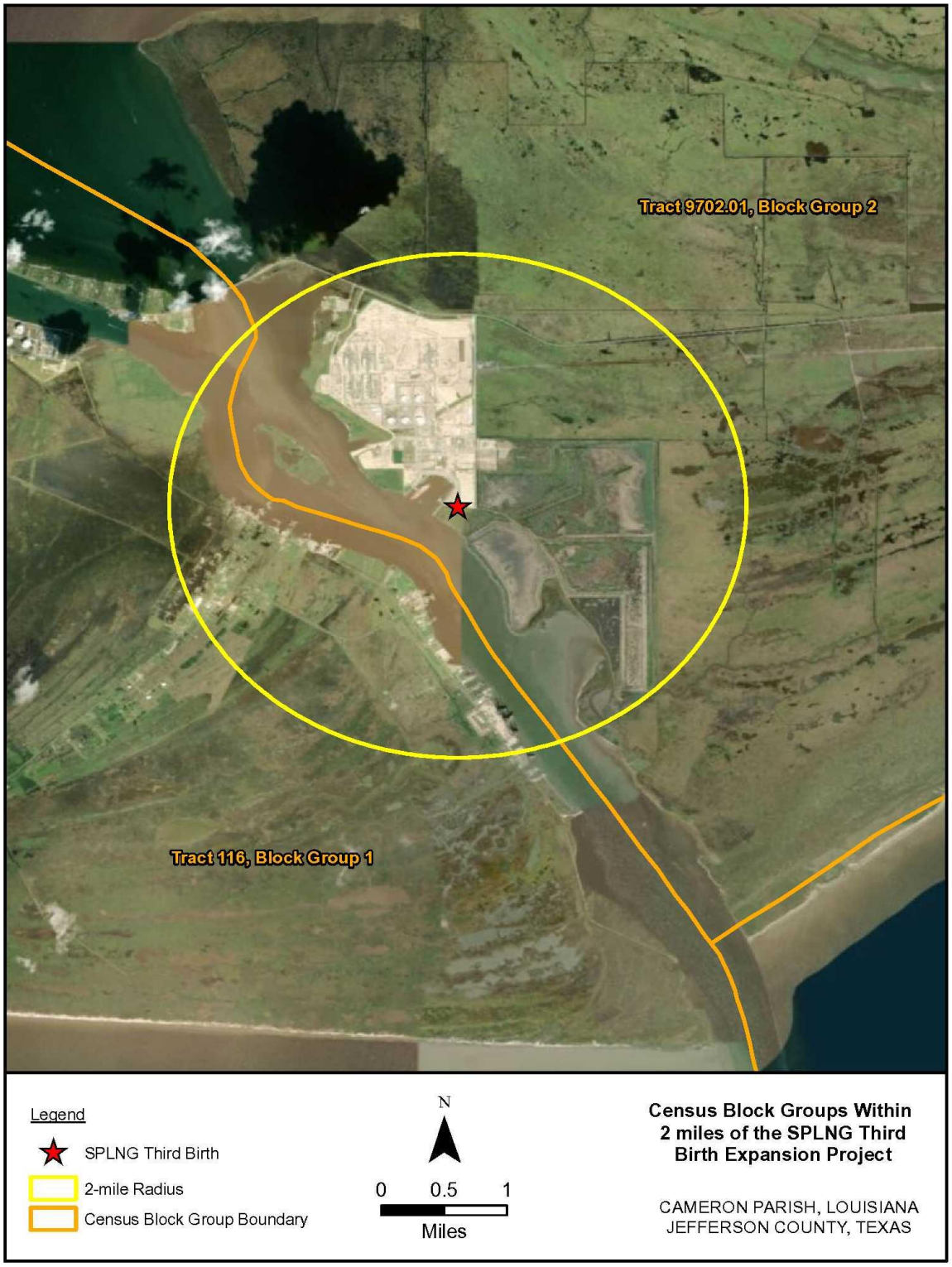

Figure B.7.7-1 Third Berth Expansion Project General Location Map

Neither of the two census block groups located within 2.0 miles of the Project have minority populations greater than the general EPA guidance of 50 percent or poverty rates that exceed 20 percent. Similarly, neither of the two census block groups were determined to have minority populations or poverty rates that were significantly greater than the reference communities. Construction and operation of the Project would have positive socioeconomic impacts on the local communities by stimulating economic growth and employment and by increasing the local tax base (see sections B.7.1 and B.7.6). Therefore, we have determined that construction and operation of the Project would not have a disproportionate adverse impact on environmental justice communities.

8.0 AIR QUALITY AND NOISE

8.1 Air Quality

Air quality would be affected by construction and operation of the Project. This section addresses the construction- and operation-based emissions from the Project as well as applicable regulatory requirements and projected impacts on air quality. The term *air quality* refers to the relative concentrations of pollutants in the ambient air. The subsections below describe well-established air quality concepts that are applied to characterize air quality and to determine the significance of increases in air pollution. This includes metrics for specific air pollutants known as criteria pollutants, in terms of ambient air quality standards, regional designations to manage air quality known as Air Quality Control Regions (AQCR), and the ongoing monitoring of ambient air pollutant concentrations under state and federal programs.

Combustion of fossil fuels, such as natural gas, produces criteria air pollutants, such as nitrogen dioxide (NO_2), carbon monoxide (CO), sulfur dioxide (SO_2), and inhalable particulate matter ($PM_{2.5}$ and PM_{10}). $PM_{2.5}$ includes particles with an aerodynamic diameter less than or equal to 2.5 micrometers, and PM_{10} includes particles with an aerodynamic diameter less than or equal to 10 micrometers. Combustion of fossil fuels also produces volatile organic compounds (VOCs), a large group of organic chemicals that have a high vapor pressure at room temperature; and oxides of nitrogen (NO_x). VOCs react with nitrogen oxides, typically on warm summer days, to form ozone, which is another criteria air pollutant. Other byproducts of combustion are greenhouse gases (GHGs) and hazardous air pollutants (HAPs). HAPs are chemicals known to cause cancer and other serious health impacts.

Other pollutants, not produced by combustion, are fugitive dust and fugitive emissions. Fugitive dust is a mix of $PM_{2.5}$, PM_{10}, and larger particles thrown up in to the atmosphere by moving vehicles, construction equipment, earth movement, and/or wind erosion. Fugitive emissions, in the context of this EA, would be fugitive emissions of methane and/or VOCs from operational pipelines and aboveground facilities.

8.1.1 Regional Climate

The Project site is located on the flat Coastal Plain in the extreme southwestern corner of Louisiana. Based on information and data for Port Arthur, Texas, the climate is a mixture of tropical and temperate zone conditions. In general, the Sabine Pass area has very short, mild

winters and long, hot and humid summers, although sea breezes (from the Gulf of Mexico) prevent the occurrence of extremely high temperatures. Climate data obtained from NOAA for the period 1981 through 2010 show an annual average temperature of 69 °F. Daily average high temperatures range from 62 °F during January to 92 °F during August. Daily average low temperatures range from 43 °F in January to 74 °F during July and August. The record minimum and maximum temperatures are 12 °F and 108 °F, respectively. High humidity is the result of fairly evenly distributed rainfall and proximity to the Gulf of Mexico, resulting in an annual average relative humidity of 79 percent.

Precipitation is fairly evenly distributed throughout the year, with the lowest amounts falling during early-spring and the highest amounts falling during the summer. The annual average precipitation amounts to approximately 60 inches, with a monthly maximum of 7.1 inches in June and a monthly minimum of 3.2 inches in April. Much of the precipitation during the summer occurs in short duration thunderstorms. Tropical storms or hurricanes, although infrequent, can also enhance the summer and autumn rainfall in this region.

The predominant wind direction for most of the year is southerly, with a shift to north-northeasterly during the fall and winter. The annual average wind speed is approximately 8.5 miles per hour (mph), with the highest average monthly wind speeds occurring during late-winter/spring. The prevailing southerly wind is further enhanced during spring and summer by thermal winds which develop when the air over the heated land further inland from the coast is warmer than the air over the relatively cooler waters of the Gulf of Mexico.

Existing Air Quality

The EPA has established National Ambient Air Quality Standards (NAAQS) for six criteria pollutants: SO_2, CO, ozone (O_3), NO_2, particulate matter (PM_{10} and $PM_{2.5}$), and lead. There are two classifications of NAAQS, primary and secondary standards. Primary standards set limits the EPA believes are necessary to protect human health including sensitive populations such as children, the elderly, and asthmatics. Secondary standards are set to protect public welfare from detriments such as reduced visibility and damage to crops, vegetation, animals, and buildings.

Individual state air quality standards cannot be less stringent than the NAAQS. The federal NAAQS for criteria pollutants are the same as the state standards established by the LDEQ as outlined in the Louisiana Administrative Code (LAC) 33:III.711.A and 711.B. The federal/state ambient air quality standards are summarized in table B.8.1-1.

Air Quality Control Regions and Attainment Status

AQCRs are areas established for air quality planning purposes in which state implementation plans (SIPs) describe how ambient air quality standards would be achieved and maintained. AQCRs were established by the EPA and local agencies, in accordance with Section 107 of the Clean Air Act (CAA) and its amendments, as a means to implement the CAA and comply with the NAAQS through SIPs. The AQCRs are intrastate and interstate regions such as large metropolitan areas where the improvement of the air quality in one portion of the

AQCR requires emission reductions throughout the AQCR. The entire Project site would be located in the Southern Louisiana-Southeast Texas Interstate AQCR (No. 106). Likewise, emissions from ship transit would impact the same AQCR.

An AQCR, or portion thereof, is designated based on compliance with the NAAQS. AQCR designations fall under three general categories as follows: attainment (areas in compliance with the NAAQS); nonattainment (areas not in compliance with the NAAQS); or unclassifiable. AQCRs that were previously designated nonattainment but have since met the requirements to be classified as attainment are classified as maintenance areas. The Southern Louisiana-Southeast Texas Interstate AQCR is designated as unclassifiable and/or attainment for all criteria pollutants per 40 CFR Part 81.

Table B.8.1-1

Ambient Air Quality Standards

Pollutant	Averaging Period	Primary NAAQS ($\mu g/m^3$)	Secondary NAAQS ($\mu g/m^3$)
PM_{10}	24-hr [a]	150	150
$PM_{2.5}$	Annual [b]	12	15
	24-hr [c]	35	35
NO_2	Annual [d]	100	100
	1-hr [e]	188 (100 ppb)	N/A
CO	8-hr [f]	10,000	N/A
	1-hr [f]	40,000	N/A
Ozone [g, h]	8-hr [i]	137 (0.070 ppm)	137 (0.070 ppm)
Lead [j]	Rolling 3-month average [d]	0.15	0.15
SO_2 [k]	3-hr [f]	N/A	1,300 (0.5 ppm)
	1-hr [l]	196 (75 ppb)	N/A

$\mu g/m^3$ = micrograms per cubic meter
ppm = parts per million
ppb = parts per billion

a Not to be exceeded more than once pear year on average over three years.
b 3-year average of annual mean $PM_{2.5}$ concentrations.
c 98^{th} percentile of the 24-hr concentrations, averaged over three years.
d Not to be exceeded.
e 98^{th} percentile of the 1-hr daily maximum concentrations, averaged over three years.
f Not to be exceeded more than once per year.
g Although EPA revoked the 1-hr ozone standard (235 $\mu g/m^3$ or 0.12 ppm) in 2005 for all areas, some areas (excluding the Project area) have continuing obligations to adhere to the standard.
h Final rule for the current 8-hr ozone standard became effective December 28, 2015. Revocation of the previous (2008) ozone standards and transitioning to the current (2015) standards would be addressed in the implementation rule for the current standards.
i Annual 4^{th}-highest daily maximum 8-hr concentration, averaged over three years.
j In areas designated nonattainment for the Pb standards prior to promulgation of the current (2008) standards, and for which implmentation plans to attain or maintain the current (2008) standards have not been submitted and approved, the previous standard (1.5 $\mu g/m^3$ as a calendar quarter average) also remains in effect.
k The revoked 24-hr and annual average SO_2 standards (365 $\mu g/m^3$ and 80 $\mu g/m^3$, respectively) remain in effect in any area: 1) where it is not yet one year since the effective date of designation under the current (2010) standards; and 2) for which an implementation plan providing for attainment of the current (2010) standards has not been submitted and approved and which is designated nonattainment under the previous SO_2 standards or is not meeting the requirements of a SIP call under the previous SO_2 standards (40 CFR §50.4(3)). On April 9, 2019, the 24-hr and annual average SO_2 standards will no longer be in effect for Cameron Parish based on the 2010 SO_2 NAAQS attainment/unclassifiable designation date for Cameron Parish of April 9, 2018 (40 CFR §81.319).
l 99^{th} percentile of the 1-hr daily maximum concentrations, averaged over three years.

Transport of construction materials associated with the Project could occur within the Houston Galveston--Brazoria (HGB) area, which is a "marginal" nonattainment area for the 2015 8-hour ozone NAAQS. Additionally, the HGB area is still classified as a "moderate" nonattainment area for the 2008 8-hour ozone NAAQS and a "severe" nonattainment area for the 1997 8-hour ozone NAAQS. Transport of construction materials also could occur within the

Beaumont-Port Arthur area, which is a maintenance area for the 1997 8-hour ozone NAAQS. As discussed in the General Conformity section below, construction material transport emissions for the Project occurring within these areas would be below the applicable general conformity thresholds.

Air Quality Monitoring and Background Concentrations

Air quality monitors maintained by the LDEQ are located throughout the state to determine existing levels of various air pollutants. Air quality monitoring data for the period were reviewed by SPLNG to characterize ambient air quality for regulated criteria pollutants in the vicinity of the Project. The assessment included the following pollutants: O_3, CO, NO_2, $PM_{2.5}$, PM_{10}, SO_2, and lead. Concentration data from representative monitors for the 2015 through 2017 period are summarized in table B.8.1-2. The concentrations (rounded to the nearest whole microgram per cubic meter [$\mu g/m^3$]) shown in this table are maximum or near maximum values (as defined by EPA – see table B.8.1-2 footnotes) for the identified monitors, which are limited in number and location. As such, the concentrations are not necessarily representative of current actual air quality in the immediate vicinity of the Project. For each pollutant, table B.8.1-2 lists the available measured concentrations in terms of annual mean concentration values for each year and/or maximum short-term concentrations. As shown in the table, with the exception of the peak 1-hr SO_2 concentration for 2017, the measured pollutant concentrations are below the associated NAAQS. For SO_2, the average of the peak 1-hr concentrations for the three years in 194 $\mu g/m^3$, which is below the NAAQS, thus indicating continued, ongoing attainment of the standard.

Table B.8.1-2
Ambient Air Quality Concentrations in the Vicinity of the Project

Pollutant	Averaging Period	Concentration ($\mu g/m^3$) by Year			Monitor Information	
		2015	2016	2017	Location	ID No.
CO	8-hour [a]	573	458	573	Nederland, TX	48-245-1035
	1-hour [a]	802	802	1,145	Nederland, TX	48-245-1035
NO_2	Annual [b]	8	6	6	Nederland, TX	48-245-1035
	1-hour [c]	43	40	40	Nederland, TX	48-245-1035
O_3	8-hour [d]	126	128	132	Sabine Pass, TX	48-245-0101
$PM_{2.5}$	Annual [b]	7.33	7.59	7.75	Vinton, LA	22-019-0009
	24-hour [c]	15.4	18.0	21.1	Vinton, LA	22-019-0009
PM_{10}	24-hour [a]	56	36	70	Texas City, TX	48-167-0004
SO_2	3-hour [a]	184	210	157	Port Arthur, TX	48-245-0011
	1-hour [e]	166	192	225	Port Arthur, TX	48-245-0011[f]
Lead	3-month [g]	0	0	0	Deer Park, TX	48-201-1039[h]

Table B.8.1-2 Ambient Air Quality Concentrations in the Vicinity of the Project						
Pollutant	**Averaging Period**	**Concentration (µg/m³) by Year**			**Monitor Information**	
		2015	**2016**	**2017**	**Location**	**ID No.**
µg/m³ = micrograms per cubic meter [a] 2nd highest measurement recorded for each year. [b] Annual average measurement recorded for each year. [c] 98th percentile measurement recorded for each year. [d] 4th highest 8-hour average measurement recorded for each year. [e] 99th percentile measurement recorded for each year. [f] 2017 value based on Station No. 48-245-1071 (Port Arthur, TX) data because data from Station No. 48-245-0011 is invalid [g] Maximum 3-month measurement recorded for each year. [h] 2017 value based on Station No. 22-033-0009 (Baton Rouge, LA) data because data from Station No. 48-201-1039 is invalid						

Greenhouse Gases

The EPA has defined air pollution to include the mix of six long-lived and directly emitted GHGs (CO_2, CH_4, N_2O, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride). The EPA found that the current and projected concentrations of these six GHGs in the atmosphere threaten the public health and welfare of current and future generations through climate change.

GHG, including carbon dioxide (CO_2,) methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons, and perfluorocarbons, are naturally occurring pollutants in the atmosphere and products of human activities, including burning fossil fuels. These gases are the integral components of the atmosphere's greenhouse effect that warms the earth's surface and moderate day/night temperature variation. In general, the most abundant GHGs are water vapor, CO_2, CH_4, N_2O, and O_3. GHG produced by fossil-fuel combustion are CO_2, CH_4, and N_2O. GHGs are non-toxic and non-hazardous at normal ambient concentrations. Increased levels of all GHG since the industrial age are the primary cause of warming of the global climate system since the 1950s. Emissions of GHGs are typically expressed in terms of CO_2 equivalents (CO_2e).

As with any fossil fuel-fired project or activity, the Project would contribute to GHG emissions. The principle GHGs that would be produced by the project are CO_2, CH_4, and N_2O. Emissions of GHGs are quantified and regulated in units of CO_2e. The CO_2e unit of measure takes into account the global warming potential (GWP) of each GHG over a specified timeframe. The GWP is a ratio relative to CO_2 that is based on the particular GHG's ability to absorb solar radiation as well as its residence time within the atmosphere. Thus, CO_2 has a GWP of 1, CH_4 has a GWP of 25, and N_2O has a GWP of 298 on a 100-year timescale (EPA, 2017c). To obtain the CO_2e quantity, the mass of the particular compound is multiplied by the corresponding GWP and the product is the CO_2e for that compound. The CO_2e value for each of the GHG compounds is summed to obtain the total CO_2e GHG emissions.

The EPA has expanded its regulations to include the emission of GHGs from major stationary sources under the Prevention of Significant Deterioration (PSD) program. The EPA's

current rules require that a stationary source that is major for a non-GHG-regulated New Source Review (NSR) pollutant must also evaluate GHG emissions permit prior to beginning construction of a new or modified major source with mass-based GHG emissions equal to or greater than 100,000 tons per year (tpy) and significant net emission increases in units of CO_2e equal to or greater than 75,000 tpy. There are no NAAQS or other significant impact thresholds for GHGs.

8.1.2 Regulatory Requirements for Air Quality

The Project would be potentially subject to a variety of federal and state regulations pertaining to the construction and operation of air emission sources. The CAA, 42 USC 7401 et seq., as amended in 1977 and 1990, and 40 CFR Parts 50 through 99 are the basic federal statutes and regulations governing air pollution in the U.S. The LDEQ has the primary jurisdiction over air emissions produced by stationary sources associated with the Project. The LDEQ is delegated by the EPA to implement federal air quality programs. The LDEQ's air quality regulations are codified in LAC Title 33, Part III, Chapters 1 through 59. New facilities are required to obtain an air quality permit before initiating construction.

The following sections summarize the applicability of various federal and state regulations.

New Source Review/Prevention of Significant Deterioration

Separate pre-construction review procedures for major new stationary sources of air pollution and major modifications of major sources have been established for projects that are proposed to be built in attainment areas versus nonattainment areas. The pre-construction permit program for new or modified major sources located in attainment areas is known as the PSD program. This review process is intended to keep new air emission sources from causing existing air quality to deteriorate beyond acceptable levels codified in the federal regulations. Construction of major new stationary sources in nonattainment areas must be reviewed in accordance with the nonattainment NSR regulations, which contain stricter thresholds and requirements. Because the SPLNG facilities are located within an attainment area for all criteria pollutants, nonattainment NSR does not apply. Rather, the Project must be reviewed to determine applicability with the PSD program.

The PSD rule defines a major stationary source as any source with a potential to emit (PTE) 100 tpy or more of any criteria pollutant for source categories listed in 40 CFR §52.21(b)(1)(i) or 250 tpy or more of any criteria pollutant for source categories that are not listed. In addition, with respect to GHG, the major source threshold for CO_2e is 100,000 tpy. The SPLNG terminal is an existing major stationary source operating under PSD Permit No. PSD-LA-703(M6), issued on September 20, 2017 by the LDEQ.

Any change to a major stationary source that qualifies as a major modification under PSD rules (40 CFR §52.21 and LAC 33:III.509) is subject to PSD permitting. A major modification is defined as any physical change or change in the method of operation of a major stationary source that would result in a significant emissions increase of a regulated NSR pollutant, and a

significant net emissions increase of that pollutant from the major stationary source. Emission increases are compared against significant emission increase thresholds (100 tpy for CO; 40 tpy for NO_x, VOC, and SO_2 each; 25 tpy for total suspended particulate, 15 tpy for PM_{10}, and 10 tpy for directly-emitted $PM_{2.5}$; 75,000 tpy for CO_2e) to assess PSD applicability; increases less than the thresholds do not trigger PSD review. The Project, as a modification to the existing SPLNG Terminal, must be evaluated to determine if this modification qualifies as "major," requiring PSD review.

The Project would result in physical changes to the SPLNG terminal. In order to determine if these physical changes trigger PSD review, SPLNG compared the baseline actual emissions against the potential emissions for those emission sources affected by the Project (i.e., the existing Enclosed Ground Marine Flare and pipeline fugitives). "Baseline actual emissions" are the recent (past) emissions for the sources that are proposed to be modified (due to increased emissions in the case of the Third Berth Project). Potential emissions are the maximum (future) emissions from the modified sources under the Project. As shown in table B.8.1-3, the proposed emission rate changes (i.e., potential emissions minus baseline actual emissions) associated with the Project would not exceed the significant emission increase thresholds. Therefore, PSD review would not be triggered by the Project. A permit application air quality analysis addressing the revised emissions was submitted to the LDEQ in October 2018.

Table B.8.1-3

Major Stationary Source/Prevention of Significant Deterioration (PSD) Applicability Analysis – SPLNG Third Berth Project

Pollutant [a]	Baseline Actual Emission Rates for Third Berth Project Sources[b] (tpy)	Potential Emissions for Third Berth Project Sources (tpy)	Emission Rate Change[c] (tpy)	Major Source Modification Significant Emission Threshold (tpy)	PSD Netting Triggered?
PM_{10}	2.24	2.46	0.22	15	No
$PM_{2.5}$	2.24	2.46	0.22	10	No
NO_x	24.02	26.38	2.36	40	No
SO_2	<0.01	<0.01	<0.01	40	No
CO	109.51	120.28	10.77	100	No
VOC	8.38	11.25	2.87	40	No
CO_2e	N/A [d]	N/A [d]	N/A [d]	75,000	No [d]

[a] Projected emissions of other NSR/PSD-regulated pollutants are small to negligible.

[b] Third Berth Project-affected sources (Enclosed Ground Marine Flare and pipeline fugitives) at the SPLNG Terminal authorized under LDEQ Part 70 Permit No. 0560-00214-V6

[c] Because the emission rate changes (or increases) are below the relevant significant emission thresholds for all pollutants, PSD review is not triggered.

[d] N/A = Not applicable; CO_2e threshold is only applicable if the major source threshold for another criteria pollutant is exceeded.

The V Operating Permit

Title V of the CAA requires states to establish an air quality operating permit program. The requirements of Title V are outlined in the federal regulations in 40 CFR Part 70 and in the

state regulations in LAC 33:III.507. The operating permits required by these regulations are often referred to as Title V or Part 70 operating permits.

Major sources (i.e., sources with a PTE greater than a major source threshold level) are required to obtain a Title V operating permit. Title V major source threshold levels are 100 tpy for any regulated air pollutant (excluding any air pollutant regulated solely under Section 112 – for HAPs – of the CAA); 10 tpy for an individual HAP; or 25 tpy for any combination of HAPs. Additionally, facilities that have the potential to emit GHGs at a threshold level of 100,000 tpy CO_2e are also subject to Title V permitting requirements.

The SPLNG terminal is an existing major source subject to the Title V permitting program, operating under Part 70 Permit No. 0560-00214-V6, issued by the LDEQ on September 20, 2017. SPLNG submitted an application to the LDEQ in October 2018 to modify the Part 70 permit for the Project.

New Source Performance Standards

New Source Performance Standards (NSPS) regulations (40 CFR Part 60) establish pollutant emission limits and monitoring, reporting, and recordkeeping requirements for various emission sources based on source type and size. These regulations apply to new, modified, or reconstructed sources. No NSPS requirements were determined to be applicable to the Project-affected sources (although SPLNG is required by their Part 70 and PSD permits to comply with the NSPS general requirements under 40 CFR §60.18 as best available control technology [BACT]).

National Emission Standards for Hazardous Air Pollutants

The National Emission Standards for Hazardous Air Pollutants codified in 40 CFR Parts 61 and 63 regulate HAP emissions. Part 61 was promulgated prior to the 1990 Clean Air Act Amendments (CAAA) and regulates specific HAPs, such as asbestos, benzene, beryllium, inorganic arsenic, mercury, radionuclides, and vinyl chloride.

The 1990 CAAA established a list of 189 HAPs, while directing EPA to publish categories of major sources and area sources of these HAPs, for which emission standards were to be promulgated according to a schedule outlined in the CAAA. These standards, also known as the Maximum Achievable Control Technology standards, were promulgated under Part 63. The 1990 CAAA defines a major source of HAPs as any source that has a PTE of 10 tpy for any single HAP or 25 tpy for all HAPs in aggregate. Area sources are stationary sources that do not exceed the thresholds for major source designation.

The SPLNG terminal is an existing major source of HAPs. No National Emission Standards for Hazardous Air Pollutants requirements were determined to be applicable to the Project-affected sources.

Greenhouse Gas Reporting Rule

Subpart W under 40 CFR Part 98, the Mandatory Greenhouse Gas Reporting Rule, requires petroleum and natural gas systems that emit 25,000 metric tons or more of CO_2e per year to report annual emissions of GHG to the EPA. "LNG storage" and "LNG import and export equipment" are industry segments specially included in the source category definition of petroleum and natural gas systems. Equipment subject to reporting includes storage of LNG, liquefaction of natural gas, and regasification of LNG.

Emissions of GHGs associated with the construction and operation of the Project were calculated. In addition, GHG emissions were converted to total CO_2e emissions based on the GWP of each pollutant. Although the reporting rule does not apply to construction emissions, construction emissions have been included in this document for accounting and disclosure purposes. GHG emissions from operation of the Project would be included as part of the GHG reporting for the SPLNG terminal.

Chemical Accident Prevention Provisions

The chemical accident prevention provisions, codified in 40 CFR Part 68, are federal regulations designed to prevent the release of hazardous materials in the event of an accident and minimize potential impacts if a release does occur. The regulations contain a list of substances (including methane, propane, and ethylene) and threshold quantities for determining applicability to stationary sources. If a stationary source stores, handles, or processes one or more substances on this list in a quantity equal to or greater than specified in the regulation, the facility must prepare and submit a risk management plan (RMP). An RMP is not required to be submitted to the EPA until the chemicals are stored onsite at the facility.

If a facility does not have a listed substance on-site, or the quantity of a listed substance is below the applicability threshold, the facility does not have to prepare an RMP. However, if there is any regulated substance or other extremely hazardous substance onsite, the facility still must comply with the requirements of the General Duty Clause in Section 112(r)(1) of the 1990 CAAA.

Stationary sources are defined in 40 CFR Part 68 as any buildings, structures, equipment, installations, or substance-emitting stationary activities which belong to the same industrial group, that are located on one or more contiguous properties, are under control of the same person (or persons under common control), and are from which an accidental release may occur. However, the definition also states that the term stationary source does not apply to transportation, including storage incidental to transportation, of any regulated substance or any other extremely hazardous substance. The term transportation includes transportation subject to oversight or regulation under 49 CFR Parts 192, 193, or 195. Based on these definitions, the Project facilities are subject to 49 CFR Part 193 and would not be required to prepare an RMP.

General Conformity

A general conformity analysis must be conducted by the lead federal agency if a federal action would result in the generation of emissions that would exceed the general conformity applicability threshold levels of the pollutants(s) for which an AQCR is in nonattainment. According to Section 176(c)(1) of the CAA (40 CFR §51.853), a federal agency cannot approve or support any activity that does not conform to an approved SIP. Conforming activities or actions should not, through additional air pollutant emissions:

- cause or contribute to new violations of the NAAQS in any area;
- increase the frequency or severity of an existing violation of any NAAQS; or
- delay timely attainment of any NAAQS or interim emission reductions.

General Conformity assessments must be completed when the total direct and indirect emissions of a planned project would equal or exceed the specified pollutant applicability emission thresholds per year in each nonattainment area.

As previously discussed in section B.8.1.1, the Project facilities would be located in an area currently designated by EPA as attainment of all NAAQS or unclassifiable for all criteria pollutants. Operating emissions for these facilities would be located entirely within designated unclassifiable/attainment areas for all criteria air pollutants and would be subject to evaluation under the NSR permitting program, and these emissions are not subject to General Conformity regulations. However, during the construction phase of the Project, barges carrying equipment and materials would travel periodically through the Beaumont-Port Arthur and the HGB areas to the SPLNG Terminal construction dock via the Gulf Intracoastal Waterway. (As discussed earlier, the HGB area is a nonattainment area for the 8-hour ozone NAAQS and the Beaumont-Port Arthur area is a maintenance area for the 8-hour ozone NAAQS). The construction barge traffic emissions associated with travel in the HGB and Beaumont-Port Arthur ozone nonattainment and maintenance areas are subject to evaluation under General Conformity regulations.

The relevant general conformity pollutant thresholds for the HGB ozone nonattainment area are 25 tpy of NO_x and VOC (ozone precursors) for the portion of the Project construction-related barge/tug emissions located in that nonattainment area (which is still classified as "severe" for the 1997 8-hour ozone standard).

SPLNG estimated emissions from tug vessels that push the barges using EPA-sponsored marine vessel emissions estimation guidance. The emissions were apportioned between the HGB ozone nonattainment area, Beaumont-Port Arthur maintenance area, and the adjacent unclassifiable/attainment areas based on the emissions generated during the time spent traveling through each of these areas. SPLNG estimated that the total potential direct and indirect emissions of NO_x and VOC from the Project construction-related activity (i.e., construction barge/tug travel in the HGB ozone nonattainment and Beaumont-Port Arthur maintenance areas)

for each year in the 2020 through 2022 period would be less than 1 tpy for each year;[11] therefore, a General Conformity Determination is not required for the Project.

State Air Quality Requirements

In addition to the federal regulations identified above, the LDEQ has its own air quality regulations, codified in LAC Title 33, Part III, Chapters 1 through 59. The state requirements potentially applicable to the Project are discussed below:

- LAC 33:III Chapter 5 – *Permit Procedures*. This chapter outlines the construction and operating permit procedures for major and subject non-major sources of air pollution in Louisiana. More information on the construction (NSR) and operating (Title V) permitting for the Project specifically is found in earlier sections of this document.
- LAC 33:III Chapter 9 – *General Regulations on Control of Emissions and Emission Standards*. The SPLNG stationary emission sources are subject to the general regulations outlined in in this chapter. As such, SPLNG is required to include the emissions from these sources (including any additional emissions from the Project-affected stationary sources) in an annual emission summary report and to submit written reports of any "unauthorized discharges" of an air pollutant from these sources.
- LAC 33:III Chapter 11 – *Control of Emissions of Smoke*. This chapter outlines opacity limits for combustion units and flares, limitations on outdoor burning, and the prohibition on visibility impairment on public roads. The existing Enclosed Ground Marine Flare and Marine Flare No. 1 (the only Project sources subject to this requirement) would continue to comply with the opacity limits and notification requirement of this chapter.
- LAC 33:III Chapter 13 – *Emission Standards for Particulate Matter*. This chapter applies to any operation, process, or activity from which PM is emitted, and requires that all reasonable measures be taken to prevent generation of fugitive PM emissions. The existing Enclosed Ground Marine Flare and Marine Flare No. 1 would continue to comply with the opacity limits of this chapter.
- LAC 33:III Chapter 15 – *Emission Standards for Sulfur Dioxide*. This chapter applies to existing or new sulfuric acid production units, existing or new sulfur recovery plants, and all other single point sources that emit or have the potential to emit 5 tpy or more of SO_2. Because none of the Project-affected sources emit or have the potential to emit 5 tpy of SO_2, the requirements of this chapter would continue to not be applicable.

[11] SPLNG Third Berth Expansion Project Resource Report 9 – Air and Noise Quality (Table 9.2-8), Sabine Pass LNG, L.P., October 2018, Docket No. CP19-11-000.

- LAC 33:III Chapter 21 – *Control of Emissions of Organic Compounds*. This chapter regulates organic compound emissions from various sources; however, the only Project sources subject to this chapter are fugitive components in VOC service. LAC 33:III.2111 requires that pumps and compressors handling VOC with a true vapor pressure greater than 1.5 pounds per square inch absolute at handling conditions be equipped with mechanical seals or other equivalent equipment approved by the LDEQ. The affected Project fugitive components would be subject to and comply with this requirement.
- LAC 33:III Chapter 29 – *Odor Regulations*. This chapter prohibits the discharge of odorous substances that cause a nuisance at or beyond the property line. SPLNG would continue to operate the terminal, including Project-affected sources, in a manner that would not cause an odorous nuisance beyond the property line.
- LAC 33:III Chapter 51 – *Comprehensive Toxic Air Pollutant Emission Control Program*. This chapter applies to a major source of any toxic air pollutant(s) (TAPs) listed in LAC 33:III.5112, Table 51.2 or Table 51.3. A major source is defined as a source that has the potential to emit, in the aggregate, 10 tpy or more of any individual LDEQ-listed TAP, or 25 tpy or more of any combination of LDEQ-listed TAPs. Emissions from the combustion of Group 1 virgin fossil fuels are exempt from the requirements of this chapter, per LAC 33:III.5105.B. After excluding such combustion emissions, the SPLNG Terminal is not a major source of HAPs and is not subject to the requirements of this chapter. Emissions from Project-affected sources would not change the non-applicable status of the SPLNG Terminal.
- LAC 33:III Chapter 56 – *Prevention of Air Pollution Emergency Episodes*. This chapter requires the preparation of standby plans for the reduction of emissions contributing to high pollution levels and to activate such plans when the LDEQ declares an Air Pollution Alert, Air Pollution Warning, or Air Pollution Emergency. SPLNG would continue to comply with these requirements.
- LAC 33:III Chapter 59 – *Chemical Accident Prevention and Minimization of Consequences*. This chapter incorporates, by reference, 40 CFR Part 68 (Chemical Accident Prevention Provisions). As discussed earlier, the SPLNG Terminal is subject to 49 CFR Part 193; therefore, 40 CFR Part 68 and LAC 33:III Chapter 59 do not apply. The Project would not change the non-applicable status of the SPLNG Terminal.

8.1.3 Construction Emissions and Impacts

Construction Emissions and Impacts

Construction of the Project would result in short-term increases in emissions of some air pollutants due to the use of equipment powered by diesel fuel or gasoline and the generation of

fugitive dust due to the disturbance of soil and other dust-generating activities. More specifically, the construction activities that would generate air emissions include:

- site preparation (vegetation clearing, trenching, land contouring, foundation preparation, etc.);
- construction/installation of Project facilities;
- operation of off-road construction equipment and trucks during construction;
- operation of marine vessels (e.g., equipment barges/tugs) during construction; and
- workers' vehicles used for commuting to and from the construction site and delivery trucks (i.e., on-road vehicles).

The total period of construction for the Project facilities is estimated by SPLNG to be about 30 months.

Emission increases associated with the Project construction activities would have short-term, localized impacts on air quality. These emissions are not subject to the air quality permitting requirements that apply to emissions from operation of stationary sources associated with the Project. It should be noted that there are no residential or sensitive populations within 1 mile of the Project site. Nevertheless, the construction-related emission rates are discussed in this section as a means of identifying potential air quality concerns associated with the construction phase of the Project and to assist in developing mitigation.

The amount of fugitive dust generated in an area under construction would depend on numerous factors including:

- nature and intensity of the construction activity;
- speed, weight, and volume of vehicular traffic;
- size of area disturbed;
- amount of exposed soil and soil properties (silt and moisture content); and
- wind speed.

Fugitive dust would be produced primarily during site preparation activities, when the Project area would be cleared of debris, leveled, and graded. Site preparation activities for the Project would include land clearing, grading, filling, and placement of aggregate materials (e.g., for laydown areas and access roads). Site preparation activities would generate fugitive dust from earthmoving and movement of construction equipment over unpaved surfaces and tailpipe emissions from construction equipment and vehicle engines. Site preparation equipment would include bulldozers, excavators, compactors, graders, and other mobile construction equipment. On-road truck traffic (e.g., supply trucks) and worker commuter vehicles at the Project sites would also generate fugitive dust from travel on paved and unpaved surfaces. SPLNG intends to conduct periodic watering of construction areas and unpaved roads to reduce the generation of fugitive dust.

The construction equipment and trucks/vehicles would be powered by internal combustion engines that would generate PM_{10}, $PM_{2.5}$, SO_2, NO_x, VOC, and CO emissions. These emissions would be generated by a variety of diesel-fueled (primarily) equipment, including off-road sources (e.g., bulldozers, excavators), on-road sources (e.g., construction worker vehicles, buses, miscellaneous trucks), and marine vessels (e.g., barges/tugs). Most of the on-road vehicles would likely burn gasoline, although supply trucks and some worker pickup trucks would burn ultra-low-sulfur diesel fuel.

A main component of Project construction would involve the dredging of a new berth pocket located adjacent and southeast of the two existing SPLNG marine berths along the Sabine Pass Channel. In conducting this work, emissions would be generated by a cutter suction dredge and mechanical bucket dredger and various support vessels (e.g., tugboats, barges), as well as the booster pump used to move dredge material, via floating pipeline, to the DMPA. Construction of the Project would also include a new platform, LNG loading lines and cooldown lines, and LNG loading arms, as well as buildings (and associated foundations) and a hydraulic gangway. No new LNG storage tanks are proposed as part of the Project. Construction equipment to be used for the Project would include cranes, forklifts, welders, manlifts, and generators (for various duties, such as pumping, lighting, etc.).

Project construction materials would be delivered primarily by barge to the existing construction dock at the SPLNG Terminal. SPLNG estimates that a total of approximately 70 marine deliveries over the construction period would be needed for construction materials shipped from the Houston and New Orleans areas. Barge/tug operations would result in fuel combustion emissions from diesel-fired engines.

SPLNG developed an inventory of off-road equipment and vehicles, on-road vehicles, and expected activity levels (either hours of operation or miles travelled) based on the expected duration of Project construction for the purposes of calculating emissions. The level of activity for each piece of construction equipment was combined with the relevant EPA emission factors (e.g., MOVES2014a model) to estimate the annual emissions. Fuel combustion emissions from barges/tugs were calculated using engine sizes and loads, activity levels, and emission factors based on EPA-sponsored marine vessel emissions estimation guidance.[12] SO_2 emission estimates were based on the use of ultra-low-sulfur diesel fuel. Annual emissions for on-road vehicles were calculated using MOVES2014a model emission factors and estimates of total annual offsite and onsite travel distance for worker/commuter vehicles and construction material delivery trucks. Fugitive dust emission estimates associated with land disturbance activities for the Project were based on an estimate of total disturbed acreage and the use of emission factors based on Western Governors' Association-sponsored guidance,[13] including an emission reduction or control factor of 50 percent for application of dust suppressants (e.g., water).

[12] EPA's *Current Methodologies in Preparing Mobile Source Port-Related Emission Inventories (Final Report)*, April 2009.
[13] Western Governors Association's *WRAP Fugitive Dust Handbook*, September 7, 2006.

The total criteria air pollutant and GHG (as CO_2e) emissions associated with construction-related activities for the Project are summarized in table B.8.1-4. These totals include fuel combustion emissions (from on-shore equipment and marine vessels) as well as fugitive dust (i.e., particulate) emissions. The total PM_{10} and $PM_{2.5}$ emissions shown table B.8.1-4 are mainly the result of fugitive dust-generating activities, with most of the fugitive dust emissions associated with land disturbance activities. Note that the estimated annual construction emissions are based on the latest available information on Project schedule; and the timing and magnitude of annual emissions could vary based on when construction activities actually occur, which is dependent on business-related and other (e.g., regulatory) factors.

Table B.8.1-4
Annual Project Construction Emissions (tpy)

Year	Pollutant							
	PM_{10}	$PM_{2.5}$	NO_x	CO	SO_2	VOC	HAPs	CO_2e [a]
2020	337.5	95.0	1,286.3	154.5	2.2	49.8	2.0	29,563
2021	331.3	42.5	210.0	79.2	1.9	9.2	1.1	15,454
2022	345.2	36.6	68.8	47.3	3.0	3.1	0.8	7,634
Total Construction Period Emissions	**1,014.0**	**174.1**	**1,565.1**	**281.1**	**7.1**	**62.1**	**3.9**	**52,651**

[a] Metric tons

Emissions over the construction period would increase pollutant concentrations in the vicinity of the Project. However, the effect on ambient air quality would vary with time due to the intensity of activities during the construction period, the mobility of the sources, and the variety of emission sources. There may be localized, temporary minor to moderate elevated levels of fugitive dust and tailpipe emissions in the vicinity of construction areas during periods of peak construction activity. In addition, there would be overlap of emissions from construction activities for the Project and construction and commissioning activities for the last liquefaction train (SPLNG Expansion Project Train 6) of the existing SPLNG Terminal. The potential impact of the overlap of emissions from construction and operations are discussed in the Operations Impacts Assessment section. Considering all of these factors, we determine that construction of the Project would not have a long-term, permanent effect on air quality in the area.

During the concurrent construction periods, the higher emission levels could result in greater impacts to air quality compared with that for the Project alone. These higher concentrations would not be persistent due to the dynamic and fluctuating nature of construction activities within a day, week, or month.

Construction Emissions Mitigation Measures

As discussed previously, fugitive dust accounts for the primary PM emissions during the construction period for the Project. Therefore, fugitive dust controls would play an important role in reducing potential effects on air quality in the Project area. Project construction activities would be subject to LAC 33:III.1305, which requires that all reasonable precautions (including application of dust suppressants) be taken to prevent fugitive dust generation.

In addition to the regulation-based precautions, SPLNG developed a *Fugitive Dust Control Plan* (FDCP), committing to additional measures to reduce fugitive dust emissions. FERC staff reviewed the FDCP and finds it acceptable. Measures outlined in the FDCP, include the following:

- use of a dedicated water truck to apply water to most areas (access roads, construction dock, staging and laydown areas, and designated parking areas) within the Project boundary;
- ensure that dump trucks and other open-bodied trucks hauling soil or other dusty materials to or from the Project site are covered;
- use of signage to direct construction vehicle traffic to designated roads;
- enforcement of a 15-mph speed limit on unsurfaced roads;
- use of gravel or larger rock at construction entrance and exit locations; and
- measures to clean paved roads upon mud or dirt track-out.

SPLNG would minimize vehicular exhaust and crankcase emissions from gasoline- and diesel-fired engines by complying with applicable EPA mobile source emission performance standards and by using equipment manufactured to meet these standards. Additionally, SPLNG would be expected to implement the following work practices:

- Maintain construction equipment in accordance with manufacturers' recommendations. Maintenance and tuning of all construction-related equipment would be conducted in accordance with the original equipment manufacturers' recommendations; and
- Minimize engine idling to the extent practicable. SPLNG would instruct Project construction personnel to minimize the idle time of equipment to 5 minutes or less when not in active use. SPLNG's expectations concerning minimizing on-site idling would be communicated to construction personnel during safety/environmental training sessions and enforced by construction supervisors and inspectors. Also, consistent with industry practice, unmanned equipment would be turned off and would not be left idling.

8.1.4 Operation Emissions Impacts and Mitigation

Operating Air Emissions

Operation of the SPLNG Third Berth would result in additional air emissions from increasing the emissions at existing marine flare and additional marine (e.g., LNGCs) traffic.

No new stationary emission sources have been proposed by SPLNG for the Project. Due to the additional LNGCs calling at the Third Berth that would undergo the cool-down process, the Project would result in an increase in potential annual emissions of criteria air pollutants, GHGs, and HAPs from combustion of additional cool-down process gases in the currently-

permitted Enclosed Ground Marine Flare and its backup, Marine Flare No. 1. (Note that the Marine Flare No. 1 would only be utilized when the Enclosed Ground Marine Flare is not operational; therefore, emissions from the Marine Flare No. 1 would be equal to or less than the emissions from the Enclosed Ground Marine Flare.) Also, potential fugitive VOC and GHG emissions would increase due to the additional components (e.g., valves) associated with new piping and other infrastructure to transport LNG to the Third Berth. These increased operational-phase emissions would be permanent.

Table B.8.1-5 provides a summary of the total annual criteria air pollutant, GHG (as CO_{2e}), and HAP emission rates for routine operations of the SPLNG Terminal, including the authorized emissions for Trains 1-6, proposed emissions modifications for Trains 1-6 of the authorized SPLNG terminal, and proposed emissions for the Third Berth Project alone, including associated marine vessels. In table B.8.1-5, the Third Berth Project emissions are composed of the additional emissions from the existing Enclosed Ground Marine Flare and pipeline components (fugitives) at the SPLNG Terminal once the Third Berth is in full operation. The additional marine flare and fugitive emissions associated with the Third Berth Project would be generated by the additional LNGCs undergoing cool-down. (Note that this analysis addresses the additional 180 LNGCs per year associated with the Project; however, only 8 of these 180 ships will undergo cool-down and emit to the Enclosed Ground Marine Flare.)

Table B.8.1-5

Annual Emissions (tpy) for Operation of Existing and Proposed SPLNG Terminal Sources

Emission Source	Pollutant							
	PM_{10}	$PM_{2.5}$	NO_x	CO	SO_2	VOC	Total HAPs	CO_2e [a]
SPLNG Terminal								
Liquefaction Trains 1-6 (Authorized)[b]	187.42	187.40	6,185.40	5,213.92	38.24	334.18		10,797,256
Marine Vessels[c]	17.19	16.05	342.65	302.37	92.26	31.26		40,945
Proposed Changes – Trains 1-6[b]	+0.44	+0.40	+324.09	+15.31	<+0.01	+8.05		-29,600
Third Berth Project								
Additional Emissions from SPLNG Terminal	0.22	0.22	2.36	10.77	<0.01	1.78		5,587
Marine Vessels	11.8	11.1	235.4	294.2	72.3	48.6		40,362
Facility Total	**217.1**	**215.2**	**7,089.9**	**5,836.6**	**202.8**	**423.8**	**83.21[d]**	**10,854,550**

Table B.8.1-5

Annual Emissions (tpy) for Operation of Existing and Proposed SPLNG Terminal Sources

Emission Source	Pollutant							
	PM_{10}	$PM_{2.5}$	NO_x	CO	SO_2	VOC	Total HAPs	CO_2e [a]

[a] Metric tons per year

[b] Resource Report 9, Appendix 9D: Title V Air Permit Significant Modification/Reconciliation and PSD Permit Reconciliation Application, Table 1-5 (but excluding incremental contribution from Third Berth operation) (submitted to the Louisiana DEQ on October 29, 2018). The Louisiana DEQ application included information for two independent capital projects: 1) the new Third Berth Project, and 2) equipment additions and improvements to existing equipment for previously-permitted Trains 1-6. Some of the equipment changes for Trains 1-6 resulted in the proposed modifications to permitted emissions.

[c] Resource Report 9, Appendix 9A, Table 9.A.1.31.

[d] Attachment 24a, Table 1 of SPLNG's Response to Comments, submitted to FERC on July 26, 2019.

During operation of the SPLNG Third Berth, LNGCs and supporting marine vessels would routinely generate air emissions. The calculation assumptions/methodologies and emission factors used by SPLNG to develop emission rates for the marine vessels are consistent with those used for the existing SPLNG Terminal marine vessel operations.

The basis for estimating marine vessel emissions associated with the Project operation is based on the post-Project SPLNG Terminal capacity (for all three berths combined) increasing from 400 to 580 LNGCs per year. For the purposes of estimating emissions, SPLNG assumed that 194 LNGs (580/3, rounded up to the next whole ship) would call at the Third Berth annually.

Marine vessel emissions are quantified for operation in transit within state territorial waters, for maneuvering to/from the pier, and for hoteling at the pier. LNGC transiting would occur over a 6-hour time period for each ship call (three hours arriving and three hours departing). LNGC maneuvering around the pier would occur over a 2-hour time period for each ship call (1 hour arriving and 1 hour departing) with the assistance of four tugboats for part of each hour. LNGCs also would employ bow thrusters (powered by auxiliary engines) to assist in maneuvering around the pier. While the LNGC is docked at the pier, emissions would be generated by carrier hoteling operations for an approximate representative time period of 20 hours. SPLNG analyzed emissions from the hoteling and maneuvering operations for the LNGCs assuming that the power requirements would be met through use of either a steam turbine, slow speed diesel (SSD) engine, or dual fuel diesel-electric engine. SPLNG estimated LNGC maneuvering emissions assuming a representative main engine size/rating of 41,013 kilowatts. In addition to these power generation systems/combustion units, emissions from use of a Gas Combustion Unit and auxiliary boilers on the LNGCs having such equipment were accounted for by SPLNG. Emissions from the Gas Combustion Unit and auxiliary boilers could be generated by LNGCs in transit to and maneuvering and hoteling at the Third Berth. The analysis assumes primarily natural gas as fuel, although use of marine gas oil for maneuvering operations with a SSD engine was also evaluated.

According to SPLNG, the Coast Guard has delegated authority for security escort of each LNGC to the local Sheriff's department. Based on historical site experience, the Sheriff's security vessel would escort the LNGCs about 80 percent of the time, and only for the last 30

minutes of each LNGC transit inbound and first 20 minutes of each LNGC transit outbound. The security vessel utilized would be a pilot-type boat equipped with an engine rated at 300 hp. Although SPLNG did not calculate security vessel emissions for the Project due to the small vessel engine and limited vessel operation for each LNGC call, SPLNG demonstrated that the maximum expected annual emissions would be no greater than 13 percent of the security vessel emissions calculated in support of the Sabine Pass Expansion Project (due to conservative assumptions made for the emission calculations for that project).

Under CFR 33.165.819, the Coast Guard has mandated that the Sabine Pass LNG mooring basins are designated as fixed security zones whenever LNG carriers are moored within them. The SNND has statutory responsibility and authority for waterway security in Jefferson County under Chapters 49 and 60 of the Texas Water Code and serves as the local government waterway security program manager. The mooring basin security zone would be enforced by the Coast Guard under the CFR process and relies on ad hoc patrols by SNND and/or local Coast Guard unit, on a risk-based basis. Initial discussions with the Coast Guard COTP, is that, the CFR regulation would be updated to further include the coordinates of the Third Berth mooring basin once operational. Expectations from both Coast Guard and SNND are that the existing security processes would be implemented similarly for the Third Berth. The SPLNG Facility Security Plan, which is required under the U.S. Marine Transportation Act of 2002 would be updated as part of the Third Berth implementation plan and submitted and agreed with the Coast Guard prior to the new berth placed into service.

SPLNG's emission calculations for marine vessels are based on a representative set of engine emission factors for each phase of vessel operation (i.e., transiting, maneuvering, and hoteling). The sources of emission factors are: 1) EPA emissions estimation guidance documents[14]; 2) engine manufacturer/vendor data for NO_x emissions from natural gas-fired LNGC engines; 3) International Convention for the Prevention of Pollution from Ships (or MARPOL) Annex VI standards (Tiers I and II) for NO_x emissions from diesel-fired LNGC engines; and 4) EPA Tier 4 exhaust emissions standards (Category 1 engines) for NO_x, PM, and VOC emissions from tugboat engines. Per EPA guidance, low load adjustment factors are applied to the emission factors for the LNGC operating scenarios with SSD engines. For marine vessel operation on diesel or marine gas oil fuel, SPLNG's SO_2 emission calculations are based on emission factors assuming use of fuel oil with a sulfur content of 0.1 percent, which is consistent with the requirements of the MARPOL Annex VI standards for the North America Emission Control Area.

Table B.8.1-6 presents a summary of the estimated annual criteria air pollutant and GHG (as CO_2e) emissions associated with 1) LNGCs and tugboats maneuvering to the pier; and 2) LNGCs hoteling at the pier. According to SPLNG, no tugboats would be idling without shore power (i.e., no fuel combustion in tugboat engines) while the LNGC is maneuvering and hoteling. However, under this scenario, the tugboats would either be maneuvering to assist the LNG carrier or docked and on shore power (i.e., no air emissions). Note that the emissions

[14] EPA's *AP-42 – Compilation of Air Pollutant Emission Factors, Volume I: Stationary Point and Area Sources* and *Current Methodologies in Preparing Mobile Source Port-Related Emission Inventories (Final Report), April 2009*.

associated with tugboats maneuvering are already included in table B.8.1-6. SPLNG confirms that the tugboats would meet the EPA Tier IV engine NOx emission standards and the required NOx emissions standards of MARPOL Annex VI as required by the International Maritime Organization. Table B.8.1-7 presents a summary of the estimated annual criteria air pollutant and GHG (as CO_2e) emissions for LNGCs transiting in state waters. The emissions presented in Tables B.8.1-6 and B.8.1-7, which are not subject to consideration/review under the federal/state air permitting programs for stationary sources, are based on 194 carrier calls per year.

Table B.8.1-6
Annual Emissions (tpy) for Marine Vessels Associated with Maneuvering and Hoteling Operations

Emission Source	Pollutant						
	PM_{10}	$PM_{2.5}$	NO_x	CO	SO_2	VOC	CO_2e [a]
LNG Carriers [b]	0.88	0.88	77.76	113.84	14.45	34.47	13,154
Tugs	1.33	1.33	59.71	165.87	1.39	6.30	23,610
Total Emissions	**2.2**	**2.2**	**137.5**	**279.7**	**15.8**	**40.8**	**36,764**

[a] Metric tons per year
[b] Emissions included for on-board Gas Combustion Unit and auxiliary boilers

Table B.8.1-7
Annual Emissions (tpy) for Marine Vessels Associated with Transiting in State Waters

Emission Source	Pollutant						
	PM_{10}	$PM_{2.5}$	NO_x	CO	SO_2	VOC [a]	CO_2e [b]
LNG Carriers [c]	9.62	8.90	97.89	14.50	56.48	7.80	3,598

[a] Represents hydrocarbon emission rate (conservative)
[b] Metric tons per year
[c] Emissions included for on-board Gas Combustion Unit and auxiliary boilers

Operations Emissions Mitigation Measures

BACT was established for the flares and component fugitive sources in past permitting actions (as recently as September 2017) for the SPLNG Terminal. The Project would continue to use BACT in the operation of the Enclosed Ground Marine Flare and Marine Flare No. 1. SPLNG would ensure the flares are operated with good combustion practices in continual compliance with NSPS requirements (40 CFR §60.18), maintaining a flame when vent gas is routed to the flares. Although BACT is not triggered for the Project, SPLNG would apply its current VOC BACT requirements (use of mechanical seals or equivalent for substances with a true vapor pressure of 1.5 psia or greater) and GHG BACT practices (application of leak detection and repair program) to the component fugitive emissions associated with the Project. The BACT-based emissions standards and operating practices are consistent with NSPS and LDEQ standards and practices applicable to these emission sources.

Operations Impact Assessment

To provide a more thorough evaluation of the potential impacts on air quality in the vicinity of the Project, SPLNG conducted a quantitative assessment of air emissions, including marine vessel emissions, associated with operation of the Third Berth Project and the existing SPLNG Terminal. This assessment used EPA- and/or LDEQ-recommended pollutant dispersion modeling methods to predict off-site (i.e., ambient) concentrations in the vicinity of the Project for comparison against applicable federal and state ambient air quality standards.

Although the Project is not subject to review under the PSD permitting program based on the potential emissions increases, an air quality impact analysis was required by FERC. The focus of the impact analysis was assessing compliance with the NAAQS. The air quality impacts analysis was conducted by SPLNG per U.S. EPA and LDEQ modeling guidelines. In conducting the air quality impact analysis to address FERC requirements, SPLNG built upon the previous analysis conducted to satisfy LDEQ permitting/modeling requirements, addressing emissions from on-shore stationary sources (including the existing SPLNG Terminal emission sources) as well as LNGCs maneuvering to and hoteling at the pier and supporting marine vessel (e.g., tugboats) activities. Because the Project would not be subject to PSD review, offsite emission sources were not included in the modeling. Regarding modeled Project $PM_{2.5}$ emissions, SPLNG utilized interpollutant offset ratios to account for secondary $PM_{2.5}$ emissions formation, which had been approved by the LDEQ for use in calculating secondary $PM_{2.5}$ emissions formation for the existing SPLNG sources.

SPLNG's accounting of marine vessel emissions in the impact analysis assumed conservative operating scenarios for LNGCs and tug boats at Berth 1, Berth 2, and Berth 3 (i.e., the Third Berth). For a worst-case operating scenario for the three berths, SPLNG conservatively assumed that three LNGCs would be operating simultaneously at the three berths, with hoteling and maneuvering activities occurring within the same hour for all three carriers, concurrent with two maneuvering tugboats at Berths 1 and 2 and two maneuvering tugboats at Berth 3. SPLNG also examined a worst-case operating scenario for Berth 3 in particular, conservatively assuming that four tugboats would be maneuvering during the same hour as a hoteling carrier at that berth.

The results of the impact analysis, shown in table B.8.1-8, indicate that emissions associated with the Project facilities, including stationary and marine sources, would be below the NAAQS. Therefore, we conclude that construction and operation of the proposed Project would not have a significant impact on air quality.

Table B.8.1-8
Summary of Air Quality Impact Analysis Results

Pollutant	Averaging Period	Model-Predicted Concentration ($\mu g/m^3$)	Background Concentration ($\mu g/m^3$) [a]	Total Concentration ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)
NO_2	1-hour	151.0	35.7	186.7	188

Table B.8.1-8 Summary of Air Quality Impact Analysis Results					
Pollutant	**Averaging Period**	**Model-Predicted Concentration ($\mu g/m^3$)**	**Background Concentration ($\mu g/m^3$) [a]**	**Total Concentration ($\mu g/m^3$)**	**NAAQS ($\mu g/m^3$)**
$PM_{2.5}$	Annual	11.0	35.7	46.7	100
	24-hour	4.2	22.0	26.2	35
	Annual	2.1	9.5	11.6	12
PM_{10}	24-hour	6.0	70	76	150
CO	1-hour	2,963.5	1,111.1	4,074.6	40,000
	8-hour	1,653.7	555.6	2,209.3	10,000
[a] Background concentrations are based on available representative monitoring data for the 2015-2017 period.					

Note that SO_2 emissions were not included in the air quality impact assessment because EPA and the LDEQ did not require a NAAQS compliance analysis for that criteria pollutant under the PSD regulations. Furthermore, SPLNG showed that the total annual SO_2 emission rate (15.9 tpy) for the Project, including emissions from stationary sources and marine vessel sources (within the moored safety zone), would be well below the PSD Significant Emission Rate of 40 tpy.

The impact on atmospheric ozone, another criteria pollutant, was assessed by SPLNG using EPA guidance. This assessment, accounting for the combined contributions from ozone precursors (NO_x and VOC), showed that the 8-hour daily maximum impact from the Project would be below the critical air quality threshold (i.e., Significant Impact Level) for ozone; therefore, a cumulative impact analysis would not be required.

As noted previously, there would be an overlap of construction, commissioning, and operational emissions at the SPLNG Terminal in the years of construction of the Project, as shown in Table B.8.1-9. The Project would be under construction while Train 6 (Train 5 is anticipated to commence operation in 2019) of the SPLNG Expansion Project would continue construction. According to SPLNG's Resource Report 1 and SPLNG's Responses to Comments for the Project, construction of both the Project and the SPLNG Expansion Project is scheduled for completion in late-2022. The emissions from these construction activities would occur concurrently with the emissions from operation of the SPLNG Terminal, including associated pipeline facilities and SPLNG Expansion Project Train 5. Because construction activities for the SPLNG Expansion Project Train 6 and the Project would be completed in late-2022, 2023 would be the first full year of operation for the fully-expanded SPLNG Terminal and associated pipeline facilities, including the SPLNG Expansion Project and the Project, with associated emissions shown in Table B.8.1-9.

Table B.8.1-9
SPLNG Terminal, Expansion Project (Trains 5 and 6), and Third Berth Combined Construction, Commissioning, and Operation Emissions (tpy)

Year	Pollutant							
	PM_{10}	$PM_{2.5}$	NO_x	CO	SO_2	VOC	CO_2e[a]	Total HAPs
2020[b]	808	319	7,424	5,288	156	431	9,651,507	91
2021[c]	839	271	6,369	5,221	158	391	9,639,405	90
2022[d]	779	266	6,349	5,538	173	422	9,917,186	87
2023[e]	228	226	7,257	6,086	227	467	11,074,899	91

_____

[a] Metric tons
[b] 2020 construction emissions for SPLNG Expansion Project Train 6 and Third Berth Project from Table 1 of Attachment 24a of SPLNG's Response to Comments, submitted to FERC on July 26, 2019, plus operation emissions for SPLNG associated pipeline facilities from Table 2 of Attachment 24a, plus operation emissions for SPLNG Terminal from Table 1 of Attachment 24a (excluding all Train 6 and Third Berth operation emissions).
[c] 2021 construction emissions for SPLNG Expansion Project Train 6 and Third Berth Project from Table 1 of Attachment 24a of SPLNG's Response to Comments, submitted to FERC on July 26, 2019, plus operation emissions for SPLNG associated pipeline facilities from Table 2 of Attachment 24a, plus operation emissions for SPLNG Terminal from Table 1 of Attachment 24a (excluding all Train 6 and Third Berth operation emissions).
[d] 2022 construction emissions for SPLNG Expansion Project Train 6 and Third Berth Project from Table 1 of Attachment 24a of SPLNG's Response to Comments, submitted to FERC on July 26, 2019, plus operation emissions for SPLNG associated pipeline facilities from Table 2 of Attachment 24a, plus operation emissions for SPLNG Terminal from Table 1 of Attachment 24a (including Train 6 and Third Berth operation emissions for part of the year).
[e] Operational emissions for complete SPLNG Terminal (including SPLNG Expansion Project and Third Berth Project) from Table 1 of Attachment 24a of SPLNG's Response to Comments, submitted to FERC on July 26, 2019, plus SPLNG associated pipeline facilities from Table 2 of Attachment 24a.

8.2 Noise

Construction and operation of the Project would affect the local acoustical environment. The ambient sound level of a region is defined by the total noise generated within the specific environment and comprises sounds from both natural and industrial sources. At any location, both the magnitude and frequency of environmental noise may vary considerably throughout the day and week, in part due to changing weather conditions and the impacts 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 equivalent sound level (L_{dn}). The L_{eq} is a sound level containing the same sound energy as the instantaneous sound levels measured over a specific time period. Noise levels 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 to early morning (10:00 p.m. to 7:00 a.m.) noise exposures are penalized by 10 A-weighted decibels (dBA), to account for people's greater sensitivity to sound during the

nighttime hours. The A-weighted scale is used because human hearing is less sensitive to low and high frequencies than mid-range frequencies. For an essentially steady sound source that operates continuously over a 24-hour period, the L_{dn} is 6.4 dBA above the measured L_{eq}.

In 1974, the EPA published its *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety*. This document provides information for state and local governments to use in developing their own ambient noise standards. The EPA has indicated that an L_{dn} of 55 dBA protects the public from indoor and outdoor activity interference. SPLNG has adopted this criterion to evaluate the potential noise impacts from the Project at noise-sensitive areas (NSAs) such as residences, schools, or hospitals. Because of the 10 dBA nighttime penalty added when calculating the L_{dn}, for a facility to meet the L_{dn} 55 dBA limit, it must be designed such that average noise levels on a 24-hour basis do not exceed 48.6 dBA L_{eq} at any NSA. In general, a person's threshold of perception for a change in loudness is about 3 dBA, whereas a 5 dBA change is clearly noticeable, and a 10 dBA change is perceived as either twice or half as loud.

Cameron Parish has a local noise ordinance that states, "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 parish" (Cameron Parish Police Jury, 1997). This is a qualitative ordinance and does not include quantitative sound level limits. The FERC sound level criterion is considered adequate to prevent any unreasonable interference with comfort or repose and, therefore, determined to be compatible with the Cameron Parish noise ordinance. In addition, the Cameron Parish ordinance specifically prohibits construction and demolition activities within 165 feet of any residential or noise sensitive area during certain hours. There are no residences or other NSAs located within 165 feet of the Project; therefore, this prohibition does not apply to the Project.

Chapter 34, Article V, Section 34-176 of the Port Arthur zoning code includes noise limits and specifies limits of 57 dBA and 52 dBA for sound levels at residential properties during the day and at night, respectively. However, Chapter 34, Article V, Section 34-183.(4) of the ordinance includes the following exemption for construction noise during daytime hours:

Noise sources associated with demolition, construction, repair, remodeling or grading of any real property construction activities are exempted provided that such activities do not take place during nighttime hours.

SPLNG stated that no general construction activities or pile driving would occur during the nighttime hours from 10:00 p.m. to 7:00 a.m., as defined in the ordinance.[15] However, SPLNG would conduct dredging activities during nighttime hours, although, SPLNG's noise analysis determined that dredging activities would not generate sound levels in excess of the Port Arthur ordinance levels, as presented in table B.8.2-4 below.

[15] As identified by SPLNG in their December 21, 2018 responses to our December 13, 2018 Environmental Information Request, which are available on the FERC eLibrary website at https://elibrary.ferc.gov/idmws/search/fercadvsearch.asp under accession number 20181221-5070.

8.2.1 Existing Noise Conditions

The proposed Project involves the expansion of the existing SPLNG Terminal, which is located on the Sabine Pass Channel in Cameron Parish. The nearest NSAs to the proposed Project site were identified, and a baseline noise survey was conducted at locations close to these NSAs to determine the existing sound levels. The locations of these NSAs and the corresponding sound measurement locations relative to the Project site are depicted in figure B.8.2-1 below.

Table B.8.2-1

Baseline Sound Level Measurement Results at Noise Sensitive Areas near the Project Site

NSA	Distance from Third Berth to NSA (feet)	Direction to NSA from Third Berth	NSA Description	Duration HH:MM	Daytime L_{eq} (dBA) [a]	Nighttime L_{eq} (dBA) [b]	Ambient L_{dn} (dBA)	Comments / Audible Noise Sources [c]
1	7,100	West	NE end of Tremont St, residences in Sabine Pass, Texas	24:00	51.2	49.1	55.9	Local and distant traffic, industrial activity to the north, wind, and birds.
2	3,300	Southwest	Sabine Pass Battleground State Historic Park	16:30	52.1	44.8	53.3	Local and distant traffic, landscaping equipment, industrial activity to the southeast, boating traffic, wind, water, and birds.
3	13,000	Northwest	Walter Umphrey State Park	15:00	50.3	46.3	53.6	Traffic on State Highway 82, local traffic, LNG operations, wind, birds, and pedestrians.

[a] Daytime is considered as the time between 7:00 a.m. and 10:00 p.m.
[b] Nighttime is considered from 10:00 p.m. until 7:00 a.m. the following day.
[c] Sound level measurements recorded during a period of high winds were removed from the sound level measurements presented herein.

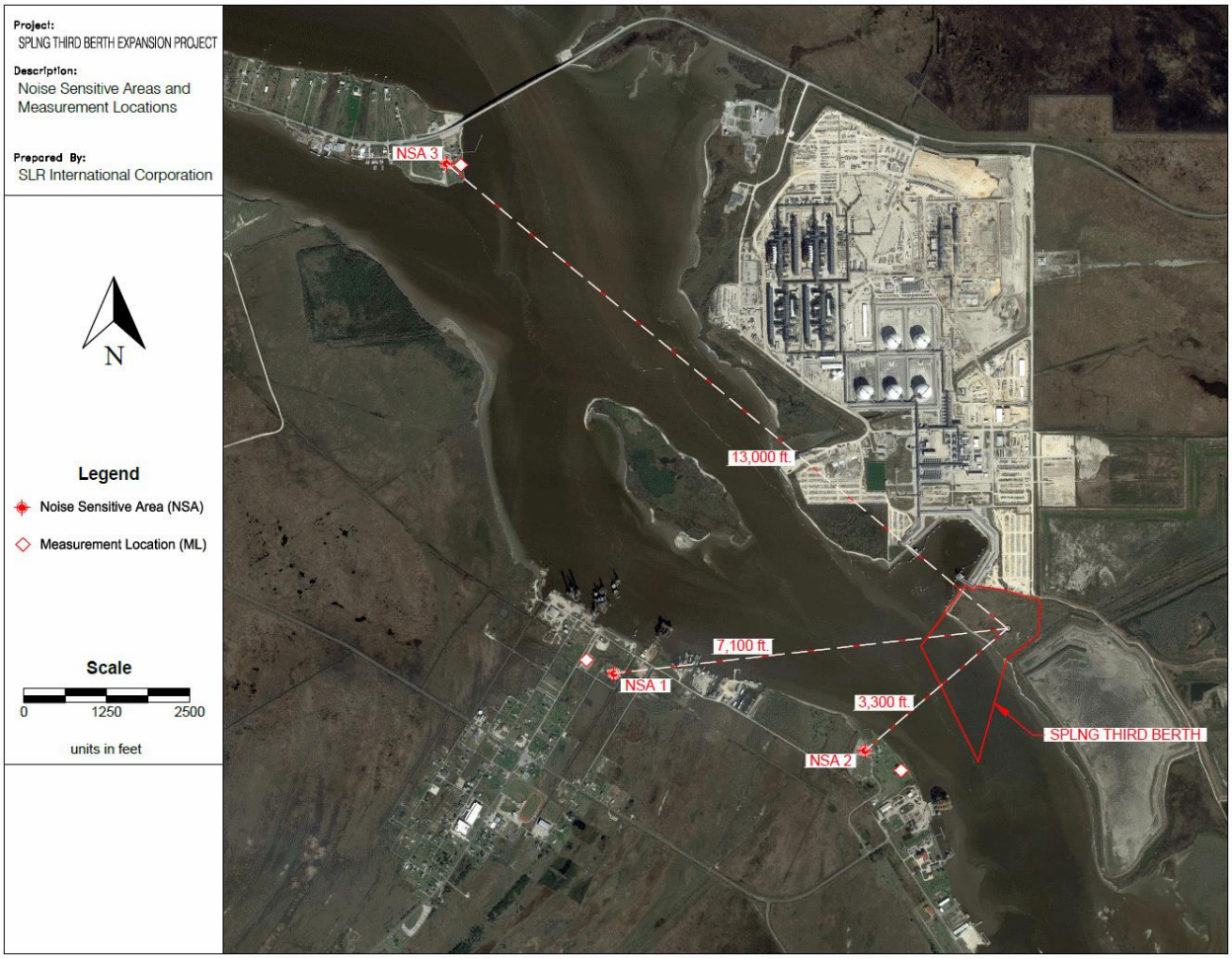

Figure B.8.2-1 NSAs and Ambient Sound Measurement Locations

The baseline noise survey for the Project was conducted on April 18 and 19, 2018. Audible existing sound sources included the equipment operating at the SPLNG Terminal, industrial activity southeast, distant and local vehicular traffic, wind, and wildlife (primarily birds). High winds were present during a certain period at two of the measurement sites, and the associated sound level measurements during this high wind period were removed from the calculations to provide a more conservative characterization of the existing acoustic environment. The existing sound levels recorded at the measurement locations ranged from 53.3 to 55.9 dBA L_{dn}.

Table B.8.2-1 presents the distance and direction to the NSAs relative to the Third Berth, as well as the measured daytime and nighttime sound levels (L_{eq}, dBA) and the day-night average sound levels (L_{dn}, dBA) at the nearby NSAs.

8.2.2 Construction Noise Impacts and Mitigation

Construction of the Project would result in short-term increases in sound levels, but due to the temporary nature of construction noise, no long-term effects are anticipated. SPLNG would generally use standard construction equipment for construction of the Project, and no dynamic compaction is anticipated to be required for the Project. Pile driving activities would

occur during construction of the Project. The time period considered for the cumulative noise criterion is the 10 hours of pile driving activity daily.

SPLNG stated that most construction would occur during a single 10-hour daytime shift between the hours of 7:00 a.m. and 10:00 p.m., though dredging would take place on a 24-hour basis. While exact start times are not known at this point in the project, it is likely that construction would start between 7-9 a.m. and finish between 5-7 p.m. SPLNG stated that it is unlikely that there would be significant general construction activity after 7 p.m. Emergencies or other non-typical circumstances may necessitate limited nighttime work. The highest sound levels during construction would be expected during the early earthmoving phase. According to SPLNG, equipment that may be operating during this phase would include bulldozers, front end loaders, dump trucks, generators, etc.

Airborne Noise Impacts

A portion of the total construction noise would originate from land-based activities. Noise-generating equipment and activities during construction of the Project would primarily result from pile driving, internal combustion engines associated with general construction equipment, and dredging. The various types of construction activities proposed at the Project site and the associated noise levels are described below. Noise levels from construction of the Project were evaluated by SPLNG using sound levels from the Federal Highway Administration's Roadway Construction Noise Model version 1.1 (USDOT, 2008). Tables B.8.2-3, B.8.2-4, and B.8.2-5 below present the predicted airborne noise impacts associated with Project construction during daytime, nighttime, and overall (i.e., equivalent day-night), respectively.

Pile-Driving

A summary of SPLNG's proposed pile driving activities is presented in table B.8.2-2. The peak pile driving period would be during Month 9, when up to three pile driving rigs may be working simultaneously, and SPLNG's noise model represented this worst-case pile driving period. The rigs in the noise model were located on the edge of the pile driving work area closest to the NSAs, and represent a worst-case, conservative pile driving work scenario.

Table B.8.2-2
Pile Driving Activity Summary

Area	Pile Type	Pile Quantity	Equipment	Start	Finish	Approx. Days
Piperack and trestle concrete piles (on-land)	14" concrete piles	42	1 rig	M9	M9	30
PND Open Cell Bulkhead (on-land)	Sheet and anchor piles	1400	2 rigs	M5	M9	150
Trestle Steel Pipe Piling (marine)	48" steel pipe piles	10	1 rig	M10	M11	30
Marine Berth Steel Piling (marine)	54" steel pipe piles	106	1 barge rig	M10	M18	270
M= month						

Because pile driving is a short-term impulsive noise source, SPLNG's analysis was performed for both the daytime average sound level and the short-term maximum noise level

in dB (L_{max}) from pile-driving. The L_{max} represents the highest level for any given single pile driving event while the L_{eq} is the average due to pile driving over the course of the full work day.

For a diesel-driven impact hammer, the airborne L_{max} sound level is 101 dBA at 50 feet, based on measured values from the *Highway Construction Noise Handbook* published by the Federal Highway Administration (USDOT, 2008). To estimate the long-term equivalent sound level (the L_{eq}), SPLNG applied a usage factor of 10 percent to the L_{max}. The resulting long-term sound power level is 126 dBA L_{eq}.

Dredging

SPLNG would likely conduct dredging primarily using a conventional barge-mounted hydraulic cutter suction dredge, with a diameter of approximately 30 inches. Some material located close to the berth walls may be dredged using a mechanical bucket dredge. Dredging would be conducted 24 hours per day for approximately 270 days. The primary noise sources during dredging include the diesel-powered dredge with associated pumps as well as tugboats and other support vessels used to position the dredge.

General Construction

The highest sound levels during construction are expected during the early earthmoving phase. Equipment that may be operating during this phase would include bulldozers, front end loaders, dump trucks, generators, etc. Based on the equipment usage predictions, a sound level calculation was performed using sound levels from the Federal Highway Administration's Roadway Construction Noise Model version 1.1 (USDOT, 2008). Along with the land-based equipment, barges, skiffs, and tugboats would be used in the construction effort. These vessels would create airborne as well as underwater noise. According to SPLNG, the land-based equipment would generate equivalent airborne sound power levels of approximately 131 dBA, and the water-based vessels would generate airborne noise, with an expected total sound power level of 133 dBA.

Impact Summary

SPLNG used a noise model to predict the airborne construction sound levels at nearby NSAs. The results of those calculations are summarized in tables B.8.2-3, B.8.2-4, and B.8.2-5, which present the predicted short-term sound levels at the NSAs during different construction activities during daytime as well as the sound levels at the NSAs during nighttime dredging activities. The model predicts that the sound levels due to daytime construction activity, for both land and water-based equipment, would range from 43.4 to 59.9 dBA L_{eq} at the NSAs, with the highest levels at NSA 2.

Table B.8.2-3 Daytime Construction Sound Level Impact Evaluation – Pile Driving							
NSA	**Distance to NSA (feet)**	**Direction to NSA**	**Measured Daytime Ambient L_{eq} (dBA)**	**Sound Level, L_{eq}, of Pile Driving (dBA)**	**Combined Pile Driving and Daytime Ambient L_{eq} (dBA)**	**Potential Increase Above Ambient (dB)**	**Pile Driving L_{max} (dBA)**
1	7,100	West	51.2	38.4	51.4	0.2	44.1
2	3,300	Southwest	52.1	54.6	56.5	4.4	60.1
3	13,000	Northwest	50.3	23.8	50.3	0.0	29.4
NOTE: Noise attributable to construction does not include use of noise mitigation measures.							

Table B.8.2-4 Daytime Construction Sound Level Impact Evaluation –General Construction and Dredging									
NSA	**Distance to NSA (feet)**	**Direction to NSA**	**Measured Daytime Ambient L_{eq} (dBA)**	**Sound Level, L_{eq}, of General Construction (dBA)**	**Sound Level, L_{eq}, of Dredging (dBA)**	**Combined Construction and Dredging L_{eq} (dBA)**	**Combined Construction and Dredging L_{dn} (dBA)**	**Combined Construction, Dredging, and Daytime Ambient L_{eq} (dBA)**	**Potential Increase Above Ambient L_{eq} (dBA)**
1	7,100	West	51.2	50.4	29.6	50.4	47.0	53.8	2.6
2	3,300	Southwest	52.1	59.9	45.0	60.0	57.4	60.7	8.6
3	13,000	Northwest	50.3	43.4	20.1	43.4	39.8	51.1	0.8
NOTE: Noise attributable to construction does not include use of noise mitigation measures.									

At NSA 2 (Sabine Pass Battleground State Historic Site), maximum impulse noises from pile driving are likely to be clearly audible during daytime hours (pile driving would not occur at night). At NSA 2, it is also likely that general construction noises would be intermittently audible during daytime hours (these activities would not normally occur at night).

At NSAs 1 and 3, the sound from pile driving and general construction activities may be intermittently audible during quiet ambient conditions, but these sounds would not be expected to be a significant contributor.

Regarding table 8.2-3, during test piling for the Project, SPLNG would perform sound level measurements to ensure the L_{max} sound levels from pile driving activities do not exceed 10 dBA over the previously measured daytime ambient levels at each NSA. SPLNG's sound level measurements will quantify the actual L_{max} sound levels during pile driving at locations close to the test piling. SPLNG would update the noise model with the measured L_{max} pile driving sound levels, and the model would then be used to predict the measured pile driving L_{max} levels at the NSAs. If the predicted levels are found to be higher than 10 dBA over the previously measured ambient daytime L_{eq}, then SPLNG would perform short-term sound level measurements at NSA 2 during test piling to determine the actual L_{max} levels due to pile driving. SPLNG personnel or SPLNG's subcontractors would attend the measurements and note the audible cause of each L_{max} event during the measurements so that extraneous environmental sources can be excluded.

Daytime dredging noises are expected to be below ambient sound levels at all three NSAs and would only rarely be audible.

Table B.8.2-5 presents a summary of the predicted short-term sound levels at the NSAs during dredging construction activities during nighttime hours.

Table B.8.2-5
Nighttime Construction Sound Level Impact Evaluation –Dredging Only

NSA	Measured Ambient L_{eq} (dBA)	Sound Level, L_{eq}, of Dredging (dBA)	Combined All Activities L_{eq} and Ambient L_{eq} (dBA)	Potential Increase Above Ambient (dB)
1	49.1	29.6	49.1	0.0
2	44.8	45.0	47.9	3.1
3	46.3	20.1	46.3	0.0

Due to distance to the NSAs, dredging activities are not predicted to have any significant impact on the sound levels at the NSAs, with predicted nighttime dredging sound levels significantly lower than the existing ambient levels.

Table B.8.2-6 presents a summary of the predicted L_{dn} sound levels at the NSAs for all combined construction activities during daytime and nighttime hours.

Table B.8.2-6
Construction Sound Level Impact Evaluation – Overall Equivalent Day-Night Levels

NSA	Measured Ambient L_{dn} (dBA)	Daytime Sound Level, L_{eq} of All Activities Combined (dBA)	Nighttime Sound Level, L_{eq}, of Dredging (dBA)	L_{dn} of Combined Daytime and Nighttime Activities	Combined Construction L_{dn} and Ambient L_{dn} (dBA)	Potential Increase Above Ambient (dB)
1	55.9	50.7	29.6	47.2	56.5	0.6
2	53.3	61.1	45.0	58.2	59.4	6.1
3	53.6	43.5	20.1	39.9	53.8	0.2

As presented in the tables above, the daytime and nighttime L_{eq} for all construction activities at NSAs 1 and 3 are below the daytime and nighttime ambient L_{eq} at these NSAs. At both NSAs 1 and 3, the combined L_{dn} for the all daytime and nighttime construction activities are less than the measured ambient L_{dn} and are also below 55 L_{dn}. NSA 1 is the location of the nearest residences to the Project site.

At NSA 2, the expected nighttime L_{eq} from dredging is 0.2 dBA above the nighttime ambient, and the expected daytime L_{eq} from all construction activities is 9 dBA above the daytime ambient L_{eq}. The combined L_{dn} from all construction activities is 58.2 dBA at NSA 2. Dredging, which is the only nighttime construction activity, would produce an L_{dn} of 51.4 dBA (equivalent to an L_{eq} of 45.0 dBA for 24 hours per day), which meets the FERC criterion of 55 L_{dn} for any nighttime construction activities.

Therefore, we have determined that the expected construction sound levels at NSA 2 are acceptable for the following reasons:

- The dredging meets the FERC criterion for nighttime noises.

- There are no residences at NSA 2. The nearest residences to the Project site are at NSA 1.
- NSA 2 is a park that is closed at night.
- Actual combined construction noises are expected to be lower than the calculated levels, because the calculated levels assumed simultaneous worst-case locations and activity levels for dredging, pile driving, and general construction activities. For example, general construction activities are expected to peak early in the Project, and pile driving activities are expected to peak during Month 9.

Underwater Noise Impacts

The Project would include several different construction activities that have the potential to cause underwater noise impacts. Pile driving and dredging activities associated with the Project have the greatest potential to result in increased underwater noise, which can adversely impact aquatic resources. Underwater noise impacts are discussed in greater detail in sections B.4.2.2, B.4.5.1, and B.4.5.3.

To ensure that the underwater sound levels generated during in-water pile driving would be consistent with the anticipated sound levels, SPLNG proposes to perform underwater sound level measurements during the initial in-water test piling phase. Sound levels would be measured at appropriate distances during the initial test piling to quantify the underwater sound levels due to the pile driving. These sound levels would be compared to the sound levels used in the underwater noise evaluation to ensure that they are consistent with the levels used in the initial analysis (see our recommendation in section B.4.2.2).

Construction Vessels

Support vessels involved in the general construction activities would include tenders, barges, and tugs. Typical levels for construction and maintenance ships range from 150 – 180 dB re 1 µPa rms (Protection of the Marine Environment of the North-East Atlantic, 2009). SPLNG expects that use of these vessels would be sporadic with long periods of inactivity, similar to the existing water craft and activities in the channel. In general, underwater noise from these construction support craft would not be expected to cause a significant construction noise impact.

Construction Conclusion

With the implementation of the mitigation measures presented above and compliance with our recommendations, we conclude that construction noise from the Project would not have a significant impact on the acoustical environment at the nearby NSAs.

8.2.3 Ground-Borne Vibration

Impacts due to construction activities such as pile driving can generate ground-borne vibration. High levels of vibration at close proximity can cause perceptible vibration or even damage to structures. However, due to the distance from the Project to the NSAs, which is 2,700 feet away, and the type of equipment proposed for construction and operation of the Project,

SPLNG stated that there would be no detectable increase in vibration at the NSAs. Vibration levels at the closest NSA would generate a peak particle velocity of 0.37 millimeters per second at the closest NSA, which is approximately one third of the vibration necessary to be perceived by humans. The installed operating equipment would consist of well-balanced rotating equipment with small horsepower electric motor drives. There are no significant sources of vibration. The loading process is a steady-state, continuous process with no impulsive or impact events. Noise-induced vibration of structures is also not anticipated for operational noise due to the low amplitude sound levels predicted by SPLNG for operations.

8.2.4 Operational Noise Impacts and Mitigation

Operation of the Project facilities has the potential to result in noise impacts at nearby NSAs. SPLNG performed an acoustical analysis to estimate noise contributions from operation of the Project at each of the nearest NSAs.

Third Berth Operations

The following noise-generating equipment was included in SPLNG's operational noise model for the Project:

- Impoundment Basin Pumps;
- Basin Sump Pumps;
- Sanitary Treatment Package Air Blower;
- Sanitary Treatment Package Pump;
- Gangway Hydraulic Power Unit;
- Loading Arm Hydraulic Power Unit; and
- Onboard Generator on the LNGC while at the Third Berth.

SPLNG developed a noise model using CadnaA, version 2018, build 161.4801 to estimate noise contributions during operation of the Project. The software considers spreading losses, ground and atmospheric effects, shielding from barriers and buildings, reflections from surfaces, and other sound propagation properties based on the ISO 9613 standard.

Sound power levels for operational equipment were taken from the engineering specifications for the Project. SPLNG stated that these levels would be noted in the equipment specifications during the equipment requisition process to ensure that the purchased equipment meets the Project sound level goals. No additional noise mitigation was identified by SPLNG for any of the operations equipment.

While they are moored at the berth, it is typical for LNGCs to continuously operate onboard generators. Almost all of the sound level energy from the generators is concentrated in the 63 Hz octave band, with Panamax-sized modern cargo ships producing 68 dB at 1,500 feet. SPLNG used these sound levels in the noise model as a typical contribution from the LNGC generator.

Table B.8.2-7 provides a summary of the ambient sound levels, predicted operational sound levels for the Project, and combined total sound levels at the nearby NSAs. As presented below, the operational sound levels predicted for the Project are much lower than the ambient sound levels and well below the FERC criterion of 55 dBA L_{dn} at the nearby NSAs.

Table B.8.2-7

Sound Level Impact Evaluation – Predicted Operations Noise at Noise Sensitive Areas

NSA	Measured Ambient L_{dn} (dBA)	Estimated Contribution of Project Operational Equipment, L_{dn} (dBA)	Combined Project L_{dn} and Ambient L_{dn} (dBA)	Potential Increase Above Ambient (dB)
1	55.9	37.3	56.0	0.1
2	53.3	43.1	53.7	0.4
3	53.6	32.5	53.6	0.0

The predicted operational sound level contribution for the Project are shown on figure B.8.2-2 as lines of equal sound levels.

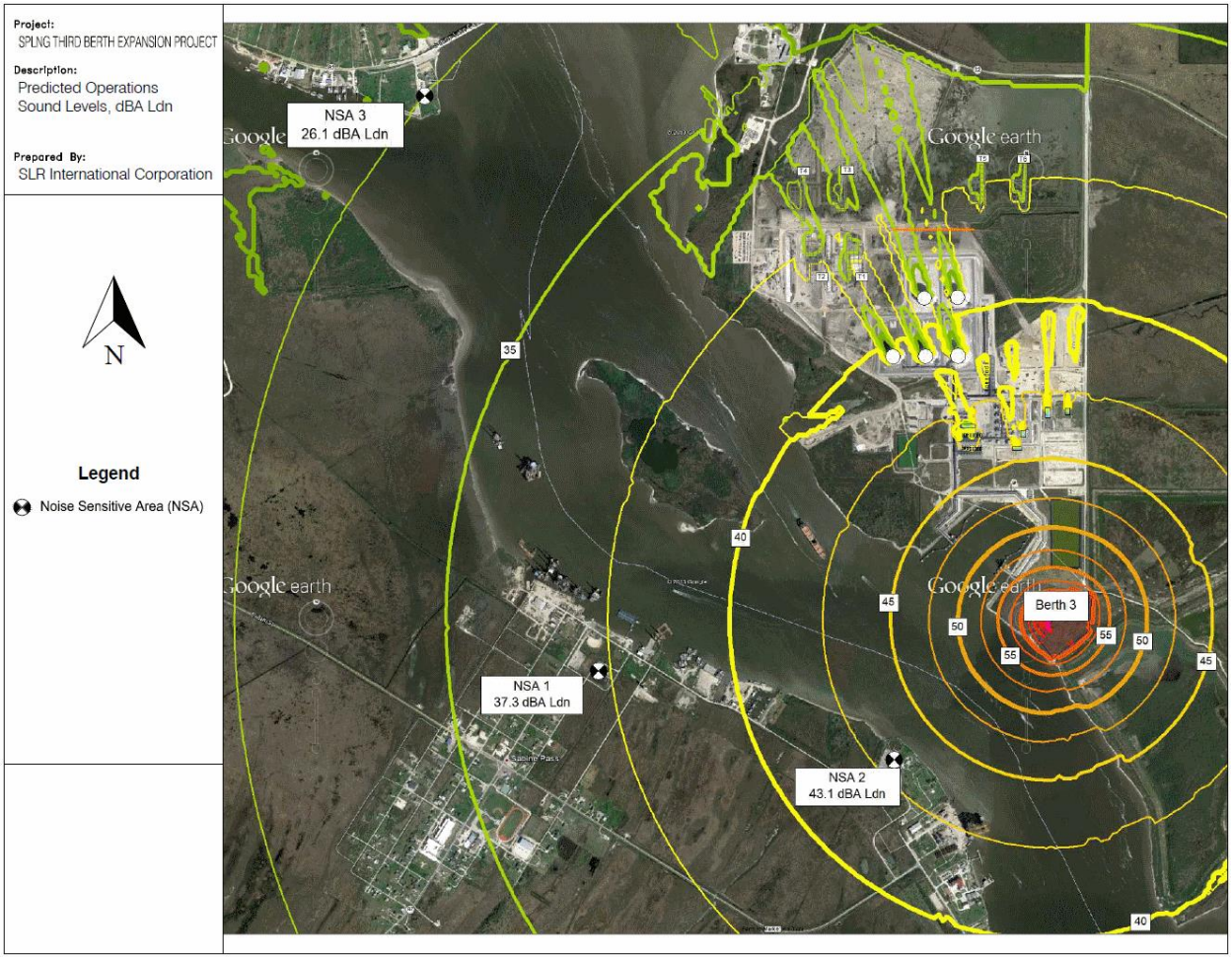

Figure B.8.2-2 NSAs and Modeled Operational Noise Contours

Based on the results provided by SPLNG, operation of the Project would comply with the 55 dBA L_{dn} criterion. The increases in ambient noise levels during operation of the Project are

less than 1 dBA at the nearby NSAs and would be considered imperceptible to most listeners. Therefore, noise impacts associated with operation of the Project would not be significant.

LNGC Traffic

SPLNG proposes to increase the number of LNGCs calling on the SPLNG Terminal from the currently authorized 400 LNGCs to 580 LNGCs. Anticipated sound levels are not significant compared to the existing sound levels in the area and the sound level contribution of the other Project equipment. As discussed above, the operation of the onboard generators has been included in the operations noise model for the Project.

Airborne Noise

The Project operations would involve LNGC traffic to and from the new Third Berth. LNGC transits are not expected to cause significant airborne sound level impacts at the NSAs. Typical LNGCs have a sound power level of about 111 dBA while under way (Papua New Guinea LNG Project, 2009). For a single LNGC passby along the expected approach path to the Third Berth, sound levels from the tanker would be about 42 dBA L_{eq} at NSA 2 and 30 dBA L_{eq} at NSA 1 during the closest approach. According to SPLNG, these levels would only last for the duration of the closest approach in the transit, for typical operation no more than 10 to 15 minutes. The same type of LNGCs that utilize the existing SPLNG would utilize the Third Berth, and although the frequency of LNGCs calling on the SPLNG Terminal would increase as a result of the Project, an increase in sound level is not expected to occur.

Underwater Noise

Transit of LNGCs to and from the Third Berth would result in temporary increases in the underwater sound levels. Typical large vessel shipping sound levels range from 180 to 190 dB re 1 µPa rms at 1 meter (Protection of the Marine Environment of the North-East Atlantic, 2009). At these levels, the vessels pose a risk for injury to mammals, fish, and sea turtles only in very close proximity, which would be unlikely given the large size, displacement, and slow-moving nature of LNGC compared to aquatic life. As the LNGC transits would be transitory, short term impacts would occur only as the LNGCs move through the channel.

LNG Pumps

Sound generated by the LNGCs during the loading process would not contribute to overall operational airborne or underwater sound level impacts since the pumps are completely submerged in LNG and encased in the concrete LNG storage tanks.

Venting Noise

There Project facilities do not include any venting events or systems; therefore, noise from venting was not been evaluated.

Marine Flare Noise

Operation of the Third Berth would require increased use of the marine flare due to the additional loading operations associated with the Project. The marine flare is an enclosed ground flare, with less noise impacts expected as compared to a typical elevated flare. The marine flare

is expected to operate for an additional 696 hours per year due to the Project. According to SPLNG, the sound level contributions for the marine flare as a result of the Project would not increase, rather the duration of use of the flare would increase with increased LNGC loading operations resulting in a slight increase in long-term sound levels.

Table B.8.2-8 provides a noise assessment for marine flare operations from the Project including a summary of the ambient sound levels; estimated sound levels for the marine flare during Project operation; cumulative operational sound levels of Trains 1 through 6 and the Project, including the marine flare; and combined total sound levels at the nearby NSAs. As presented below, the operational sound levels predicted for the marine flare and the cumulative operational sound levels for the Project, marine flare, and Trains 1 through 6 are below the FERC criterion of 55 dBA Ldn at the nearby NSAs.

Table B.8.2-8

Cumulative Sound Level Impact Evaluation – Marine Flare Contribution to Operational Levels

NSA	Measured Ambient (dBA L_{dn})	Total Cumulative Future, SPLNG Trains 1 – 6 and Project (dBA L_{dn})	Estimated Marine Flare Sound Levels (dBA L_{eq})	Estimated Overall Marine Flare Sound Levels (dBA L_{dn})	Cumulative Future, SPLNG Trains 1 – 6, Project, and Marine Flare (dBA L_{dn})	Cumulative Future, SPLNG Trains 1 – 6, Project, Marine Flare, and Ambient (dBA L_{dn})	Potential Increase Above Ambient (dB)
1	55.9	49.1	47.6	46.6	51.1	56.6	0.7
2	53.3	47.8	50.3	49.3	51.6	55.2	1.9
3	53.6	49.5	42.8	41.8	50.2	54.2	0.6

Operations Conclusion

With the implementation of the mitigation measures presented above (i.e., purchase of equipment with specifications which meet the Project sound level goals), we conclude that operational noise from the Project would not have a significant impact on the acoustical environment at the nearby NSAs.

9.0 RELIABILITY AND SAFETY

9.1 LNG Safety

9.1.1 LNG Facility Reliability, Safety, and Security Regulatory Oversight

LNG facilities handle flammable and sometimes toxic materials that can pose a risk to the public if not properly managed. These risks are managed by the companies owning the facilities, through selecting the site location and plant layout as well as through suitable design, engineering, construction, and operation of the LNG facilities. Multiple federal agencies share regulatory authority over the LNG facilities and the operator's approach to risk management. The safety, security, and reliability of the Third Berth Facilities would be regulated by the USDOT PHMSA, the Coast Guard, and the FERC.

In February 2004, the USDOT PHMSA, the Coast Guard, and the 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 and LNG marine vessel 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 USDOT PHMSA and the Coast Guard participate as cooperating agencies but remain responsible for enforcing their regulations covering LNG facility siting, design, construction, operation, maintenance, and security. All three agencies have some oversight and responsibility for the inspection and compliance during the LNG facility's operation.

The USDOT PHMSA establishes and has the authority to enforce the federal safety standards for the location, design, installation, construction, inspection, testing, operation, and maintenance of onshore LNG facilities under the *Natural Gas Pipeline Safety Act* (49 USC 1671 *et seq.*). The USDOT PHMSA's LNG safety regulations are codified in 49 CFR 193, which prescribes safety standards for LNG facilities used in the transportation of gas by pipeline that are subject to federal pipeline safety laws (49 USC 60101 *et seq.*) and 49 CFR 192. On August 31, 2018, the USDOT PHMSA and the FERC signed an MOU regarding methods to improve coordination throughout the LNG permit application process for FERC jurisdictional LNG facilities. In the MOU, the USDOT PHMSA agreed to issue an LOD stating whether a proposed LNG facility would be capable of complying with location criteria and wind force design standards contained in Subpart B of Part 193. The Commission committed to rely upon the USDOT PHMSA determination in conducting its review of whether the facilities would be consistent with the public interest. The issuance of the LOD does not abrogate the USDOT PHMSA's continuing authority and responsibility over a proposed project's compliance with Part 193 during construction and future operation of the facility. The USDOT PHMSA's conclusion on the siting and hazard analysis required by Part 193 would be based on preliminary design information which may be revised as the engineering design progresses to final design. The USDOT PHMSA regulations also contain requirements for the design, construction, installation, inspection, testing, operation, maintenance, qualifications and training of personnel, fire protection, and security for LNG facilities, but the scope of their regulations exclude the Project facilities per 49 CFR 193.2001 (b) (3)

The Coast Guard has authority over the safety and security of the Project facilities and associated LNG marine vessel traffic. The Coast Guard regulations for waterfront facilities handling LNG are codified in 33 CFR 105 and 33 CFR 127. As a cooperating agency, the Coast Guard assists FERC staff in evaluating whether an applicant's proposed waterway would be suitable for LNG marine vessel traffic and whether the waterfront facilities handling LNG would be operated in accordance with 33 CFR 105 and 33 CFR 127. If the Third Berth Facilities are constructed and become operational, the Third Berth Facilities would be subject to the Coast Guard inspection program to ensure compliance with the requirements of 33 CFR 105 and 33 CFR 127.

FERC has the authority to authorize, with or without conditions, or deny the siting and construction of the Project facilities under the NGA and delegated authority from the DOE. The

FERC requires standard information to be submitted to perform safety and reliability engineering reviews. FERC's filing regulations are codified in 18 CFR §380.12 (m) and (o), and requires each applicant to identify how its proposed design would comply with the USDOT PHMSA's siting requirements of 49 CFR 193, Subpart B. The level of detail necessary for this submittal requires the applicant to perform substantial front-end engineering of the complete project. The design information is required to be site-specific and developed to the extent that further detailed design would not result in significant changes to the siting considerations, basis of design, operating conditions, major equipment selections, equipment design conditions, or safety system designs. As part of the review required for a FERC Order, we use this information from the applicant to assess whether the proposed facilities would have a public safety impact and to recommend additional mitigation measures to the Commission for incorporation as conditions in the Order. If the Third Berth Facilities are approved, FERC staff would review material filed to satisfy the conditions of the Order and conduct periodic inspections throughout construction and operation.

In addition, the Energy Policy Act of 2005 requires the FERC to coordinate and consult with the U.S. Department of Defense (DOD) on the siting, construction, expansion, and operation of LNG terminals that would affect the military. On November 21, 2007, FERC and the DOD (http://www.ferc.gov/legal/mou/mou-dod.pdf) entered into a MOU formalizing this process. In accordance with MOU, FERC sent a letter to the DOD on December 6, 2018 requesting their comments on whether the planned Project could potentially have an impact on the test, training, or operational activities of any active military installation. On February 15, 2019, the FERC received a response letter from the DOD Siting Clearinghouse stating that the Project would have a minimal impact on military training and operations conducted in Cameron Parish, Louisiana.

9.1.2 USDOT PHMSA Siting Requirements and 49 CFR 193 Subpart B Determination

Siting LNG facilities, as defined in 49 CFR 193, with regard to ensuring that the proposed site selection and location would not pose an unacceptable level or risk to public safety is required by the USDOT PHMSA's regulations in 49 CFR 193, Subpart B. The Commission's regulations under 18 CFR §380.12 (o) (14) require SPLNG to identify how the proposed design complies with the siting requirements of 49 CFR 193, Subpart B. The scope of the USDOT's siting authority under 49 CFR 193 applies to LNG facilities used in the transportation of gas by pipeline subject to the federal pipeline safety laws and 49 CFR 192.[16]

The regulations in 49 CFR 193, Subpart B require the establishment of an exclusion zone surrounding an LNG facility in which an operator or government agency must exercise legal control over the activities where specified levels of thermal radiation and flammable vapors may

[16] 49 CFR 193.2001 (b) (3), Scope of part, excludes any matter other than siting provisions pertaining to marine cargo transfer systems between the LNG marine vessel and the last manifold (or in the absence of a manifold, the last valve) located immediately before a storage tank.

occur in the event of a release for as long as the facility is in operation. Approved mathematical models must be used to calculate the dimensions of these exclusion zones. The siting requirements specified in NFPA 59A (2001), an industry consensus standard for LNG facilities, are incorporated into 49 CFR 193, Subpart B by reference, with regulatory preemption in the event of conflict. The following sections of 49 CFR 193, Subpart B specifically address siting requirements:

- Section 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), which is incorporated by reference in 49 CFR §193.2013, under Subpart A. In the event of a conflict with NFPA 59A (2001), the regulatory requirements in 49 CFR 193 prevail.
- Section 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).
- Section 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).
- Section 193.2067, Wind forces, requires the Project facilities must be designed for a sustained wind velocity of not less than 150 mph unless the USDOT PHMSA Administrator finds a lower wind speed is justified or the most critical combination of wind velocity and duration for a 10,000-year mean return interval.

As stated in 49 CFR §193.2051, under Subpart B, LNG facilities must meet the siting requirements of NFPA 59A (2001), Chapter 2, and include but may not be limited to:

- NFPA 59A (2001) section 2.1.1 (c) requires consideration of protection against forces of nature.
- NFPA 59A (2001) section 2.1.1 (d) 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) 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 British thermal units per square foot per hour (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 LNGFIRE3 or with models that have been validated by experimental test data appropriate for the hazard to be evaluated and that have been approved by the USDOT PHMSA.
- NFPA 59A (2001) 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

approved alternative models that take into account physical factors influencing LNG vapor dispersion.[17]

In sum, 49 CFR 193, Subpart B and NFPA 59A (2001), as incorporated by reference into Part 193 require that flammable LNG vapors from design spills do not extend beyond areas in which the operator or a government agency legally controls all activities. Furthermore, consideration of other hazards which may affect the public or plant personnel must be evaluated as prescribed in NFPA 59A (2001) section 2.1.1 (d).

Title 49 CFR 193, Subpart B and NFPA 59A (2001) also requires that radiant heats of 1,600 Btu/ft^2-hr flux level from transfer areas do not extend beyond the plant property line onto a property that can be built upon[18].

In accordance with the August 31, 2018 MOU, the USDOT PHMSA issued an LOD to FERC on the 49 CFR 193 Subpart B regulatory requirements.[19] The LOD provides PHMSA's analysis and conclusions regarding 49 CFR 193 Subpart B regulatory requirements for the Commission to consider in its decision to authorize, with or without modification or conditions, or deny an application.

9.1.3 Coast Guard Safety Regulatory Requirements and Letter of Recommendation

SPLNG Third Berth's Waterway Suitability Assessment

The Sabine Pass LNG terminal has been receiving LNG shipments for import, re-export, and export purposes since 2008, 2010, and 2016, respectively. Marine safety and vessel maneuverability studies were submitted for the Sabine Pass terminal under FERC docket numbers CP04-47-000 and affirmed in CP05-396-000. Also, in accordance with 33 CFR 127, the Coast Guard previously indicated that a revised Letter of Recommendation regarding the suitability of the waterway for the type and frequency of the Liquefaction and Liquefaction Expansion Projects (docket numbers CP11-72-000 and CP13-552-000) would not be necessary because it did not result in an increase in the size and/or frequency of the LNG marine traffic from the initial waterway suitability assessment for the LNG import terminal facilities (i.e., a maximum of 400 LNG carrier visits per year). On January 19, 2018, SPLNG submitted a Letter of Intent to the COTP Marine Safety Office Port Arthur to notify the Coast Guard that it proposed an expansion of the Sabine Pass Liquefied Natural Gas Terminal (SPLNG Terminal),

[17] The USDOT has approved two additional models for the determination of vapor dispersion exclusion zones in accordance with 49 CFR 193.2059, under Subpart B: FLACS 9.1 Release 2 (Oct. 7, 2011) and PHAST-UDM Versions 6.6 and 6.7 (Oct. 7, 2011).

[18] The 1,600 Btu/ft^2-hr flux level is associated with producing pain in less than 15 seconds, first degree burns in 20 seconds, second degree burns in approximately 30-40 seconds, 1 percent mortality in approximately 120 seconds, and 100 percent mortality in approximately 400 seconds, assuming no shielding from the heat, and is typically the maximum allowable intensity for emergency operations with appropriate clothing based on average 10 minute exposure.

[19] The LOD is available on the FERC eLibrary at www.ferc.gov under accession number 20190725-3012.

including the addition of a third marine berth, and a resultant increase in LNG marine vessel traffic. SPLNG submitted the Follow-on WSA to the Coast Guard on October 24, 2018.

LNG Marine Vessel Routes and Hazard Analysis

SPLNG proposes no changes to the liquefaction and storage facilities previously authorized under the Liquefaction Project. However, the proposed Project would include the addition of a new marine berth (Third Berth) and would subsequently increase the maximum LNG marine vessel traffic from the currently-authorized 400 LNG marine vessels up to 580 LNG marine vessels per year. The LNG marine vessel route and the associated hazards would remain largely unchanged and are described below.

A LNG marine vessel's transit to and from the LNG terminal would travel along the Sabine-Neches Ship Channel, which begins in the Gulf of Mexico approximately 20 statute miles below the Louisiana coastline. The existing SPLNG Terminal and proposed location for the SPLNG Third Berth Expansion Project is near Mile Point 7 along the Sabine Pass Channel. Pilotage is compulsory for foreign vessels and U.S. marine vessels under registry in foreign trade when in U.S. waters. All deep draft marine vessels currently entering the shared waterway would employ a U.S. pilot. The National Vessel Movement Center in the U.S. would require a 96-hour advance notice of arrival for deep draft vessels calling on U.S. ports. The one-way travel time for an LNG marine vessel between the sea buoy and the third berth facilities would be no more than 3 hours for transits with transit speeds of up to approximately 11 to 18 knots depending on the location, weather, sea state, and vessel traffic in the area and then gradually slows down until it docks at the Sabine Pass terminal. During transit, vessels would be required to maintain voice contact with controllers and check in on designated frequencies at established way points.

NVIC 01-11 references the Zones of Concern for assisting in a risk assessment of the waterway. As LNG marine vessels proceed along the intended track line, Hazard Zone 1 would encompass the entire area between the jetties within the Sabine Pass Channel. There is one private airstrip (Texas Menhaden Strip) and three private heliports located on the west side of the Sabine Pass Channel. Hazard Zone 1 also includes a portion of SPLNG's existing facility, commercial businesses and properties, residences, a U.S. Coast Guard station, and the Sabine Pass Lighthouse. Hazard Zone 2 includes a portion of SPLNG's existing facility, commercial businesses and properties, residences, and the Sabine Pass Port Authority. There are two private heliports located within Hazard Zone 2. One heliport is located within Texas Point National Wildlife Refuge and one heliport is located north of the proposed Project within the SPLNG facility.

Hazard Zone 3 extends to the town of Sabine Pass, Texas and includes Sabine Pass School (pre-K through grade 12), two churches, U.S. Post Office, a community center, residences, commercial businesses and properties, and an RV park. All Hazard Zones include portions of the Sabine Pass Battleground State Historical Park and Texas Point National Wildlife Refuge. The areas impacted by the three different hazard zones are illustrated for both accidental and intentional events in figures B.9.1-1 and B.9.1-2, respectively.

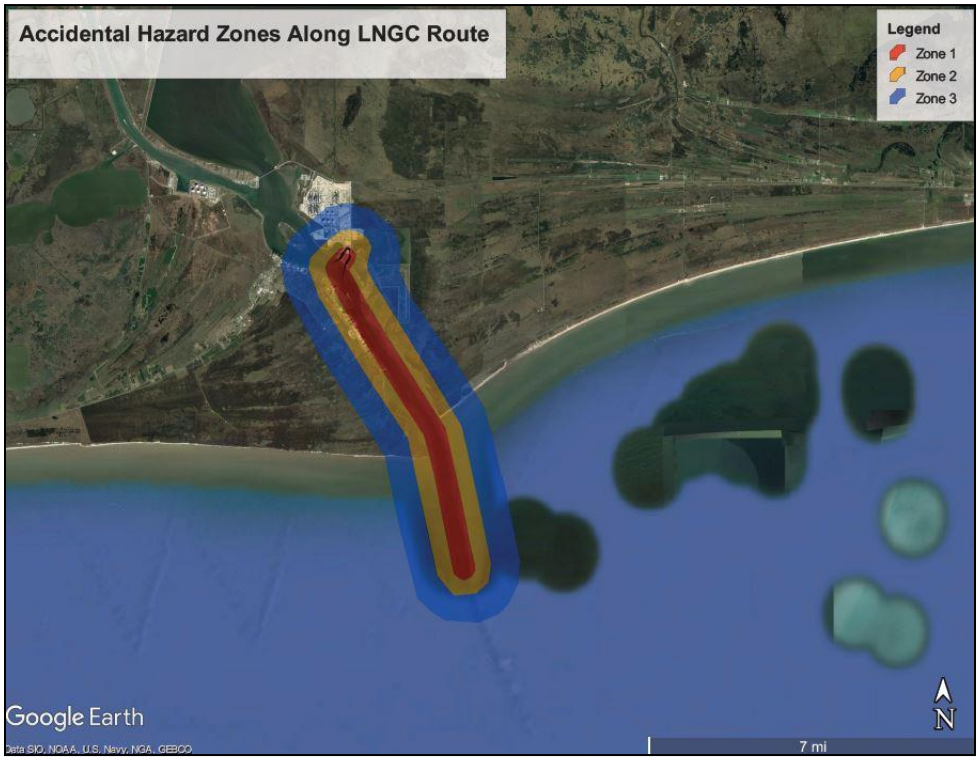

Figure B.9.1-1 Accidental Hazard Zones along LNG Marine Vessel Route

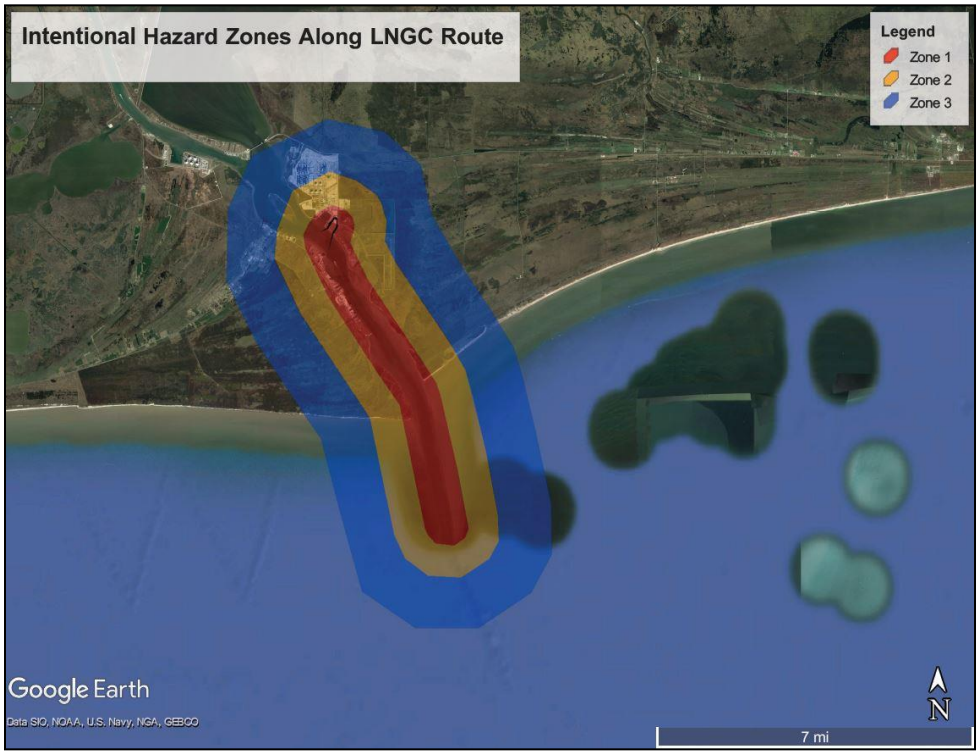

Figure B.9.1-2 Intentional Hazard Zones along LNG Marine Vessel Route

Coast Guard Letter of Recommendation and Analysis

In a letter dated May 21, 2019, the Coast Guard issued a LOR and LOR Analysis to the FERC stating that the Sabine-Neches Waterway would be considered suitable for accommodating the type and frequency of LNG marine traffic associated with this Project. As part of its assessment of the safety and security aspects of this Project, the COTP Port Arthur consulted a variety of stakeholders including the Area Maritime Security Committee, Sabine Pilots Association, state and local government representatives, and local emergency response groups. The LOR was based on full implementation of the strategies and risk management measures identified by the Coast Guard to SPLNG in its WSA.

Although SPLNG has suggested mitigation measures for responsibly managing the maritime safety and security risks associated with LNG marine traffic, the necessary vessel traffic and/or facility control measures may change depending on changes in conditions along the waterway. The Coast Guard regulations in 33 CFR 127 require that applicants annually review WSAs until a facility begins operation. The annual review and report to the Coast Guard would identify any changes in conditions, such as changes to the port environment, the LNG facility, or the LNG marine vessel route, that would affect the suitability of the waterway for LNG marine traffic.

The Coast Guard's LOR is a recommendation, regarding the current status of the waterway, to FERC, the lead agency responsible for siting the on-shore LNG facility. Neither the Coast Guard nor FERC has authority to require waterway resources of anyone other than the applicant under any statutory authority or under the Emergency Response Plan (ERP) or the Cost Sharing Plan. As stated in the LOR, the Coast Guard would assess each transit on a case by case basis to identify what, if any, safety and security measures would be necessary to safeguard the public health and welfare, critical infrastructure and key resources, the port, the marine environment, and the LNG marine vessel.

Under the *Ports and Waterways Safety Act*, the *Magnuson Act*, the MTSA, and the *Security and Accountability For Every Port Act*, the COTP has the authority to prohibit LNG transfer or LNG marine vessel movements within his or her area of responsibility if he or she determines that such action is necessary to protect the waterway, port, or marine environment. If this Project is approved and if appropriate resources are not in place prior to LNG marine vessel movement along the waterway, then the COTP would consider at that time what, if any, vessel traffic and/or facility control measures would be appropriate to adequately address navigational safety and maritime security considerations.

9.1.4 LNG Facility Security Regulatory Requirements

The security requirements for the Third Berth Project Facilities are governed by 33 CFR 105 and 33 CFR 127. Title 33 CFR 105, as authorized by the MTSA, 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 before commencement of operations of proposed project facilities. SPLNG would also be required to control and restrict access, patrol and monitor the

plant, detect unauthorized access, and respond to security threats or breaches under 33 CFR 105. Some of the responsibilities of the applicant include, but are not limited to:

- designating a Facility Security Officer with a general knowledge of current security threats and patterns, security assessment methodology, vessel and facility operations, conditions, security measures, emergency preparedness, response, and contingency plans, who would be responsible 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 federal, state, and local authorities; prevention of unauthorized access; measures to prevent or deter entrance with dangerous substances or devices; training; and evacuation;
- defining the security organizational structure with facility personnel with knowledge or training in current security threats and patterns; recognition and detection of dangerous substances and devices; recognition of characteristics and behavioral patterns of persons who are likely to threaten security; techniques to circumvent security measures; emergency procedures and contingency plans; operation, testing, calibration, and maintenance of security equipment; and inspection, control, monitoring, and screening techniques;
- implementing scalable security measures to provide increasing levels of security at increasing maritime security levels for facility access control, restricted areas, cargo handling, LNG marine vessel stores and bunkers, and monitoring; ensuring that the Transportation Worker Identification Credential (TWIC) program is properly implemented;
- ensuring coordination of shore leave for LNG marine vessel personnel or crew change out as well as access through the facility for visitors to the LNG marine vessel;
- conducting drills and exercises to test the proficiency of security and facility personnel on a quarterly and annual basis; and
- reporting all breaches of security and transportation security incidents to the National Response Center.

Title 33 CFR 127 has requirements for access controls, lighting, security systems, security personnel, protective enclosures, communications, and emergency power. In addition, an LNG facility regulated under 33 CFR 105 and 33 CFR 127 would be subject to the TWIC Reader Requirements Rule issued by the Coast Guard on August 23, 2016. This rule requires owners and operators of certain vessels and facilities regulated by the Coast Guard to conduct electronic inspections of TWICs (e.g., readers with biometric fingerprint authentication) as an access control measure. The final rule would also include recordkeeping requirements and security plan amendments that would incorporate these TWIC requirements. The implementation of the rule was first proposed to be in effect August 23, 2018. In a subsequent

notice issued on June 22, 2018, the Coast Guard indicated delaying the effective date for certain facilities by 3 years, until August 23, 2021. On August 2, 2018, the President of the U.S. signed into law the *Transportation Worker Identification Credential Accountability Act* of 2018 (H.R. 5729). This law prohibits the Coast Guard from implementing the rule requiring electronic inspections of TWICs until after the U.S. Department of Homeland Security (DHS) has submitted a report to the Congress. Although the implementation of this rule has been postponed for certain facilities, the company may need to consider the rule when developing access control and security plan provisions for the facility. If the Project is authorized, constructed, and operated, compliance with the security requirements of 33 CFR 105 and 33 CFR 127 would be subject to the respective Coast Guard inspection and enforcement programs.

SPLNG provided preliminary information on these security features and indicated additional details would be completed in the final design. SPLNG would make some minor modifications to their existing security features to accommodate the Project facilities. We recommend in section B.9.1.6 that SPLNG file final design details on these security features, for review and approval, that demonstrate lighting coverage adequately cover the perimeter of the site and Third Berth facilities in accordance with SPLNG's specification to meet American Petroleum Institute (API) 540 and federal regulations, including in the interior and exterior of buildings, and along paths/roads of access and egress; demonstrate camera coverage adequately cover the Project facilities; demonstrate fencing would restrict and deter access to the Project facilities; and provide vehicle barriers and design details at controlled access points adjacent to the berth facility and Light House Road. Furthermore, in accordance with the February 2004 Interagency Agreement among the FERC, the USDOT PHMSA, and the Coast Guard, FERC staff would collaborate with the Coast Guard and the USDOT on the Project's security features.

9.1.5 FERC Engineering and Technical Review of the Preliminary Engineering Designs

LNG Facility Historical Record

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 with the exception of the October 20, 1944 failure at an LNG plant in Cleveland, Ohio. The 1944 incident in Cleveland led to a fire that killed 128 people and injured 200 to 400 more people.[20] The failure of the LNG storage tank was due to the use of materials not suited for cryogenic temperatures. LNG migrated through streets and into underground sewers due to inadequate spill impoundments at the site. Current regulatory requirements ensure that proper materials suited for cryogenic temperatures are used in the design and that spill impoundments are designed and constructed properly to contain a spill at the site. To ensure that this potential hazard would be addressed for the proposed Third Berth Facilities, we evaluated the preliminary and final specifications for suitable

[20] 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.

materials of construction and for the design of spill containment systems that would properly contain a spill at the site.

Another operational accident occurred in 1979 at the Cove Point LNG plant in Lusby, Maryland. A pump electrical seal located on a submerged electrical motor LNG pump leaked causing flammable gas vapors to enter an electrical conduit and settle in a confined space. When a worker switched off a circuit breaker, the flammable gas ignited, causing severe damage to the building and a worker fatality. With the participation of the FERC, lessons learned from the 1979 Cove Point accident led to changes in the national fire codes to better ensure that the situation would not occur again. The proposed Project would not include any new submerged LNG pumps, but could include other electrical pass through interfaces with LNG. Therefore, to ensure that this potential hazard would be addressed for proposed facilities that may have electrical seal interfaces, we recommend in section B.9.1.6 that SPLNG file, for review and approval, the final design details of any electrical seal designs at the interface between flammable fluids and the electrical conduit or wiring system, details of the electrical seal leak detection system, and the details of a downstream physical break (i.e., air gap) in the electrical conduit to prevent the migration of flammable vapors.

On January 19, 2004, a blast occurred at Sonatrach's Skikda, Algeria LNG liquefaction plant that 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 into a 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 separation equipment of Train 40, and spread to Trains 20 and 30. Although Trains 10, 20, and 30 had been modernized in 1998 and 1999, Train 40 had been operating with its original equipment since start-up in 1981. While the Project facilities would not include any combustion air intakes, there are heating and ventilation air intakes that could lead to an ignition source in a confined area. Therefore, we evaluated the preliminary design for mitigation of flammable vapor dispersion and ignition in buildings to ensure they would be adequately covered by hazard detection equipment that could isolate and deactivate any air intakes whose continued operation could add to or sustain an emergency. We also recommend in section B.9.1.6 that SPLNG file, for review and approval, the final design details of hazard detection equipment, including the location and elevation of all detection equipment, instrument tag numbers, type and location, alarm indication locations, and shutdown functions of the hazard detection equipment.

On March 31, 2014, a detonation occurred within a gas heater at Northwest Pipeline Corporation's LNG peak-shaving plant in Plymouth, Washington[21]. This internal detonation subsequently caused the failure of pressurized equipment, resulting in high velocity projectiles. The plant was immediately shut down, and emergency procedures were activated, which

[21] For a description of the incident and the findings of the investigation, see Root Cause Failure Analysis, Plymouth LNG Plant Incident Investigation under CP14-515.

included notifying local authorities and evacuating all plant personnel. No members of the public were injured, but one worker was sent to the hospital for injuries. As a result of the incident, the liquefaction trains and a compressor station located onsite were rendered inoperable. Projectiles from the incident also damaged the control building that was located near the pre-treatment facilities and penetrated the outer shell of one of the LNG storage tanks. All damaged facilities were ultimately taken out of service for repair. The accident investigation showed that an inadequate purge after maintenance activities resulted in a fuel-air mixture remaining in the system. The fuel-air mixture auto-ignited during startup after it passed through the gas heater at full operating pressure and temperature. The proposed Project facilities would not include any heaters that could potentially heat up any fluids above their auto-ignition temperatures, but the project would still need to follow proper purging practices. Therefore, we recommend in section B.9.1.6 that SPLNG file any updates to the existing plan for purging, for review and approval, which addresses the requirements of the American Gas Association *Purging Principles and Practice* and provide justification if not using an inert or non-flammable gas for purging. In evaluating such plans, we would assess whether the purging could be done safely based on review of other plans and lessons learned from this and other past incidents. If a plan proposes the use of flammable mediums for cleaning, dry-out, or other activities, we would evaluate the plans against other recommended and generally accepted good engineering practices, such as NFPA 56, *Standard for Fire and Explosion Prevention during Cleaning and Purging of Flammable Gas Piping Systems*. We also recommend in section B.9.1.6 that SPLNG provide, for review and approval, operating and maintenance plans, including safety procedures, prior to commissioning. In evaluating such plans, we would assess whether the plans cover all standard operations, including purging activities associated with startup and shutdown.

FERC Preliminary Engineering Review

FERC requires an applicant to provide safety, reliability, and engineering design information as part of its application, including hazard identification studies and front-end engineering design (FEED) information, for its proposed project. FERC staff evaluates this information with a focus on potential hazards from within and nearby the site, including external events, which may have the potential to cause damage or failure to the project facilities, and the engineering design and safety and reliability concepts of the various protection layers to mitigate the risks of potential hazards.

The primary concerns are those events that could lead to a hazardous release of sufficient magnitude to create an offsite hazard or interruption of service. Further, the potential hazards are dictated by the site location and the engineering details. In general, FERC staff considers an acceptable design to include various layers of protection or safeguards to reduce the risk of a potentially hazardous scenario from developing into an event that could impact the offsite public. These layers of protection are generally independent of one another so that any one layer would perform its function regardless of the initiating event or failure of any other protection layer. Such design features and safeguards typically include:

- a facility design that prevents hazardous events, including the use of inherently safer designs; suitable materials of construction; adequate design margins from operating

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 that 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 cryogenic, overpressure, and fire structural protection, to prevent escalation to a more severe event;
- site security measures for controlling access to the plant, including security inspections and patrols, response procedures to any breach of security, and liaison with local law enforcement officials; and
- onsite and offsite 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 plant design can minimize the potential for an initiating event to develop into an incident that could impact the safety of the offsite public. The review of the engineering designs for these layers of protection is initiated in the application process and carried through to the next phase of the proposed Project in final design if authorization is granted by the Commission.

The reliability of these layers of protection is informed by occurrence and likelihood of root causes and the potential severity of consequences based on past incidents and validated hazard modeling. As a result of the continuous engineering review, we recommend mitigation measures and continuous oversight to the Commission for consideration to include as conditions in the Order. If a facility is authorized and recommendations are adopted as conditions to the Order, FERC staff would continue its engineering review through final design, construction, commissioning, and operation.

Process Design

As part of our process engineering review, we evaluated the process flow diagrams (PFDs), heat and material balances (HMBs), piping and instrumentation diagrams (P&IDs), and other process engineering related information. The PFDs and HMBs provide the flow rates, pressures, and temperatures that form the basis of design for other engineering documents, including P&IDs, piping specifications, hazard analyses, and other pertinent engineering information. We recommend in section B.9.1.6 that SPLNG provide final design PFDs, HMBs, and P&IDs for review and approval. We also recommend that modifications to engineering information be requested prior to the implementation of the modification and that a change log

be provided explaining the rationale for those changes. This would capture any other changes to other engineering information as a result of the process simulations.

In developing the FEED, SPLNG conducted a process hazard analysis using the "What If" methodology based on the Project's process conditions (e.g., flow, temperature, pressure) and the inventories and basis of the nature of the chemicals involved in the process. The process hazard analysis examined the response of a process system to equipment failures, operator errors, and off-normal process conditions and developed recommendations to address actionable risks.

The SPLNG Third Berth would be an expansion of the existing Sabine Pass LNG terminal. The existing terminal including the LNG storage tanks, were previously approved, constructed, and placed into operation under FERC docket numbers CP04-47-000, CP05-396-000, CP11-72-000, and CP13-551-000. The Project would include the construction of a third marine berth and associated piping, pipe racks, utilities and other infrastructure that would be tied into the existing marine transfer lines. LNG stored within the existing LNG storage tanks would be sent out via existing in-tank pumps through the previously authorized marine transfer lines (FERC docket numbers CP04-47-001, CP05-396-001, etc.) that would connect to the proposed third berth marine transfer line. The third berth marine transfer line then flow LNG through the third berth marine transfer arms that would be connected to LNG marine vessels. The Third Berth would load LNG marine vessels with a capacity of 125,000 to 180,000 cubic meters for export. The LNG transferred to the LNG marine vessels would displace vapors from the LNG marine vessels, which would be sent back to the LNG storage containers through new vapor lines that would be tied into existing marine vapor lines. In addition to the displaced vapors from the LNG marine vessel, low pressure BOG generated during ship loading would be compressed into the previously authorized BOG system. Once loaded, the LNG marine vessels would be disconnected and leave for export.

In addition, SPLNG Third Berth would tie into the existing utility supplies and associated auxiliary equipment. The previously authorized auxiliary systems required for the operation of the Project include instrument air, utility air, potable water, firewater, and nitrogen. The electrical power for SPLNG Third Berth would be supplied from the existing onsite integrated power plant which is generated by multiple gas turbine generators. Essential backup power would be provided by existing diesel generators.

The failure of equipment could pose potential harm if not properly safeguarded through the use of appropriate controls and operation. SPLNG would install process control valves and instrumentation to safely operate and monitor the facilities. Alarms would have visual and audible notification locally in the Third Berth Area and in the existing central control room to warn operators that process conditions may be approaching design limits. SPLNG would integrate the proposed control systems and human machine interfaces into the existing control center and operator workstations at the previously authorized Terminal which meets the International Society for Automation (ISA) Standards 5.3 and 5.5, and 60.1, 60.3, 60.4, and 60.6, and other standards and recommended practices. We also recommend in section B.9.1.6 that SPLNG update the existing alarm management program, for review and approval to ensure the

effectiveness of the alarms. FERC staff would evaluate the alarm management program against recommended and generally accepted good engineering practices, such as ISA Standard 18.2.

Operators would have the capability to take action from the existing central control room and a newly proposed Jetty Marine Building to mitigate an upset. The proposed Jetty Marine Building would be located on the jetty dock and would provide accommodations for local unit operators, which would include an operator workstation and electrical/telecoms rooms. SPLNG would expand the existing operation procedures to encompass the new Project facilities after completion of the final design; this timing is fully consistent with accepted industry practice. We recommend in section B.9.1.6 that SPLNG file more information, for review and approval, on the updates to the operating and maintenance procedures prior to commissioning, including safety procedures, hot work procedures and permits, abnormal operating conditions procedures, and personnel training prior to commissioning. In addition, we recommend in section B.9.1.6 that SPLNG tag and label instrumentation and valves, piping, and equipment and provide car-seals/locks to address human factor considerations and improve facility safety and prevent incidents.

In the event of a process deviation, emergency shutdown valves and instrumentation would be installed to monitor, alarm, shut down, and isolate equipment and piping during process upsets or emergency conditions. The existing central control building and newly proposed Jetty Marine Building would have emergency shutdown capability for the Third Berth Facilities. However, an emergency shutdown button would not be located within the loading arm process area. Additionally, safety-instrumented systems would comply with ISA Standard 84.00.01 and other recommended and generally accepted good engineering practices. We recommend in section B.9.1.6 that SPLNG file information, for review and approval, on the final 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 system in the plant control room and throughout the plant.

In addition, the process hazard analysis provided by SPLNG referenced a transient analysis that was performed as a safeguard for marine transfer piping flows from sudden closure of the emergency shutdown valves. However, it is not clear what the maximum loading rates would be in the marine transfer piping and therefore the transient analysis might not represent a worst-case hydraulic scenario. Therefore, we recommend in section B.9.1.6 that SPLNG file an updated transient analysis, for review and approval, on the final design hydraulic conditions that the marine transfer line could be subjected to during loading operations.

If the Project is authorized, constructed, and operated, SPLNG would finalize the details of the design and install equipment in accordance with its design. We recommend in section B.9.1.6 that SPLNG file all changes to their FEED for review and approval by FERC staff. However, major modifications could require an amendment or new proceeding. We recommend in section B.9.1.6 that Project facilities be subject to construction inspections and that SPLNG provide, for review and approval, commissioning plans, procedures, and commissioning demonstration tests that would verify the performance of equipment. In addition, we recommend in section B.9.1.6 that SPLNG provide semi-annual reports that include

abnormal operating conditions and planned facility modifications. Furthermore, we recommend in section B.9.1.6 that the Project facilities be subject to regular inspections throughout the life of the facilities to verify that equipment is being properly maintained and to verify basis of design conditions do not exceed the original basis of design.

Mechanical Design

The mechanical design of the facilities is essential in ensuring that hazardous fluids remain contained in the equipment and piping. The mechanical design is driven by the design codes and specifications that provide the design conditions and criteria, materials of construction, material design thicknesses, reinforcement, welding requirements, heat treatment, assembly and erection, non-destructive examination, testing, and inspection, based upon the basis of design, including potential process conditions provided in the PFDs and HMBs and the potential stresses induced by the internal pressures, temperatures, and other loads.

FERC regulations under 18 CFR 380.12(o)(7) requires applicants to provide engineering studies on the design approach and 18 CFR 380.12(o)(12) requires applicants to identify all codes and standards under which the plant would be designed. SPLNG provided codes and standards for the design, fabrication, construction, and installation of piping and equipment and specifications for the facility. The design specifies materials of construction and ratings suitable for the pressure and temperature conditions of the process design.

Piping would be designed, fabricated, assembled, erected, inspected, examined, and tested in accordance with the American Society of Mechanical Engineers (ASME) B31.3, B36.10, and B36.19. Valves and fittings would be designed to standards and recommended practices such as API 594, 598, 600, 602, 607, 608, and 609; ASME B16.5, B16.10, B16.20, B16.25, and B16.34; and ISA 75.01.01, 75.08.01, 75.08.05, and 75.08.06. Among other requirements, Title 33 CFR §127.101 requires the marine transfer area for LNG to meet NFPA 59A (1994) Chapter 6 and Section 8-2. NFPA 59A (1994) chapter 6 requires piping to adhere to ASME B31.3 (1993) and valves to comply with ASME B31.5 (1992), ASME B31.8 (1992), or API 6D (1991). If the Project is authorized, constructed, and operated, compliance with the requirements of 33 CFR Part 127 would be subject to the Coast Guard inspection and enforcement program.

Pressure safety relief valves would be installed to protect piping from an unexpected or uncontrolled pressure excursion. The safety relief valves would be designed to handle process upsets and thermal expansion, per NFPA 59A and ASME B31.3; and would be designed in accordance with API 520, 521, 526, 527, and other recommended and generally accepted good engineering practices. We recommend in section B.9.1.6 SPLNG provide final design information on pressure relief devices, for review and approval, to ensure that the final sizing, design, and installation of these components are adequate and in accordance with the standards referenced and other recommended and generally accepted good engineering practices. NFPA 59A (1994) section 6-8 require thermal expansion relief valves in any section of a liquid or cold vapor pipeline that can be isolated by valves set to discharge above the maximum pressure normally expected but less than the rated test pressure of the line in protections. Coast Guard regulations under 33 CFR §127.407 require the marine transfer system, including piping, hoses,

and loading arms to be pressure tested to 1.1 times the maximum allowable working pressure (MAWP) for a minimum of 30 minutes, and for the operator to verify the set pressure of the pressure relief valves after the system or valves are altered, repaired, after any increase in MAWP, and at least once each calendar year for components not continuously kept at cryogenic temperatures. If the Project is authorized, constructed, and operated, compliance with the requirements of 33 CFR Part 127 would be subject to the Coast Guard inspection and enforcement program.

Although many of the codes and standards were described or listed as ones the Project would meet, SPLNG did not make reference to all codes and standards required by regulations (e.g., NFPA 51B), or that are recommended and generally accepted good engineering practices (e.g., API 603, ISA 75.19.01, etc.). Therefore, we recommend in section B.9.1.6 that SPLNG provide, for review and approval, a summarized list of all referenced codes and standards and the final specifications for all equipment.

If the Project is authorized, constructed, and operated, SPLNG would install equipment and piping in accordance with its design and FERC staff would verify equipment and piping specifications and documentation to ensure equipment is being installed based on approved design. In addition, FERC staff would conduct construction inspections including reviewing quality assurance and quality control plans to ensure construction work is being performed according to proposed Project specifications, procedures, codes, and standards. We recommend in section B.9.1.6 SPLNG provide semi-annual reports that include equipment malfunctions and abnormal maintenance activities. In addition, we recommend in section B.9.1.6 that the Project facilities be subject to inspections to verify that the equipment is being properly maintained during the life of the facility.

Hazard Mitigation Design

If operational control of the facilities were lost and basic process controls and safety instrumented systems (SIS) and emergency shutdown systems failed to maintain the Project within the mechanical design limits of the piping and safety relief valves, a release could potentially occur. Hazard mitigation systems would be installed to mitigate the risk of a release. Coast Guard regulations under 33 CFR 127 have requirements for spill retention, spacing and plant layout, ignition control, hazard detection, hazard control, passive protection, and firewater. If authorized, constructed, and operated, the Project must comply with the requirements of 33 CFR 127 and would be subject to Coast Guard's inspection and enforcement program.

In addition, FERC regulations under 18 CFR §380.12(o)(1) through (4) require applicants to provide information on spill containment, spacing and plant layout, hazard detection, hazard control, and firewater systems. In addition, 18 CFR §380.12(o)(7) requires applicants to provide engineering studies on the design approach and 18 CFR §380.12(o)(12) requires applicants to identify all codes and standards under which the plant would be designed. FERC staff evaluated the proposed spill containment, plant layout and spacing, ignition controls, hazard detection, emergency shutdown and depressurization systems, hazard detection, hazard control, structural

protection, firewater, and onsite and offsite emergency response to ensure they would provide adequate protection of the Third Berth Facilities, as described more fully below.

SPLNG considered NFPA 59A provisions to conduct a fire protection evaluation, however the fire protection evaluation submitted in the application was preliminary. Therefore, we recommend in section B.9.1.6 that SPLNG provide a final fire protection evaluation for review and approval, and to provide more information on the final design, installation, and commissioning of spill containment, plant layout and spacing, ignition controls, hazard detection, emergency shutdown and depressurization systems, hazard detection, hazard control, structural protection, firewater, and onsite and offsite emergency response procedures.

Spill Containment

In the event of a liquid release, spill containment would be provided to minimize the spread of the spill and reduce the subsequent consequences. Coast Guard regulations under 33 CFR §127.101(b) require the marine transfer area for LNG to meet NFPA 59A (1994) Section 2-1.2, which requires site preparation include provisions for retention of spilled LNG, flammable refrigerants, and flammable liquids within the plant property and for surface water drainage. If authorized, constructed, and operated, the Project must comply with the requirements of 33 CFR 127 and would be subject to Coast Guard's inspection and enforcement program. In addition, FERC regulations under 18 CFR §380.12(o)(4) require applicants to provide information on spill containment system. In addition, 18 CFR §380.12(o)(7) requires applicants to provide engineering studies on the design approach and 18 CFR §380.12(o)(12) requires applicants to identify all codes and standards under which the plant would be designed.

FERC staff evaluated whether all hazardous liquids are provided with spill containment and whether the design capacity is based on the largest flow capacity from a single pipe for 10 minutes accounting for de-inventory or the liquid capacity of the largest vessel served, whichever is greater. The spill containment system would consist of the existing impoundment basin, which would serve the existing facility and the Project, as well as yet to be constructed troughs and curbed areas that would serve the Project. In the event of a release, sloped areas at the proposed marine jetty platform would direct a spill away from equipment and toward the impoundment system consisting of a trench that would sit below the proposed marine transfer line that drains into an existing impoundment basin previously approved, constructed, and placed into operation under FERC docket number CP04-47-000. This arrangement would minimize the dispersion of flammable vapors into confined, occupied, or public areas and minimize the potential for heat from a fire to impact adjacent equipment, occupied buildings, or public areas if ignition were to occur. SPLNG selected a LNG loading rate of 12,000 m^3/hr to perform the sizing spill analysis. However, the in-tank pump capacity as well as the maximum flow rates achievable through the marine transfer lines would exceed this loading rate and should be limited by SIL 2 or SIL 3 rated systems or equivalent. Therefore, FERC staff recommend in section B.9.1.6 that SPLNG update the Basis of Design for Spill Containment systems to account for the maximum flow rate hydraulically achievable at the Third Berth unless the flow rate is limited by SIL 2 or SIL 3 rated systems or equivalent.

In addition, the spill containment volume of the existing impoundment basin would not contain the maximum sizing spill volumes calculated by SPLNG. Therefore, FERC staff recommend in section B.9.1.6 that SPLNG verify the usable impoundment basin volume and limit the maximum flow rate at the Third Berth to a value which can be accommodated in the existing impoundment basin or revise capacity of the existing impoundment system to contain the 10-minute sizing spill. In addition, SPLNG provided 3D model diagrams of the proposed piping to verify de-inventory volumes. However, these diagrams are not scaled drawings and do not assist in determining how long the proposed piping lengths would be. Therefore, FERC staff recommend in section B.9.1.6 provide a plot plan that shows exactly where the all tie-ins would be (including main LNG loading line, cooldown line, BOG, etc.) and specify the length of the piping.

FERC staff also could not assess whether sizing spills could overflow the trench heights based on the details provided in the application and in responses to information requests. SPLNG provided trench design details in the basis of design, spill containment drawings, and the Hazard Analysis Report, but details on useable trench dimensions to verify the capacity and performance were either inconsistent or missing. Furthermore, the trench information provided in the Hazard Analysis Report would not accommodate the impoundment swale hydraulics analysis provided in the application. Therefore, FERC staff recommend in section B.9.1.6 that SPLNG provide the minimum and maximum trench height as well as the length of each section of the trench system evaluated in its Impoundment Swale Hydraulics analysis and demonstrate that the maximum sizing spill would be contained without overtopping each trench segment.

FERC staff also evaluated storm water removal systems to ensure impoundment volumes would not be reduced through accumulations of rain water. In addition, FERC staff evaluated whether there are provisions to ensure that hazardous fluids are not accidentally discharged through the systems intended to remove rainwater. SPLNG indicated that low temperature detection within the impoundment basin would trip the storm water removal pumps off but SPLNG did not clarify if redundant automatic shutdown controls would be provided to prevent pumping when LNG is present. Therefore, FERC staff recommend in section B.9.1.6 that SPLNG should provide documentation demonstrating that the impoundment basin would have redundant automatic shutdown controls to prevent the water removal pumps operating when LNG is present.

In addition, SPLNG proposes to install curbing with normally closed storm water removal valves in areas with significant hydrocarbon inventories such as the loading arms area. However, FERC staff could not assess the curbing design due to insufficient information on the significant hydrocarbon inventories spill volumes, locations of the curbed area, and dimensions of the curbed areas. In addition, SPLNG did not adequately address how releases from the marine areas would be prevented from entering the water and which release sizes would be captured by the marine area spill collection system. Therefore, FERC staff recommend in section B.9.1.6 that SPLNG confirm the significant hydrocarbon inventories would be provided with a containment system and provide drawings and dimensions of each containment system. The information should demonstrate how releases from the marine areas would be prevented

from entering the water and which size of releases would be captured by the marine area spill collection system. In addition, it is unclear whether the use of normally closed valves instead of storm water removal pumps would be provided with administrative or other controls to prevent the inadvertent opening or failure to close. Therefore, FERC staff recommend in section B.9.1.6 that SPLNG provide documentation of consultation with the USDOT PHMSA on whether using normally-closed valves as a storm water removal device on curbed areas would meet the requirements of 49 CFR 193, and at least provide administrative (e.g. car seal or locked closed) or other controls (e.g., dead man switch) to prevent the inadvertent opening or failure to close the normally closed valves used to remove storm water from curbed areas.

If the Project is authorized, constructed, and operated, SPLNG would install spill impoundments in accordance with its design and FERC staff would verify during construction inspections that the spill containment system including dimensions, slopes of curbing and trenches, and volumetric capacity matches final design information. In addition, we recommend in section B.9.1.6 that the Project facilities be subject to regular inspections throughout the life of the facility to verify that impoundments are being properly maintained.

Spacing and Plant Layout

Equipment would be spaced and laid out to minimize the likelihood of ignition and cascading events. Coast Guard regulations under 33 CFR §127.105 require LNG impounding spaced be located so that the heat flux from a fire over the impounding spaces does not cause structural damage to an LNG vessel moored or berthed at the waterfront facility handling LNG and that each LNG loading flange be located at least 300 meters (984.3 feet) from each bridge crossing a navigable waterway ad each entrance to any tunnel under a navigable waterway intended for the use of the general public or railways. If authorized, constructed, and operated, the Project must comply with the requirements of 33 CFR 127 and would be subject to Coast Guard's inspection and enforcement program. In addition, FERC regulations under 18 CFR 380.12(o)(4) require applicants to provide information on spill containment system. In addition, 18 CFR 380.12(o)(7) requires applicants to provide engineering studies on the design approach and 18 CFR 380.12(o)(12) requires applicants to identify all codes and standards under which the plant would be designed. FERC staff evaluated the spacing to determine if there could be cascading damage and to inform what fire protection measures may be necessary to reduce the risk of cascading damage. If it was not practical for spacing to mitigate the potential for cascading damage, FERC staff evaluated whether other mitigation measures were in place and evaluated those systems in further detail, as discussed in subsequent sections. FERC staff evaluated hazards associated with releases and whether any damage would result in cascading damage.

To minimize the risk of cryogenic spills causing structural supports and equipment from cooling below their minimum design metal temperature, SPLNG would have spill containment systems surrounding areas of potential cryogenic releases. In addition, FERC staff recommend in section B.9.1.6 SPLNG file drawings and specifications for structural passive protection systems to protect equipment and supports that could be exposed to cryogenic releases.

To minimize risk for flammable vapor ingress into buildings and flammable vapors reaching areas that could result in cascading damage from explosions, buildings would typically be located away from major process piping. However, the Jetty Marine Building would be within flammable dispersion distances from releases at the dock. SPLNG committed to providing hazard detection devices at the air intakes of buildings that would isolate or shut down any combustion or heating ventilation and air conditioning equipment whose continued operation could add to or sustain an emergency. Details of these hazard detection systems would be developed in final design. Therefore, we recommend in section B.9.1.6 that SPLNG conduct a technical review of facility, for review and approval, identifying all combustion/ventilation air intake equipment and the distances to any possible flammable gas release and demonstrates that these areas are adequately covered by hazard detection devices and indicates how these devices would isolate or shutdown any combustion or heating ventilation and air conditioning equipment whose continued operation could add to or sustain an emergency. We also recommend in section B.9.1.6 that Project facilities be subject to periodic inspections during construction to verify flammable gas detection equipment is installed in heating, ventilation, and air condition intakes of buildings at appropriate locations. In addition, we recommend in section B.9.1.6 that Project facilities be subject to regular inspections throughout the life of the facilities to continue to verify that flammable gas detection equipment installed in building air intakes function as designed and are being maintained and calibrated.

To minimize the risk of pool and jet fires from causing cascading damage that could exacerbate the initial hazard, SPLNG would utilize an existing impoundment whose location would have minimal radiant heat impacts on most areas of the Project and existing terminal. To mitigate jet fires, SPLNG would provide various safety measures such as fire-safe emergency shutdown valves with fire resistant instrument and power cabling, fire and gas detectors, fire proofing of the marine gangway tower, and fire monitors and hydrants. These measures would mitigate or reduce the risk of some cascading events. However, there is no current provision to mitigate the risk of cascading failures of the marine transfer piping along the piperack and details of the proposed systems would be developed in final design. Therefore, we recommend in section B.9.1.6 that SPLNG provide mitigation to prevent failure of the marine transfer piping in the event of a jet fire and also the final design of these mitigation measures, for review and approval, to demonstrate cascading events would be mitigated.

If the Project is authorized, SPLNG would finalize the plot plan, and we recommend in section B.9.1.6 that SPLNG provide any changes for review and approval to ensure capacities and setbacks are maintained. If the Project facilities are constructed, SPLNG would install equipment in accordance with the spacing indicated on the plot plans. In addition, we recommend in section B.9.1.6 that the Project facilities be subject to periodic inspections during construction to verify equipment is installed in appropriate locations and the spacing is met in the field. We also recommend in section B.9.1.6 that the Project facilities be subject to regular inspections throughout the life of the facilities to verify that equipment setbacks from other equipment and ignition sources are being maintained during operations.

Ignition Controls

In the event of a release, ignition controls would be in place to reduce the likelihood of ignition. Coast Guard regulations under 33 CFR §127.101 require the marine transfer area to meet NFPA 59A (1994) section 7-6 and 7-7 and Chapter 8, except 8-3, 8-5, and 8-7.2. NFPA 59A (1994) Section 7-6 requires electrical equipment and wiring to be installed in accordance with NFPA 70 (1993) and within classified areas for hazardous locations. NFPA 59A (1994) section 7-6 also requires process seals with certain requirements to be installed between a flammable fluid system and electrical conduit or wiring system to prevent passage of flammable fluids through the conduit, stranded conductors, and cables. NFPA 59A (1994) section 7-7 contains requirements for electrical grounding, bonding, stray and impressed currents, and lightning protection. NFPA 59A (1994) section 8-4.3 prohibits vehicle traffic on the pier or dock within 100 feet of the loading manifold while transfer operations are in progress, and NFPA 8-7.1.3 requires sources of ignition, such as welding, flames, and unclassified equipment not be permitted in loading or unloading areas while transfer is in progress. In addition, 33 CFR 127.113 require that the marine transfer area for LNG have warning signs that indicate no visitors, no smoking, and no open lights; 33 CFR §127.315(g) require that the person in charge of shoreside transfer operations eliminate all ignition sources in the marine transfer area for LNG; and 33 CFR §127.405 requires welding be done in accordance with NFPA 51B (1994) and NFPA 59A (1994) section 6-3.4. If authorized, constructed, and operated, the Project must comply with the requirements of 33 CFR 127 and would be subject to Coast Guard's inspection and enforcement program.

In addition, FERC regulations under 18 CFR §380.12(o)(7) requires applicants to provide engineering studies on the design approach and 18 CFR §380.12(o)(12) requires applicants to identify all codes and standards under which the plant would be designed.

SPLNG's plant areas would be designated with an appropriate hazardous electrical classification and process seals commensurate with the risk of the hazardous fluids being handled in accordance with NFPA 59A, 70, and 497 and API RP 500. Depending on the risk level, these areas would either be unclassified or classified as Class 1 Division 1, or Class 1 Division 2. Electrical equipment located in these classified areas would be designed such that in the event a flammable vapor is present, there would be a minimal risk of igniting the vapor. We evaluated SPLNG's electrical area classification drawings to determine whether SPLNG would meet these electrical area classification requirements and good engineering practices in NFPA 59A, 70, 497, and API 500. In the application and responses to information requests, SPLNG used API 500 to select electrical area classification designations for the proposed marine transfer area. However, SPLNG selected a designation typically used for pipelines handling natural gas in its gaseous state and may not be appropriate for liquid products such as LNG. Therefore, we recommend in section B.9.1.6 that SPLNG justify the electrical area classification designations for the marine transfer area by performing hazard modeling using the release rates specified in NFPA 497 or modify the API RP 500 electrical area classification designations to be consistent with LNG operations in the marine transfer area.

In addition, while the project has stated that buildings in the marine transfer area would be unclassified. Therefore, FERC staff recommend in section B.9.1.6 that SPLNG provide documentation demonstrating that the elevation of building located at the marine transfer area would result in the building being unclassified. We also recommend that SPLNG provide documentation demonstrating that the placement of heating, ventilation, and air conditioning (HVAC) intakes are in a location such that they not ingest gas from design spills. In addition, to prevent Project buildings air intakes and HVAC systems from ingesting flammable vapors that would ignite, we also recommend in section B.9.1.6 that SPLNG file, for review and approval, the final design details of hazard detection equipment, including the location and elevation of all detection equipment, instrument tag numbers, type and location, alarm indication locations, and shutdown functions of the hazard detection equipment. If the Project is authorized, SPLNG would finalize the electrical area classification drawings and would describe changes made from the FEED design. We recommend in section B.9.1.6 that SPLNG file the final design of the electrical area classification drawings for review and approval.

If the Project facilities are constructed, SPLNG would install appropriately classed electrical equipment, and we recommend in section B.9.1.6 that the Project facilities be subject to periodic inspections during construction for FERC staff to spot check electrical equipment and verify equipment is installed per classification and are properly bonded or grounded in accordance with NFPA 70. In addition, we recommend in section B.9.1.6 that the Project facilities be subject to regular inspections throughout the life of the facility to ensure electrical equipment is maintained (e.g., bolts on explosion proof equipment properly installed and maintained, panels provided with purge, etc.), and electrical equipment are appropriately de-energized and locked out and tagged out when being serviced.

Hazard Detection, Emergency Shutdown, and Depressurization Systems

Hazard detection systems would be installed to detect cryogenic releases, flammable and toxic vapors, and fires and allow operating personnel to shutdown operations and isolate a release to minimize the consequences. Coast Guard regulations under 33 CFR §127.201 require fixed sensors to meet NFPA 59A (1994) section 9-4, which requires areas that have a potential for flammable gas concentrations, LNG or flammable refrigerant spills, and fire to be monitored as appropriate and that the detection systems determined in Section 9-1.2 to be designed in accordance with NFPA 72 (1993) or NFPA 1221 (1991), as applicable. However, sections 9-4 and 9-1.2 do not prescribe or provide guidance on how to determine which areas have potential for these hazards or how they should be appropriately monitored. If authorized, constructed, and operated, the Project must comply with the requirements of 33 CFR 127 and would be subject to Coast Guard's inspection and enforcement program.

In addition, FERC regulations under 18 CFR 380.12(o)(3) require applicants to provide information on hazard detection system. In addition, 18 CFR 380.12(o)(7) requires applicants to provide engineering studies on the design approach and 18 CFR 380.12(o)(12) requires applicants to identify all codes and standards under which the plant would be designed.

SPLNG would install hazard detection systems to detect cryogenic spills, flammable vapors, and fires. The hazard detection systems would alarm and notify personnel in the area and control room to initiate an emergency shutdown or initiate appropriate procedures, and would meet NFPA 72, ISA Standard 12.13, and other recommended and generally accepted good engineering practices. Depressurization systems would not be installed because there are no proposed pressure vessels that would be subject to BLEVE in the event of an external fire.

FERC staff evaluated the adequacy of the general hazard detection type, location, and layout to ensure adequate coverage to detect cryogenic spills, flammable vapors, and fires near potential release sources (i.e., sumps, trenches, flanges, and instrument and valve connections). However, we noted that the marine transfer area did not have appropriate emergency shutdown provisions. Title 33 CFR 127.205 requires each transfer system have a manual local shutdown as well as fixed sensors that would trigger a shutdown after LNG concentrations exceeding 40 percent of the lower flammability limit. Therefore, we recommend in section B.9.1.6 that SPLNG file documentation that demonstrates that the marine transfer area would have an emergency shutdown system that can be activated manually and is activated automatically when the fixed sensors measure gas concentrations exceeding 40 percent of the lower flammable limit. In addition, we recommend in section B.9.1.6 that SPLNG file specifications, for review and approval, of the final design of fire safety specifications, including hazard detection, hazard control, and firewater systems.

SPLNG would also install an uninterruptible power supply battery rack in the Jetty Control Building. However, SPLNG did not analyze hydrogen off gassing from the battery rack area. Given the propensity of hydrogen to ignite and generate damaging overpressures, FERC staff recommend in section B.9.1.6 that SPLNG file an analysis of the off gassing of hydrogen in battery storage areas and demonstrate ventilation calculations limit concentrations below the lower flammability limits (LFL) (e.g., 25 percent LFL) and that hydrogen detectors be installed that alarm (e.g., 20 to 25 percent LFL) and initiate mitigative actions (e.g., 40 to 50 percent LFL).

Furthermore, we recommend in section B.9.1.6 that SPLNG provide additional information, for review and approval, on the final design of all hazard detection systems (e.g., manufacturer and model, elevations, etc.) and hazard detection layout drawings. In addition, FERC staff recommend in section B.9.1.6 that SPLNG provide, for review and approval, the final design cause and effect matrices for process instrumentation, fire and gas detection system, and emergency shutdown system.

If the Project is authorized and constructed, SPLNG would install hazard detectors according to its final specifications and drawings, and we recommend in section B.9.1.6 that the Project facilities be subject to periodic inspections during construction to verify hazard detectors and emergency shutdown pushbuttons are appropriately installed per approved design and functional based on cause and effect matrixes prior to introduction of hazardous fluids. In addition, we recommend in section B.9.1.6 that the Project facilities be subject to regular inspections throughout the life of the facility to verify hazard detector coverage and functionality is being maintained and are not being bypassed without appropriate precautions.

Hazard Control

If ignition of flammable vapors occurred, hazard control devices would be installed to extinguish or control incipient fires and releases. Coast Guard regulations under 33 CFR §127.603 requires each marine transfer area for LNG to have portable extinguishers to meet NFPA 59A (1994) section 9-6.1 and NFPA 10 (1994) Chapter 3. NFPA 59A (1994) section 9-6.1 requires portable and wheeled fire extinguishers recommended by their manufacturer for gas fires be available at strategic locations as determined in accordance with section 9-1.2 and that they also be provided in accordance with NFPA 59A (1990). NFPA 10 (1990 and 1994) requires fire extinguishers be provided based on maximum travel distances for various class fires. If authorized, constructed, and operated, the Project must comply with the requirements of 33 CFR 127 and would be subject to Coast Guard's inspection and enforcement program.

FERC regulations under 18 CFR §380.12(o)(2) require applicants to provide information on hazard control systems, such as dry chemical systems. In addition, 18 CFR §380.12(o)(7) requires applicants to provide engineering studies on the design approach and 18 CFR §380.12(o)(12) requires applicants to identify all codes and standards under which the plant would be designed.

SPLNG indicated they would meet NFPA 59A, 10, 12, 17, and 2001; API 2218 and 2510A; and other recommended and generally accepted good engineering practices. We evaluated the adequacy of the number and availability of handheld, wheeled, and fixed fire extinguishing devices throughout the site based on the FEED. FERC staff also generally evaluated whether the spacing of the fire extinguishers meet NFPA 10 and agent type and capacities meet NFPA 59A (2009 and later editions). The hazard control plans appear to meet NFPA 10 travel distances to most components containing flammable or combustible fluids (Class B) with 20 pounds (lb) hand-held fire extinguishers (30-50 feet) and 300-lb wheeled extinguishers (100 feet). The agent storage capacities of 20 lb for hand-held (minimum 20 lb) and 350 lb wheeled (minimum 125 lb) also appear to meet NFPA 59A requirements. SPLNG would use dry chemical (ABC) for the 20 lb hand-held fire extinguishers and the 350 lb wheeled fire extinguishers, while Purple K (potassium bicarbonate) for the 5400 lb fixed dry chemical system. In addition, SPLNG committed to supplying the Jetty Marine building with handheld extinguishers per NFPA 10 spacing requirements. The agent storage capacities for wheeled (minimum 125 pounds [lb]) and for handheld extinguishers (minimum 20 lb) also appear to meet NFPA 59A requirements. However, it is unclear if SPLNG's selection of Class ABC dry chemical extinguishers would utilize sodium bicarbonate which would not meet NFPA 59A (2009 and later editions) or potassium bicarbonate which would meet NFPA 59A (2009 and later editions). Therefore, we recommend in section B.9.1.6 that SPLNG specify the use of potassium bicarbonate extinguishers in areas of LNG and the use of ABC extinguishers in areas of ordinary combustibles. In addition, travel distances, installation heights, visibility, flow rate capacities, and other requirements should be confirmed in final design and in the field where design details, such as manufacturer, obstructions, and elevations, would be better known. Therefore, we recommend in section B.9.1.6 that SPLNG provide the final design of these systems, for review and approval, where details are yet to be determined (e.g., manufacturer and model, elevations,

flowrate, capacities, etc.) and where the final design could change as a result of these details or other changes in the final design of the Project.

In addition, we evaluated whether clean agent systems would be installed in all instrumentation buildings in accordance with NFPA 2001. In the application SPLNG stated that clean agent systems would not be applicable to the Project. However, the marine jetty building would house electrical and control equipment that may warrant a clean agent fire suppression system. Therefore, we recommend in B.9.1.6 that SPLNG provide a clean agent system in accordance with NFPA 2001 in buildings that house instrumentation and electrical equipment.

If the Project is authorized and constructed, SPLNG would install hazard control equipment, and we recommend in section B.9.1.6 that the Project facilities be subject to periodic inspections during construction to verify hazard control equipment is installed in the field and functional prior to introduction of hazardous fluids. In addition, we recommend in section B.9.1.6 that the Project facilities be subject to regular inspections throughout the life of the facility to verify in the field that hazard control coverage and is being properly maintained and inspected.

Passive Cryogenic and Fire Protection

If cryogenic releases or fires could not be mitigated from impacting facility components to insignificant levels, passive protection (e.g., fireproofing structural steel, cryogenic protection, etc.) should be provided to prevent failure of structural supports of equipment and pipe racks.

Coast Guard regulations under 33 CFR §127.103(b) require substructures, except moorings and breasting dolphins, that support or are within 5 meters (16.4 feet) of any pipe or equipment containing LNG or are within 15 meters (49.2 feet) of a loading flange be made of concrete or steel and have a fire endurance of not less than two hours. In addition, 33 CFR §127.101 requires the marine transfer area for LNG to meet NFPA 59A (1994) Chapter 6. NFPA 59A (1994) section 6-2.1.2 requires piping that can be exposed to the cold of a LNG spill or heat of an ignited spill during an emergency where such exposure could result in a failure of the piping that would significantly increase the emergency shall be made of materials suitable in its normal operating temperature and extreme temperature that it might be subjected to during the emergency, or protected by insulation or other means to delay failure due to such extreme temperatures until corrective action may be taken by the operator, or capable of being isolated and flow stopped in piping that would be expose only to the heat of an ignited spill during the emergency. In addition, NFPA 59A (1994) section 6-2.1.3 requires piping insulation used to mitigate fire exposure be made of materials that will not propagate fire in the installed condition and shall maintain any properties necessary during emergency when exposed to fire, heat, cold, or water, as applicable. NFPA 59A (1994) section 6-4.2 also requires pipe supports, including any insulation systems used to support pipe whose stability is essential to plant safety, to be resistant to or protected against fire exposure, escaping cold liquid, or both. Lastly, NFPA 59A (1994) section 6-3.2.4 requires gaskets include the consideration of exposure to fire and section. However, NFPA 59A (1994) does not provide the criteria anywhere for determining if piping, pipe supports, equipment, or structures are subject to cold liquid or fire exposures or the level of protection needed to protect the pipe supports, equipment, or structures against such exposures. If authorized, constructed, and operated, the Project must comply with the

requirements of 33 CFR 127 and would be subject to Coast Guard's inspection and enforcement program.

In addition, FERC regulations under 18 CFR §380.12(o)(7) requires applicants to provide engineering studies on the design approach and 18 CFR §380.12(o)(12) requires applicants to identify all codes and standards under which the plant would be designed.

FERC staff evaluated whether passive cryogenic and fire protection would be applied to structural supports that could be exposed to cryogenic liquids or to radiant heats of 4,900 Btu/ft^2-hr or greater from fires with durations that could result in failures[22] and that they are specified in accordance with recommended and generally accepted good engineering practices, such as ISO 20088, API 2001, API 2010A, API 2218, ASCE/SFPE 29, ASTM E84, ASTM E2226, IEEE 1202, ISO 22899, NACE 0198, NFPA 58, NFPA 255, NFPA 290, OTI 95 634, UL 1709, and/or UL 2080, with a cryogenic temperature and duration or fire protection rating of a commensurate to the exposure.

To minimize the risk of cryogenic spills causing structural supports and equipment from cooling below their minimum design metal temperature to a point of failure, SPLNG would specify materials of construction that would not fail when exposed to a cryogenic release or would coat or shield structural supports and equipment with materials that would be cryogenic resistant. Therefore, we recommend in section B.9.1.6 that SPLNG file drawings and specifications for the cryogenic structural protection and calculations or test results (e.g., ISO 20088) that demonstrate the effectiveness of the cryogenic structural protection.

SPLNG would generally direct LNG releases to curbed areas and remote impoundment basins. Therefore, SPLNG concluded that passive fire protection at the proposed project would not be necessary because there would be a lack of fire impacts to the proposed equipment. However, NFPA 307 as well as 33 CFR §127.104 each have additional requirements related to substructures at piers and wharves including selecting structures being made of concrete or steel and having a fire endurance rating of not less than two hours. In addition, while pool fires may not be a concern at the supports due to the spills being conveyed, there does not appear to be appropriate protection from jet fires as the current design does not provide either active or passive protection for portions of the marine transfer line. Therefore, we recommend in section B.9.1.6 that SPLNG demonstrate that the design for the marine areas are consistent with the requirements of NFPA 307 and 33 CFR §127.104.

It is unclear if the jetty marine building and other proposed buildings that would house electrical, instrument, and control systems that would be used to activate emergency systems would be designed to withstand a 20-minute fire exposure equivalent to UL 1709. Therefore, we recommend in section B.9.1.6 that SPLNG provide documentation demonstrating that the marine

[22] Pool fires from impoundments are generally mitigated through use of emergency shutdowns, depressurization systems, structural fire protection, and firewater, while jet fires are primarily mitigated through the use of emergency shutdowns, depressurization systems, and firewater with or without structural fire protection.

buildings which would house electrical, instrument, and control systems used to activate emergency systems would be designed to withstand a 20-minute fire exposure to UL 1709.

If the Project is authorized and constructed, SPLNG would install structural cryogenic and fire protection according to its design, and we recommend in section B.9.1.6 that the Project facilities be subject to periodic inspections during construction to verify structural cryogenic and fire protection is properly installed in the field as designed prior to introduction of hazardous fluids. In addition, we recommend in section B.9.1.6 that the Project facilities be subject to regular inspections throughout the life of the facility to continue to verify that passive protection is being properly maintained.

Firewater Systems

Firewater systems would be installed to cool equipment and structures to prevent their failure in the event of a fire. Coast Guard regulations under 33 CFR §127.601 and 33 CFR §127.607 provides requirements for firewater systems in marine transfer areas. If authorized, constructed, and operated, the Project must comply with the requirements of 33 CFR 127 and would be subject to Coast Guard's inspection and enforcement program.

In addition, FERC regulations under 18 CFR §380.12(o)(2) require applicants to provide information on fire protection systems. In addition, 18 CFR §380.12(o)(7) requires applicants to provide engineering studies on the design approach and 18 CFR §380.12(o)(12) requires applicants to identify all codes and standards under which the plant would be designed.

FERC staff evaluated the adequacy of the general firewater system coverage and verified the appropriateness of the associated firewater demands of those systems and worst-case fire scenarios to verify the capabilities of the existing firewater system. Firewater systems at SPLNG would be comprised of new and existing systems. However, no new monitors or hydrants are proposed along the marine transfer piping. While the marine transfer piping would not be at risk for pool fire exposure there is risk of jet fire exposure. It is a recommended and generally accepted good engineering practice to have a means of cooling the piperack supports for the marine transfer line in the event of a jet fire or else there is risk of failing the pipe rack and having a higher consequence event occurring from a smaller event. NFPA 307 (2016 edition), *Standard for the Construction and Fire Protection of Marine Terminals, Piers, and Wharves*, recommends that hydrants and hose connections would be spaced 300 feet or less apart and 150 feet or less from the end of the marine transfer area. These distances are similar to the effective reach or throw distance of many monitors and length and throw distances of hoses. We recommend in section B.9.1.6 that SPLNG provide hydrants or monitors with throw distances to reach along the entire marine transfer line and with flow rates based on design densities that can absorb the radiant heat exposure from a jet fire. For reference, we estimate that SPLNG would need a minimum water spray density of 0.30 gallons per minute per square foot, which includes a 0.05 gallons per minute per square foot wastage allowance as specified in NFPA 15 and API 2030, to absorb a 400 kilowatts per cubic meter radiant heat flux, which is representative of the maximum expected mean surface emissive power of a LNG fire, and does not include other heat transfer effects (i.e., convective heat transfer). In addition, we recommend in section B.9.1.6 that

SPLNG complete and document the firewater monitor and hydrant coverage test to verify that actual coverage area from each monitor and hydrant meets or exceeds the final design coverage area.

Three existing diesel firewater pumps and two booster pumps each with a capacity of 4,000 gallons per minute would provide cooling water for the Project. The firewater would be supplied from an existing earthen pond with a capacity of 7 million gallons or more reserved for firefighting. While the firewater demand case provided by the applicant is yet to be validated, the capacity of the pond and firewater pumps would likely be sufficient to service the Project. SPLNG proposes to install additional oscillating firewater monitors and firewater hydrants and hoses for use during an emergency to cool the surface of piping and equipment exposed to heat from a fire. These firewater systems would also be designed, tested, and maintained to meet NFPA 24 and 25 requirements.

In addition, we recommend in section B.9.1.6 that SPLNG file additional information on the final design of all the firewater systems, for review and approval, where details are yet to be determined (e.g., manufacturer and model, nozzle types, etc.) and where the final design could change as a result of these details or other changes in the final design of the Project. If the Project is authorized and constructed, SPLNG would install the firewater system based on the final specifications and drawings, and we recommend in section B.9.1.6 that the Project facilities be subject to periodic inspections during construction and that companies provide results of commissioning tests to verify the firewater systems are installed and functional as designed prior to introduction of hazardous fluids.

Geotechnical and Structural Design

SPLNG provided geotechnical and structural design information for its facilities to demonstrate the site preparation and foundation designs would be appropriate for the underlying soil characteristics and to ensure the structural design of the Project facilities would be in accordance with federal regulations, standards, and recommended and generally accepted good engineering practices. The application focuses on the resilience of the Project facilities against natural hazards, including extreme geological, meteorological, and hydrological events, such as earthquakes, tsunamis, seiche, hurricanes, tornadoes, floods, rain, ice, snow, regional subsidence, sea level rise, landslides, wildfires, volcanic activity, and geomagnetism.

Geotechnical Evaluation

The Coast Guard regulations do not have any explicit requirements for geotechnical investigations. The USDOT PHMSA regulations under 49 CFR 193 are only applicable to the siting of the Project facilities. The siting regulations under 49 CFR 193 Subpart B incorporate by reference NFPA 59A (2001). NFPA 59A (2001), under Chapter 2 Plant Siting and Layout, section 2.1.4 requires soil and general investigations of the site to determine the design basis for the facility. However, no additional requirements are set out in 49 CFR 193 or NFPA 59A on minimum requirements for evaluating existing soil site conditions or evaluating the adequacy of the foundations. The Project's compliance with 49 CFR 193 Subpart B would be covered in the USDOT PHMSA's LOD. If authorized, constructed, and operated, all LNG facilities, as defined

by 49 CFR 193 must comply with the requirements of 49 CFR 193 and would be subject to USDOT PHMSA's inspection and enforcement programs.

FERC regulations under 18 CFR §380.12(h)(3) require geotechnical investigations to be provided. FERC staff evaluated the existing and proposed site conditions, geotechnical report, and proposed foundations to ensure they are adequate for the Third Berth Facilities, as described below.

The Third Berth would be located within the existing SPLNG Terminal property boundary, which had a completed geotechnical review, including review of dredge material. The site elevation ranges between 6 feet and 9 feet NAVD 88, and would average approximately 15 feet NAVD 88 if proposed fill is placed. The water channel bordering this proposed project would be dredged to construct the berth and approach channel. Specifically, the maneuvering area and berthing area would be dredged roughly perpendicular to the Sabine Pass Channel to a depth of -46 feet NAVD 88. Excavated material produced by dredging would not be used as landfill for the proposed project. Disposal of dredge material is discussed in section A.8.2.1.

The Third Berth Facilities are located just north of the existing Liquefaction Project along the Sabine Pass Channel in Cameron Parish, Louisiana within the Coastal Prairie region of the west Gulf Coastal Plain physiographic province (Bureau of Economic Geology, 1996). To inform the "Final Geotechnical Report" for this proposed project TWEI reviewed previous geotechnical investigations concerning soil conditions prepared for the Sabine Pass liquefaction facility before it was constructed. These previous geotechnical investigations assessed soil conditions before dredged hydraulic fill was placed. TWEI then obtained additional soil samples at continuous 2-ft interval to 10-ft depth, 5-ft interval to 100-ft depth and thereafter typically at 10-ft interval to boring termination depths of 120- to 200-ft to investigate the ground conditions post-dredge-fill. These samples indicated Holocene epoch sediments ranging from 0-75 feet subsurface. The soil profile is predominantly soft to stiff clays with no or negligible organic matter, sand inclusions, and occasional shell beds. All clay varieties near surface and deep contain high water content. For example, a boring encountered nearly fully-saturated very soft clay just below the surface. Furthermore, stiff clays near surface contained high moisture contents fewer than 10 feet subsurface. Low permeability limits surface water infiltration, though keeps existing in-situ water in place. Because of the high moisture content, clays identified by TWEI have low shear strength and a propensity to deform under induced loads. Data do not indicate the presence of rock within the top 200 feet sampled.

TWEI also performed laboratory and field tests including: 34 piezocone penetration tests; moisture content, liquid limit, soil density, fine material analysis, particle size analysis, organic content, unconsolidated triaxial compression, miniature vane, triaxial compression with pore pressure, incremental consolidation, specific gravity, pH, soluble sulfate, chloride ion, and soil electrical resistivity. TWEI did not always state how many samples and tests on them were conducted, or to what extent the results were published in the Final Geotechnical Report. However, the tests presented were sufficient in number to be considered statistically significant to interpret the geotechnical conditions at the site.

Corrosion potential tests for pH, chloride, and sulfate ion concentrations and electrical resistivity were performed on selected soil samples. TWEI presented results from 23 tests conducted on 11 borings. Several chloride ion tests resulted in measurements greater than 2,000 mg/kg. For reference, the natural abundance of chlorine ions in the Earth's crust is approximately 500 ppm. Across all geographies, a rough average soil concentration is approximately 100 ppm. The test results presented by TWEI indicate high chlorine ion concentration, and a high potential for corrosion. Electrical resistivity tests were also performed on a total of three samples across three borings. Similarly, the low electric resistivity measurements (68, 84, and 157 ohm-cm) indicate that the soil has substantial potential to corrode unprotected steel. TWEI provided sample test results for sulfate ion content levels in both soils and water and were generally all under 3,000 pm, which pose minor risks to the corrosion of concrete foundations. Finally, TWEI provided pH levels of samples collected that all ranged from 4.5 to 6.75, meaning the soils are slightly to moderately acidic. These soil conditions may increase corrosion rates on unprotected concrete and steel. TWEI makes no recommendations about preventative and mitigation measures against soil corrosion, and SPLNG makes no reference to prevention and mitigation measures in its application. Therefore, FERC staff recommends in section B.9.1.6 that SPLNG develop a soil corrosion prevention and mitigation plan to protect buried steel and concrete structures.

To investigate the groundwater conditions, TWEI collected test borings using the dry auger method to measure free water-level. Upon encountering groundwater, TWEI monitored water levels were for approximately 15 minutes. TWEI identified near-surface groundwater. Groundwater is 4.5 feet subsurface at the N-S piperack, 6.5 feet subsurface at the Secondary Road, 5.5 feet subsurface at the LNG Impoundment Basin, 6.0 feet subsurface at the E-W piperack and 0.5 feet subsurface at the Access Trestle and 3rd Berth.

The results of SPLNG's geotechnical investigation at the proposed Project site indicate that subsurface conditions are suitable for the proposed Third Berth, if proposed site preparation, foundation design, and construction methods are implemented in addition to the satisfaction of proposed recommendations.

Structural and Natural Hazard Evaluation

The marine facilities would be subject to 33 CFR 127, which requires, if the waterfront facility handling LNG is in a region subject to earthquakes, that the piers and wharves must be designed to request earthquake forces. In addition, Coast Guard regulations under 33 CFR 127 incorporate by reference certain portions of NFPA 59A (1994) and American Society of Civil Engineers (ASCE) 7-88, via NFPA 59A (1994). However, Coast Guard regulations do not provide criteria for a region subject to earthquakes or the earthquake forces necessary to be withstood and NFPA 59A (1994) sections referenced in 33 CFR 127 is for seismic design only and is applicable to LNG containers, which would not be under 33 CFR 127. Also, 33 CFR 127 does not cover design of the marine facilities to withstand other natural hazards, such as winds, floods, waves, etc. If authorized, constructed, and operated, the Project must comply with the requirements of 33 CFR 127 and would be subject to Coast Guard's inspection and enforcement program.

The USDOT PHMSA regulations under 49 CFR 193, subpart B are applicable to the siting of the Project facilities. The siting regulations under 49 CFR 193 Subpart B incorporate by reference NFPA 59A (2001). NFPA 59A (2001), under Chapter 2 Plant Siting and Layout, section 2.1.1(c) requires that SPLNG consider the plant site location in the design of the Project, with respect to the proposed facilities being protected, within the limits of practicality, against natural hazards, such as from the effects of flooding, storm surge, and seismic activities. While compliance with 49 CFR 193 Subpart B would be covered in the USDOT PHMSA's LOD the LOD does not cover whether the facility is designed appropriately against these hazards, which is a requirement of 49 CFR 193, Subpart C. Unlike other natural hazards, wind loads are covered in 49 CFR 193, Subpart B and will be covered in the LOD. If authorized, constructed, and operated, all LNG facilities, as defined by 49 CFR 193 must comply with the requirements of 49 CFR 193 and would be subject to USDOT PHMSA's inspection and enforcement programs.

FERC regulations under 18 CFR 380.12 (m) requires applicants address the potential hazard to the public from failure of facility components resulting from accidents or natural catastrophes, evaluate how these events would affect reliability, and describe what design features and procedures that would be used to reduce potential hazards.

SPLNG indicated that the facilities would be designed and constructed to the requirements in the 2006 International Building Code (IBC) and ASCE 7-05 for seismic design. These standards require various structural loads to be applied to the design of the facilities, including live (i.e., dynamic) loads, dead (i.e., static) loads, and environmental loads. FERC staff also evaluated potential engineering design to withstand impacts from natural hazards, such as earthquakes, tsunamis, seiche, hurricanes, tornadoes, floods, rain, ice, snow, regional subsidence, sea level rise, landslides, wildfires, volcanic activity, and geomagnetism. In addition, we recommend in section B.9.1.6 that SPLNG file final design information (e.g., structural drawings, specifications, and calculations) and associated quality assurance and control procedures with the documents stamped and sealed by the professional engineer of record. If the Project is authorized and constructed, SPLNG would install equipment in accordance with its final design.

Earthquakes, Tsunamis, and Seiche

Earthquakes and tsunamis often result from sudden slips along fractures in the earth's crust (i.e., faults) and the resultant ground motions caused by those movements, but can also be a result of volcanic activity or other causes of vibration in the earth's crust. The damage that could occur as a result of ground motions is affected by the type/direction and severity of the fault activity and the distance and type of soils the seismic waves must travel from the hypocenter (or point below the epicenter where seismic activity occurs).

USDOT PHMSA regulations would not apply to the seismic design of the marine transfer system. Coast Guard regulations under 33 CFR §127.101 requires marine transfer area piping to meet NFPA 59A (1994) section 4-1.3. NFPA 59A (1994) section 4-1.3 require seismic loads to be considered in the design based on the seismic potential and response spectra determined by a

site investigation that identifies surface faulting, materials underlying the site related to the transmission of vibratory motion from bedrock through soil, the potential for soil liquefaction and degradation, and determination of vertical and horizontal response spectra correlating the acceleration, velocity, and displacement with the seismic characteristics of the soil and dampening factors of the structural system in the range of anticipated natural periods of vibration. If authorized, constructed, and operated, the Project must comply with the requirements of 33 CFR 127 and would be subject to Coast Guard's inspection and enforcement program.

Similarly, FERC regulations under 18 CFR 380.12(h)(5) require evaluation of earthquake hazards based on whether there is potential seismicity, surface faulting, or liquefaction. Earthquakes and tsunamis have the potential to cause damage from shaking ground motion and fault ruptures.

The USGS maintains a database containing information on surface and subsurface faults and folds in the U.S. that are believed to be sources of earthquakes of greater than 6.0 magnitude occurring during the past 1.6 million years (Quaternary Period).[23] SPLNG Third Berth would not be near such faults, which are primarily on the West Coast. However, in the Gulf Coastal Plains, there are several hundred growth faults that are known or suspected to be active. Most of these growth faults are located within the Houston-Galveston (Texas) area subsidence bowl, but many others are known to exist from Brownsville, Texas to east of New Orleans, Louisiana. Evidence of modern activity of these growth faults includes changes in elevation that can lead to damage to pavement, buildings, and other structures. Subsidence has also been recorded occurring naturally through fault movements and compaction/consolidation of Holocene deposits. The site and surrounding areas are underlain by the middle to late Quaternary Beaumont Formation.

To assess the potential impact from earthquakes and tsunamis, SPLNG evaluated historic earthquakes along fault locations and their resultant ground motions. SPLNG engaged Lettis Consultants International, Inc. (LCI) to perform a site-specific fault and seismic analysis for the Project, involving field investigations and subsequent data evaluation. The site is located within the Gulf Highly Extended Crust seismotectonic zone. There are no active faults in the site region. However, because of the large magnitudes of past events (1811-1812) and relatively high rate of activity, four faults in the New Madrid seismic zone and the Meers fault in Oklahoma were included into the probabilistic seismic hazard analysis. SPLNG also engaged LCI to produce a supplemental report for seismic, tsunami, and other geologic hazards for the Project.

Growth faults have been mapped extensively in the subsurface of the Gulf coastal region, in the Texas and Louisiana region, and in the vicinity of the Project site. From oldest to youngest, onshore Texas growth fault zones are known as the Wilcox zone (Paleocene – Eocene), Yegua zone (middle to late Eocene), Vicksburg zone (Oligocene) and Frio zone (late

[23] USGS, Earthquake Hazards Program, Quaternary Fault and Fold Database of the United States, https://earthquake.usgs.gov/hazards/qfaults/, accessed August 2018.

Oligocene). Growth faults in south Texas have been investigated as potential sources of permanent ground deformation for new nuclear power plants proposed by South Texas Power (2006) in Bay City. These studies have documented that the surface expression of movement on onshore growth faults at depth is broad monoclonal warping with relief of a few feet expressed over horizontal distances of a few hundreds of feet in Quaternary Beaumont Formation (350,000 to 100,000 years in age). Associated average movement rates across the faults typically are on the order of 10^{-4} to 10^{-5} inches per year. The South Texas and Exelon studies indicate that surface deformation associated with these faults produces very subtle topographic features that require high resolution techniques to resolve, and may be below the detection limit of typical boring techniques in the near subsurface. The project site lies within the zone of influence of the Frio fault system, which is mapped in the subsurface as trending sub-parallel to and near the Gulf coastline in southern Texas and southwestern Louisiana (Ewing, 1986).

Aside from settlement from structural loads, the ground elevation can suddenly sink or gradually settle downward with little or no horizontal motion, caused by movements on surface faults or by subsurface mining or pumping of oil, natural gas, or ground water, or in places where fluid is expelled from underlying sediments. This phenomenon is known as subsidence. Subsidence in the Gulf Coast region primarily results from groundwater extraction, oil and gas extraction, and slumping along growth faults. There are no gas extractions or salt domes within the vicinity of the Project and currently, no significant land subsidence has been documented at or adjacent to the Project site. Subsidence rates near Sabine Pass have been recorded to be in the range of thousandths to hundredths of feet per year (Shinkle and Dokka, 2004). SPLNG estimates the total subsidence to range from 0.3 feet to 0.6 feet over the design life of the project.

While the presence of major tectonic faults and growth faults can require special consideration, the presence or lack of major tectonic faults identified near the site does not define whether earthquake ground motions can impact the site, because ground motions can be felt large distances away from an earthquake hypocenter depending on a number of factors. Title 33 CFR §127.101 incorporates NFPA 59A (1994) Section 4-1.3 and Chapter 6, which require piping systems conveying flammable liquids and flammable gases with service temperatures below -20 degrees Fahrenheit, be designed for seismic ground motions as required by NFPA 59A (1994). Based on NFPA 59A (1994), SPLNG has indicated that the site will be designed with the site-specific determinations of the MCE, DE, SSE, OBE, and ALE. Earthquakes with a ground motion at the surface level with a 10 percent probability of being exceeded within 50 years (475 year mean return interval) are termed as the operating bases earthquake (OBE), while earthquakes with a 2 percent probability of being exceeded within 50 years (2,475 year mean return interval) are termed as the safe shutdown earthquake (SSE).

In addition, FERC staff recognizes SPLNG would also need to address hazardous fluid piping with service temperatures at -20 degrees Fahrenheit and higher, and equipment other than piping. We also recognize the current FERC regulations under 18 CFR 380.12(h)(5) continue to incorporate National Bureau of Standards Information Report 84-2833. National Bureau of Standards Information Report 84-2833 provides guidance on classifying stationary storage containers and related safety equipment as Category I and classifying the remainder of the LNG project structures, systems, and components as either Category II or Category III, but does not provide specific guidance for the seismic design requirements for them. Absent any other regulatory requirements, this guidance recommends that other LNG project structures classified

as Seismic Category II or Category III be seismically designed to satisfy the Design Earthquake and seismic requirements of the ASCE 7-05 in order to demonstrate there is not a significant impact on the safety of the public. ASCE 7-05 is recommended as it is a complete American National Standards Institute consensus design standard, its seismic requirements are based directly on the National Earthquake Hazards Reduction Program Recommended Provisions, and it is referenced directly by the IBC. Having a link directly to the IBC and ASCE 7 is important to accommodate seals by the engineer of record because the IBC is directly linked to state professional licensing laws while the National Earthquake Hazards Reduction Program Recommended Provisions are not.

The geotechnical investigations of the existing site performed by TWEI indicate the site is classified as Site Class E[24] based on a site average shear wave velocity (Vs) and the time-averaged shear-wave velocity in the top 30 m (V_S30) for the site is 283 feet per second determined with ASCE 7-05 and IBC (2006) with design spectral response accelerations at short periods (S_{DS}) and at 1-second period (S_{D1}) of 0.12 g and 0.11 g, respectively. FERC staff found that the results of the site-specific study were more conservative than those obtained from the publicly available ATC[25] tool. Sites with soil conditions of this type would experience significant amplifications of surface earthquake ground motions. However, due to the absence of a major fault in proximity to the site and lower ground motions, the seismic risk to the site is considered low. These ground motions are very low compared to other locations in the U.S. ASCE 7-05 also requires determination of the Seismic Design Category based on the Occupancy Category (or Risk Category in ASCE 7-10 and 7-16) and severity of the earthquake design motion. The Occupancy Category (or Risk Category) is based on the importance of the facility and the risk it poses to the public.[26] FERC staff has identified the Project as a Seismic Design Category B or C based on the ground motions for the site and an Occupancy Category (or Risk Category) of III or IV, this seismic design categorization would appear to be consistent with the IBC (2006) and ASCE 7-05 (and ASCE 7-10). Based on the design ground motions for the site and the importance of the facilities, the facility seismic design is assigned Seismic Design Category A in accordance with ASCE 7-05. FERC staff agrees the SSE PGA, OBE PGA, and 5 percent damped spectral design accelerations used by SPLNG are acceptable.

[24] There are six different site classes in ASCE 7-05, A through F, that are representative of different soil conditions that impact the ground motions and potential hazard ranging from Hard Rock (Site Class A), Rock (Site Class B), Very dense soil and soft rock (Site Class C), Stiff Soil (Site Class D), Soft Clay Soil (Site Class E), to soils vulnerable to potential failure or collapse, such as liquefiable soils, quick and highly sensitive clays, and collapsible weakly cemented soils (Site Class F).

[25] Applied Technology Council, https://hazards.atcouncil.org, July 2019.

[26] ASCE 7-05 defines Occupancy Categories I, II, III, and IV. Occupancy Category I represents facilities with a low hazard to human life in even of failure, such as agricultural facilities; Occupancy Category III represents facilities with a substantial hazard to human life in the event of failure or with a substantial economic impact or disruption of day to day civilian life in the event of failure, such as buildings where more than 300 people aggregate, daycare facilities with facilities greater than 150, schools with capacities greater than 250 for elementary and secondary and greater than 500 for colleges, health care facilities with 50 or more patients, jails and detention facilities, power generating stations, water treatment facilities, telecommunication centers, hazardous facilities that could impact public; Occupancy Category IV represents essential facilities, such as hospitals, fire, rescue, and police stations, emergency shelters, power generating stations and utilities needed in an emergency, aviation control towers, water storage and pump structures for fire suppression, national defense facilities, and hazardous facilities that could substantially impact public; and Occupancy Category II represents all other facilities. ASCE 7-10 changed the term to Risk Categories I, II, III, and IV with some modification.

Seismic events can also result in soil liquefaction in which saturated, non-cohesive soils temporarily lose their strength/cohesion and liquefy (i.e., behave like viscous liquid) as a result of increased pore pressure and reduced effective stress when subjected to dynamic forces such as intense and prolonged ground shaking. Areas susceptible to liquefaction may include saturated soils that are generally sandy or silty. Typically, these soils are located along rivers, streams, lakes, and shorelines or in areas with shallow groundwater. Given the sites predominately clay soils, the site is not susceptible to soil liquefaction, as clay soils generally do not reach zero effective stress. While there is low chance for soil liquefaction, given the predominantly clay soil types present, significant long-term settlement may be an issue. Therefore, we recommend in section B.9.1.6 that SPLNG file final design information to confirm that SPLNG would implement settlement monitoring system to measure uniform and differential settlement, and report settlement values in semi-annual operational reports.

Seismic events in waterbodies can also cause tsunamis or seiche by sudden displacement of the sea floors in the ocean or standing water. Tsunamis and seiche may also be generated from volcanic eruptions or landslides. Tsunami wave action can cause extensive damage to coastal regions and facilities. There is little evidence to suggest that the Gulf of Mexico is prone to tsunami events, but the occurrence of a tsunami is possible. Two did occur in the Gulf of Mexico in the early 20th century and had wave heights of 3 feet or less (USGS, 2014c), which is not significantly higher than the average breaking wave height of 1.5 feet (Owen, 2008). No earthquake-generating faults have been identified that are likely to produce tsunamis, despite recorded seismic activity in the area. Based on the results of the ten Brink et al. (2009) study, the probability of a landslide-generated tsunami affecting the Project area is considered extremely low. With no observable tsunami of any consequence observed in historical times and the low occurrence rate of landslides in the Gulf of Mexico that are sufficiently large to generate a tsunami, the run-up for return period of 100 or 500 years is probably on the order of centimeters. Based on modeling and limited historical data, it is estimated that tsunamis generated from landslides would be significantly less than the hurricane design storm surge elevations discussed below, so any tsunami hazard has been considered in design.

Hurricanes, Tornadoes, and other Meteorological Events

Hurricanes, tornadoes, and other meteorological events have the potential to cause damage or failure of facilities due to high winds and floods, including failures from flying or floating debris. To assess the potential impact from hurricanes, tornadoes, and other meteorological events, SPLNG evaluated such events historically. The severity of these events is often determined on the probability that they occur and are sometimes referred to as the average number years that the event is expected to re-occur, or in terms of its mean return/recurrence interval.

The Coast Guard regulations do not have any explicit requirements for designing the marine transfer facilities to withstand wind. The USDOT PHMSA siting regulations under Subpart B include wind forces requirements, including wind speed, in 49 CFR §193.2067. On July 24, 2019 the USDOT PHMSA provided a LOD on the Project's compliance with 49 CFR 193, Subpart B with regard to wind speed. This determination has been provided to the

Commission as further consideration to the Commission on its decision to authorize or deny the Project.

FERC regulations under 18 CFR §380.12(m) requires applicants address the potential hazard to the public from failure of facility components resulting from accidents or natural catastrophes, evaluate how these events would affect reliability, and describe what design features and procedures that would be used to reduce potential hazards. In addition, FERC regulations under 18 CFR §380.12(o)(7) requires applicants to provide engineering studies on the design approach and 18 CFR §380.12(o)(12) requires applicants to identify all codes and standards under which the plant would be designed. Title 18 CFR §380.12(o)(14) also requires an applicant to identify how each applicable requirement will comply with 49 CFR 193 and NFPA 59A. FERC staff evaluated the existing and proposed site conditions, geotechnical report, and proposed foundations to ensure they are adequate for the Third Berth Facilities. In addition, FERC staff evaluated historical tropical storm, hurricane, and tornado tracks in the vicinity of the Project facilities using data from the DHS Homeland Infrastructure Foundation-Level Data and NOAA Historical Hurricane Tracker.[27,28]

SPLNG indicated that they would design their Project facilities to withstand a 150 mph sustained wind speed equivalent to approximately a 183 mph 3-second gust wind speed using the Durst Curve in ASCE 7-05 or using a 1.23 gust factor recommended for offshore winds at a coastline in World Meteorological Organization, *Guidelines for Converting between Various Wind Averaging Periods in Tropical Cyclone Conditions*. These wind speeds are equivalent to approximately 12,000-year mean return interval or 0.42 percent probability of exceedance in a 50-year period for the site, based on whether ASCE 7-05 wind speed return period conversions. The 183 mph 3-second gust equates to a strong Category 4 Hurricane using the Saffir-Simpson scale (130-156 mph sustained winds, 166-195 mph 3-second gusts). Between 1900 and 2017, there have been 33 tropical storms or hurricanes that have made landfall within 65 nautical miles of the Project site. There were several hurricanes that were considered major (i.e., Category 3 or higher): an Unnamed Hurricane in 1918 (Category 3 with sustained wind speeds of approximately 121 mph); Hurricane Audrey in 1957 (Category 3 with sustained wind speeds of approximately 127 mph); and Hurricane Rita in 2005 (Category 3 with sustained wind speeds of approximately 133 mph). The proposed design wind speed would exceed the maximum wind speed from these historical events.

In addition, as noted in the limitation of ASCE 7-05, tornadoes were not considered in developing basic wind speed distributions. This leaves a potential gap in potential impacts from tornadoes. Therefore, FERC staff evaluated the potential for tornadoes. Appendix C of ASCE 7-05 makes reference to American Nuclear Society 2.3 (1983 edition), *Standard for Estimating Tornado and Extreme Wind Characteristics at Nuclear Power Sites*. This document has since been revised in 2011 and reaffirmed in 2016 and is consistent with NUREG/CR-4461, *Tornado Climatology of the Contiguous U.S.*, Rev. 2 (Ramsdell and Rishel, 2007). These documents

[27] DHS, Homeland Infrastructure Foundation-Level Data, https://hifld-geoplatform.opendata.arcgis.com/, August 2018.

[28] NOAA, Historical Hurricane Tracker, https://coast.noaa.gov/hurricanes/, August 2018.

provide maps of a 100,000 mean year return period for tornadoes using 2-degree latitude and longitude boxes in the region to estimate a tornado striking within 4,000 feet of an area. Figures 5-8 and 8-1 from NUREG/CR-4461 indicate a 100,000-year maximum tornado wind speeds would be approximately 140 mph 3-second gusts for the Project site location, which is lower than the design basis wind speed for the project. As a result, FERC staff believes the use of a 183 mph 3-second gust, is adequate for the facility. Later editions of ASCE 7 (ASCE 7-10 and ASCE 7-16) make reference to International Code Council 500, *Standard for Design and Construction of Storm Shelters*, for 10,000-year tornadoes. However, the International Code Council 500 maps were conservatively developed based on tornadoes striking regions and indicate a 200 mph 3-second gust for a 10,000-year event, which is higher than the 140 mph 3-second gust in American Nuclear Society 2.3 and NUREG/CR-4461. Since 1950, there were 3 historical tornado events that had been recorded found within 10 nautical miles of the Project site occurring in 1969 (EF-1), 1970 (EF-2), and 1972 (EF-1).[29]

ASCE 7 also recognizes the facility would be in a wind-borne debris region. Wind borne debris has the potential to perforate piping and buildings if not properly designed to withstand such impacts. The potential impact is dependent on the equivalent projectile wind speed, characteristics of projectile, and methodology or model used to determine whether penetration or perforation would occur. However, SPLNG has a hurricane preparedness and response plan that would call for any loose equipment to be secured and, in certain circumstances, call for limited holding operations that would prevent loading any LNG marine vessels and therefore the marine transfer line would have minimal or no LNG in it.

In addition to high winds, hurricanes can result in storm surge that can flood a site. FERC staff estimate the 500-year storm surge to be approximately 18 feet and 21-22 feet with waves. Using maximum envelope of water (MEOW) storm surge inundation maps generated from the Sea, Lake, and Overland Surge from Hurricanes (SLOSH) model developed by NOAA National Hurricane Center, a 500-year event would equate to a weak Category 4 Hurricane. FERC staff evaluated the storm surge against other sources using SLOSH maps that indicate a similar upper range of 8-10 feet MEOW for Category 2 Hurricanes, and also indicated 13-16 feet MEOW for Category 3 Hurricanes, 16-20 feet MEOW for Category 4 Hurricanes, and 20-25 feet MEOW for Category 5 Hurricanes. Hurricanes that have come ashore near the terminal include Hurricanes Ike (2008) and Rita (2005). Hurricane Ike came ashore at Galveston Island as a strong Category 2 storm, with a storm surge of 15 to 20 feet. Hurricane Rita came ashore between Sabine Pass, Texas, and Johnson's Bayou, Louisiana, as a Category 3 storm, with a storm surge of 10 to 15 feet along the southwestern coast of Louisiana. FERC staff also reviewed expected sea level rise (SLR) for the project using the Sea-Level Change Curve

[29] Tornados are rated by the Enhanced Fujita Scale, with EF-0 having wind speeds from 65 to 85 mph 3-second gust, EF-1 ranging from 86 to 110 mph 3-second gust, EF-2 ranging from 111 to 135 mph 3-second gust, EF-3 ranging from 136 to 165 mph 3-second gust, EF-4 ranging from 166 to 200 mph 3-second gust, and EF-5 having wind speeds over 200 mph 3-second gust..

Calculator tool provided by the COE[30] and found the projected SLR for the site to be 0.75 feet for the proposed 20-year design life of the project

SPLNG established storm surge elevations for a 100-year and 500-year return period event as 13.8 feet NAVD 88 and 18.2 feet NAVD 88, respectively, and indicated that an elevation of 17.49 feet NAVD 88 would be used as the basis for storm surge design considerations. SPLNG engaged LCI to estimate the future elevations of sea level at the Project site for the design life of the project. LCI found that the regional sea level rise (RSL) should be taken as 2.7 ft per century for the next 2 to 4 decades, which equates to roughly 0.54 feet to 1.08 feet over the design life of the project. It is noted though that the relative SLR is inclusive of the effects of subsidence. Accordingly, SPLNG plans to have the LNG loading platform elevations set at 25 ft NAVD 88. This height would be above the combined 500-year return period storm surge, 500-year wave crest elevation, and relative SLR. Therefore, we conclude that the Third Berth facilities would be adequately protected from flooding.

In addition to the potential for large waves flooding the site, smaller more frequent waves may also impact the shoreline and erode it. The Texas and Louisiana Gulf Coast area is experiencing the highest rates of coastal erosion and wetland loss in the U.S. (Ruple, 1993). The average coastal erosion rate is 4.2 meters per year in Louisiana and 1.8 meters per year along the northern Gulf of Mexico shoreline. However, the most serious erosion and land loss is occurring in the eastern part of the coastal area, east of Atchafalaya Bay.

Landslides and Other Natural Hazards

Due to the low relief across the Project site, there is little likelihood that landslides or slope movement at the site would be a realistic hazard. Landslides involve the downslope movement of earth materials under force of gravity due to natural or human causes. The Project area has low relief which reduces the possibility of landslides.

Volcanic activity is primarily a concern along plate boundaries on the West Coast and Alaska and also Hawaii. Based on FERC staff review of maps from USGS[31] and DHS[32] of the nearly 1,500 volcanoes with eruptions since the Holocene period (in the past 10,000 years), there is no known active or historic volcanic activity within proximity of the site, with the closest being over 700 miles away across the Gulf of Mexico in Los Atlixcos, Mexico.

Geomagnetic disturbances (GMDs) may occur due to solar flares or other natural events with varying frequencies that can cause geomagnetically induced currents, which can disrupt the operation of transformers and other electrical equipment. USGS[20] provides a map of GMD intensities with an estimated 100-year mean return interval.[33] The map indicates the Project site could experience GMD intensities of 70-100 nano-Tesla with a 100 year mean return interval.

[30] COE, *Sea-Level Change Curve Calculator*, http://corpsmapu.usace.army.mil/rccinfo/slc/slcc_calc.html, July, 2019
[31] USGS, *U.S. Volcanoes and Current Activity Alerts*, https://volcanoes.usgs.gov/index.html, accessed August 2018.
[32] DHS, *Homeland Infrastructure Foundation-Level Data (HIFLD)*, Natural Hazards, hifld-geoplatform.opendata.arcgis.com, accessed August 2018.
[33] USGS, *Magnetic Anomaly Maps and Data for North America*, https://mrdata.usgs.gov/magnetic/map-us.html#home, accessed August 2018.

However, the Third Berth Facilities would be designed such that if a loss of power were to occur the valves would move into a fail-safe position. In addition, the LNG terminal is an export facility that does not serve any U.S. customers.

External Impacts

To assess the potential impact from external events, FERC staff conducted a series of reviews to evaluate transportation routes, land use, and activities within the facility and surrounding the Project site, and the safeguards in place to mitigate the risk from events, where warranted. FERC staff assessed potential impacts from vehicles along external roads and rail, impacts from aircraft operations to and from nearby airports and heliports, impacts from pipeline failures from nearby pipelines, and impacts to and from adjacent facilities that handle hazardous materials under EPA's RMP regulations and power plants, including nuclear facilities under Nuclear Regulatory Commission regulations. Specific mitigation of impacts from use of external roadways, rail, helipads, airstrips, or pipelines are also considered as part of the engineering review done in conjunction with the NEPA review.

Road

Coast Guard regulations under 33 CFR §127.101(e) require the marine transfer area for LNG to meet NFPA 59A (1994) Section 8.4-4, which requires that pipelines be located on the dock or pier so that they are not exposed to damage from vehicular traffic or other possible causes of physical damage. Similarly, NFPA 59A (1994), Section 8.4-3, requires vehicular traffic to be prohibited on the pier or dock within 100 feet of the loading and unloading manifold while transfer operations are in progress. Suitable warning signs or barricades are also required to indicate that transfer operations are in progress.

FERC staff reviewed whether any additional truck operations would be associated with the Project and whether any existing roads would be located near the site to evaluate whether the Project and any associated truck operations could increase the risk along the roadways and subsequently to the public and whether any pre-existing unassociated vehicular traffic could adversely increase the risk to the Project site and subsequently increase the risk to the public. No additional trucks would be required to service the SPLNG Third Berth facilities, with the exception of a nitrogen delivery truck for annual loading arm maintenance. Although no plans or drawings were provided, SPLNG stated that guard rails, bollards, stop signs, speed limits, etc. would be located internal to the SPLNG Third Berth facility to protect equipment containing hazardous fluids and safety related equipment similarly to the protections at the existing Terminal berths. We recommend in section B.9.1.6 that SPLNG provide final design information, for review and approval, on internal road and vehicle protections, such as guard rails, barriers, and bollards to protect transfer piping, etc. to ensure that they are located away from roadway or protected from damage by vehicle movements.

The closest road would be Lighthouse Road to the eastern side of the Project site. The marine transfer piping would be located approximately 450 feet from the road. The loading arms would be located approximately 900 feet from the road. Due to the far distance of the Project facilities from any publicly accessible roads and low risk of a vehicular incident occurring that

could directly impact the site and the proposed and recommended mitigation, we conclude the Project would not pose a significant risk or a significant increase in risk to the public from external impacts occurring on the road.

Rail

FERC staff also reviewed whether any rail operations would be associated with the Project and whether any existing rail lines would be located near the site. The closest rail lines are located approximately 8 miles northwest of the proposed Project site. Due to the far distance of the closest rail, we conclude the Project would not pose a significant risk or a significant increase in risk to the public from external impacts occurring on the rail line.

Air

FERC staff also reviewed whether any aircraft operations would be associated with the Project and whether any existing aircraft operations would be located near the site. FERC staff evaluated the risk of an aircraft impact from nearby airports. There is one on-site heliport situated 0.5 miles north of the proposed SPLNG Third Berth, three airports located within 22 miles and three heliports located within 3 miles of the Project site as follows:

- One general aviation airport - Jack Brooks Regional Airport located approximately 15 miles northwest of the Project site.
- Two private airports - Texas Menhaden Strip located approximately 1.5 miles south, which has been closed indefinitely and Chessen Airport located approximately 22 miles northeast of the Project site.
- Three private heliports - MFS Sabine Pass Heliport located approximately 1.5 miles south, Arco Sabine Heliport located approximately 2 miles southeast and Tenneco Shorebase Heliport located approximately 3 miles southeast of the Project site.

The USDOT Federal Aviation Administration regulations in 14 CFR 77 require SPLNG to provide a notice to the USDOT Federal Aviation Administration of its proposed construction if they exceed their notification requirements.[34] However, SPLNG indicated that the Project's design would not include any structure over 200 feet NAVD88, and no hazards to air travel from structures or LNG marine vessels on the waterway were anticipated. In addition, the marine elevation drawings indicate structures would be less than the height that would trigger notification for the one airport within 10,000 ft and there are no heliports within 5,000 ft aside from the onsite heliport, which have been previously evaluated. In addition, given the relatively few and far airports and helipads and small size and height of the Project facilities, the risk of an accidental aircraft impact is insignificant. Therefore, we conclude that the Project would not pose a significant risk or significant increase in risk to the public due to nearby aircraft operations.

[34] Title 14 CFR §77.9 requires notice of any construction more than 200 feet above ground level, any construction above a 100:1 distance to height ratio within 20,000 ft of a runway whose longest runway is more than 3,200 feet in actual length (excludes heliports), any construction above a 50:1 distance to height ratio within 10,000 ft of a runway whose longest runway is more than 3,200 feet in actual length (excludes heliports), and any construction above a 25:1 distance to height ratio within 5,000 ft from any landing or takeoff area (including heliports).

Pipelines

FERC staff reviewed whether any pipeline operations would be associated with the Project and whether any existing pipelines would be located near the site. For existing pipelines, FERC staff identified two active buried hydrocarbon pipelines located within close proximity to the Project site. These pipelines are all within established pipeline corridors, and no Third Berth Facilities are situated on top of the buried pipelines. However, it is unclear if construction equipment or new site access points would cross over the established pipeline corridors. Therefore, we recommend in section B.9.1.6 that SPLNG mark the existing pipeline corridors and provide calculations demonstrating that the loads over the existing pipelines would be adequately distributed for temporary crossings during initial construction activities prior to initial site preparation and for permanent crossings prior to construction of final design. Based on the potential consequences from a pipeline incident, FERC staff concludes the Project would not significantly increase the risk to the public beyond existing risk levels that would be present from a pipeline leak or pipeline rupture worst-case event near the Project site.

Hazardous Material Facilities and Power Plants

FERC staff reviewed whether any EPA RMP regulated facilities handling hazardous materials and power plants were located near the site to evaluate whether the facilities could adversely increase the risk to the Project site and whether the Project site could increase the risk to the EPA RMP facilities and power plants and subsequently increase the risk to the public. The Golden Pass LNG Terminal is located approximately 3 miles northwest of the Project site. Additionally, the proposed Project facilities would be adjacent to the existing Sabine Pass LNG Terminal. The closest operating research and nuclear test reactor is located in College Station, Texas, approximately 159 miles northwest from the site. The closest nuclear power plants, South Texas Project Units 1 and 2, and Riverbend Nuclear Power Plant are located approximately 147 miles southwest and 160 miles northeast of the site, respectively. Given the distances and locations of the facilities relative to the populated areas of the neighboring communities, FERC staff conclude the Project's proximity to hazardous material facilities and power plants would not pose a significant increase in risk to the public.

Onsite and Offsite Emergency Response Plans

As part of its application, SPLNG indicated that the Project would expand the current SPLNG ERP to include the SPLNG Third Berth facilities. The emergency procedures would continue to provide for the protection of personnel and the public as well as the prevention of property damage that may occur as a result of incidents at the Project facilities. The facility would also provide appropriate personnel protective equipment to enable operations personnel and first responder access to the area.

In addition, we recommend in section B.9.1.6 that SPLNG provide, for review and approval, an updated ERP prior to initial site preparation. We also recommend in section B.9.1.6 that SPLNG file three dimensional drawings, prior to construction of final design, for review and approval, that demonstrate there is a sufficient number of access and egress locations. In addition, we recommend in section B.9.1.6 that Project facilities be subject to regular inspections

throughout the life of the facility and would continue to require companies to file updates to the ERP.

9.1.6 Recommendations from FERC Preliminary Engineering and Technical Review

Based on FERC staff's preliminary engineering and technical review of the reliability and safety of the SPLNG Third Berth Project, we recommend the following mitigation measures as conditions to any Order authorizing the Project. These recommendations would 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 facilities to enhance the reliability and safety of the facilities and to mitigate the risk of impact on the public.

- **Prior to initial site preparation, SPLNG should file with the Secretary a plan to install a permanent settlement monitoring system to measure uniform and differential settlement for the equipment in the proposed project that is stamped and sealed by the professional engineer of record in the state of Louisiana. The settlement record shall be reported in the semi-annual operational reports.**
- **Prior to initial site preparation, SPLNG should file with the Secretary a detailed analysis that demonstrates external loads exerted by vehicular traffic and construction equipment would not exceed the maximum live load capability of buried pipelines at or adjacent to the Project. The analysis should be stamped and sealed by the professional engineer-of-record, registered in Louisiana and should include the depth of existing buried pipelines and evidence that the maximum load should be higher than plant construction and operation activities require. In addition, provide construction and operations procedures to demonstrate that the maximum allowable weight would never be exceeded.**
- **Prior to construction of final design, SPLNG should file with the Secretary documentation of consultation with the USDOT PHMSA on whether using normally-closed valves as a storm water removal device on curbed areas would meet the requirements of 49 CFR 193.**
- **Prior to construction of final design, SPLNG should file with the Secretary the following information, stamped and sealed by the professional engineer-of-record registered in Louisiana. In addition, SPLNG should file, in its Implementation Plan, the schedule for producing this information:**
  - **a. site preparation drawings and specifications;**
  - **b. LNG marine transfer piping and berth structures and foundation design drawings and calculations;**
  - **c. seismic specifications for procured equipment prior to issuing requests for quotations; and**
  - **d. quality control procedures to be used for civil/structural design and construction.**

Information pertaining to these specific recommendations should be filed with the Secretary, for review and written approval by the Director of OEP, or the Director's designee, within the timeframe indicated by each recommendation. Specific engineering, vulnerability, or detailed design information meeting the criteria specified in Order No. 833 (Docket No. RM16-15-000), including security information, should be submitted as critical energy infrastructure information pursuant to 18 CFR 388.113. See Critical Electric Infrastructure Security and Amending Critical Energy Infrastructure Information, Order No. 833, 81 Fed. Reg. 93,732 (December 21, 2016), FERC Stats. & Regs. 31,389 (2016). Information pertaining to items such as offsite emergency response, procedures for public notification and evacuation, and construction and operating reporting requirements should be subject to public disclosure. All information should be filed a minimum of 30 days before approval to proceed is requested.

- **Prior to initial site preparation, SPLNG should file an overall Project schedule, which includes the proposed stages of the commissioning plan.**

- **Prior to initial site preparation, SPLNG should file procedures for controlling access during construction.**

- **Prior to initial site preparation, SPLNG should file quality assurance and quality control procedures for construction activities.**

- **Prior to initial site preparation, SPLNG should file a corrosion mitigation plan for buried concrete and steel foundations.**

- **Prior to initial site preparation, SPLNG should file an updated Emergency Response Plan for the additional facilities of the Project.**

- **Prior to initial site preparation, SPLNG should file an updated Cost-Sharing Plan identifying the mechanisms for funding all Project-specific security/emergency management costs that should be imposed on state and local agencies. This comprehensive plan should include funding mechanisms for the capital costs associated with any necessary security/emergency management equipment and personnel base. SPLNG should notify FERC staff of all planning meetings in advance and should report progress on the development of its Cost Sharing Plan at 3-month intervals.**

- **Prior to construction of final design, SPLNG should file drawings and specifications for crash rated vehicle barriers at the facility entrance adjacent to the berth and Lighthouse Road for access control.**

- **Prior to construction of final design, SPLNG should file lighting drawings. The lighting drawings should show the location, elevation, type of light fixture, and lux levels of the lighting systems that would service the Third Berth and should be in accordance with the proposed specification to meet API 540 and provide illumination along the perimeter of the facility and along paths/roads of access and egress to facilitate security monitoring and emergency response operations.**

- **Prior to construction of final design, SPLNG should file security camera and intrusion detection drawings. The security camera drawings should show the location, areas covered, and features of the camera (fixed, tilt/pan/zoom, motion detection alerts, low light, mounting height, etc.) to verify camera coverage of the entire perimeter with redundancies, and cameras interior to the terminal that will enable rapid monitoring of the Project areas. The drawings should show or note the location of the intrusion detection to verify it covers the entire perimeter of the LNG plant.**

- **Prior to construction of final design, SPLNG should file fencing drawings. The fencing drawings should provide details of fencing that demonstrates it would restrict and deter access around the entire facility (including Lighthouse Road) and has a setback from exterior features (e.g., power lines, trees, etc.) and from interior features (e.g., piping, equipment, buildings, etc.) that does not allow for the fence to be overcome.**

- **Prior to construction of final design, SPLNG should file change logs that list and explain any changes made from the front end engineering design provided in SPLNG'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.**

- **Prior to construction of final design, SPLNG should file a plot plan of the final design showing all major equipment, structures, buildings, and impoundment systems.**

- **Prior to construction of final design, SPLNG should file three-dimensional plant drawings to confirm plant layout for maintenance, access, egress, and congestion.**

- **Prior to construction of final design, SPLNG should file up-to-date PFDs and P&IDs. The PFDs should include HMBs. The P&IDs should 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.**

- **Prior to construction of final design, SPLNG should file P&IDs, specifications, and procedures that clearly show and specify the tie-in details required to safely connect subsequently constructed facilities with the operational facilities.**

- **<u>Prior to construction of final design</u>, SPLNG should file a car seal philosophy and a list of all car-sealed and locked valves consistent with the P&IDs.**
- **<u>Prior to construction of final design</u>, SPLNG should file a HAZOP prior to issuing the P&IDs for construction. A copy of the review, a list of the recommendations, and actions taken on the recommendations should be filed.**
- **<u>Prior to construction of final design</u>, SPLNG should file the safe operating limits (upper and lower), alarm and shutdown set points for all instrumentation (i.e., temperature, pressures, flows, and compositions).**
- **<u>Prior to construction of final design</u>, SPLNG should file cause-and-effect matrices for the process instrumentation, fire and gas detection system, and emergency shutdown system for review and approval. The cause-and-effect matrices should include alarms and shutdown functions, details of the voting and shutdown logic, and set points.**
- **<u>Prior to construction of final design</u>, SPLNG should file an up-to-date equipment list, process and mechanical data sheets, and specifications. The specifications should include:**
  a. **building specifications (e.g., control buildings, electrical buildings, ventilated buildings, blast resistant buildings);**
  b. **mechanical specifications (e.g., piping, valve, insulation, other specialized equipment);**
  c. **electrical and instrumentation specifications (e.g., power system, control system, SIS, cable, other electrical and instrumentation); and**
  d. **security and fire safety specifications (e.g., security, passive protection, hazard detection, hazard control, firewater).**
- **<u>Prior to construction of final design</u>, SPLNG should file a list of all codes and standards and the final specification document number where they are referenced.**
- **<u>Prior to construction of final design</u>, SPLNG should file an evaluation of emergency shutdown valve closure times. The evaluation should account for the time to detect an upset or hazardous condition, notify plant personnel, and close the emergency shutdown valve(s).**
- **<u>Prior to construction of final design</u>, SPLNG should demonstrate that, for hazardous fluids, piping and piping nipples 2 inches or less in diameter are designed to withstand external loads, including vibrational loads in the vicinity of rotating equipment and operator live loads in areas accessible by operators.**
- **<u>Prior to construction of final design</u>, SPLNG should specify that all emergency shutdown valves would be equipped with open and closed position switches connected to the Distributed Control System/Safety Instrumented System.**
- **<u>Prior to construction of final design</u>, SPLNG should file an evaluation of emergency shutdown valve closure times. The evaluation shall account for the time to detect an**

upset or hazardous condition, notify plant personnel, and close the emergency shutdown valve.

- **Prior to construction of final design, SPLNG should file updated transient analysis on the dynamic pressure surge effects that the transfer line could experience during loading operations from valve opening and closure times and pump startup and shutdown operations.**
- **Prior to construction of final design, SPLNG should file documentation which demonstrates that the marine transfer area would have an emergency shutdown system that can be activated manually and is activated automatically when the fixed sensors measure LNG concentrations exceeding 40% of the lower flammable limit.**
- **Prior to construction of final design, SPLNG shall file the sizing basis and capacity for the final design of the pressure relief valves.**
- **Prior to construction of final design, SPLNG should file an updated fire protection evaluation of the proposed facilities. A copy of the evaluation, a list of recommendations and supporting justifications, and actions taken on the recommendations should be filed. The evaluation should justify the type, quantity, and location of hazard detection and hazard control, passive fire protection, emergency shutdown and depressurizing systems, firewater, and emergency response equipment, training, and qualifications in accordance with NFPA 59A. The justification for the flammable and combustible gas detection and flame and heat detection should take into account the set points, voting logic, and different wind speeds and directions. The justification for firewater should provide calculations for all firewater demands based on design densities, surface area, and throw distance and specifications for the corresponding hydrant and monitors needed to reach and cool equipment.**
- **Prior to construction of final design, SPLNG should file spill containment system drawings with dimensions and slopes of curbing, trenches, impoundments, and capacity calculations considering the useable LNG impoundment volume. The spill containment drawings should show containment for all hazardous fluids, including all liquids handled above their flash point, from the largest flow from a single line for 10 minutes, including de-inventory, or the maximum liquid from the largest vessel (or total of impounded vessels) or otherwise demonstrate that providing spill containment is not required to reduce the flammable vapor dispersion or radiant heat consequences of a spill.**
- **Prior to construction of final design, SPLNG should file detailed calculations to confirm that the final fire water volumes would be accounted for when evaluating the capacity of the impoundment system during a spill and fire scenario.**
- **Prior to construction of final design, SPLNG should demonstrate the maximum flowrate used in the basis of design of its impoundment system is the maximum flowrate hydraulically achievable unless the flowrate is limited by SIL 2 or 3 rated systems or equivalent.**

- **<u>Prior to construction of final design,</u> SPLNG should provide a plot plan with scale depicting all tie-in locations (including main LNG loading line, cooldown line, etc.) and identify the length of each piping segment to determine the de-inventory volumes for spill sizing calculations.**

- **<u>Prior to construction of final design</u>, SPLNG should demonstrate how releases from the marine areas would be prevented from entering the water and indicate which size of releases would not be captured by the marine area spill containment system.**

- **<u>Prior to construction of final design</u>, SPLNG should provide drawings and dimensions of the jetty spill containment system (i.e., spill curbing) on the jetty that would prevent spills from entering the water.**

- **<u>Prior to construction of final design</u>, SPLNG should provide the minimum and maximum trench height as well as the length of each section of the trench system evaluated in its Impoundment Swale Hydraulics analysis and demonstrate that the maximum sizing spill could be contained without overtopping each trench segment.**

- **<u>Prior to construction of final design</u>, SPLNG should provide documentation demonstrating that the impoundment basin would have automatic rainwater pumps with redundant automatic shutdown controls to prevent pumping when LNG is present.**

- **<u>Prior to construction of final design</u>, SPLNG should file finalized electrical area classification drawings. The drawings should demonstrate that the elevation of buildings located at the marine transfer area would result in the building being unclassified.**

- **<u>Prior to construction of final design</u>, SPLNG should provide documentation justifying the use of API RP 500's Figure 96 as a representation of Detail 13 of the Electrical Area Classification drawing E3-00-00003 using hazard modeling of various release rates from equivalent hole sizes (see NFPA 497 release rate of 1lb/min) or modify the electrical area classification drawings in the marine transfer area to be consistent with the most applicable Figure of API RP 500.**

- **<u>Prior to construction of final design</u>, SPLNG should file drawings and details of how process seals or isolations installed at the interface between a flammable fluid system and an electrical conduit or wiring system meet the requirements of NFPA 59A.**

- **<u>Prior to construction of final design</u>, SPLNG should file details of 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, alarm the hazardous condition, and shut down the appropriate systems.**

- **<u>Prior to construction of final design</u>, SPLNG should file 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.**
- **<u>Prior to construction of final design</u>, SPLNG should file a technical review of facility design that:**
  a. **identifies all combustion/ventilation air intake equipment and the distances to any possible flammable gas release; and**
  b. **demonstrates that these areas are adequately covered by hazard detection devices and indicates how these devices would isolate or shutdown any combustion or heating ventilation and air conditioning equipment whose continued operation could add to or sustain an emergency.**
- **<u>Prior to the construction of final design</u>, SPLNG should provide documentation demonstrating that the placement of HVAC intakes are in a location such that they not ingest gas from design spills**
- **<u>Prior to construction of final design</u>, SPLNG should file a list of alarm and shutdown set points for all hazard detectors that account for the calibration gas of the hazard detectors when determining the lower flammable limit set points for methane, propane, ethane/ethylene, pentane, and condensate.**
- **<u>Prior to construction of final design</u>, SPLNG should file an evaluation of the voting logic and voting degradation for hazard detectors.**
- **<u>Prior to construction of final design</u>, SPLNG should file a design that includes hazard detection suitable to detect high temperatures and smoldering combustion products in electrical buildings and control room buildings.**
- **<u>Prior to construction of final design</u>, SPLNG should file an analysis of the off gassing of hydrogen in battery rooms and ventilation calculations that limit concentrations below the lower flammability limits (e.g., 25 percent LFL) and should also provide hydrogen detectors that alarm (e.g., 20 to 25 percent LFL) and initiate mitigative actions (e.g., 40 to 50 percent LFL).**
- **<u>Prior to construction of final design</u>, SPLNG should file a drawing showing the location of the emergency shutdown buttons. Emergency shutdown buttons should be easily accessible, conspicuously labeled, and located in an area which would be accessible during an emergency.**
- **<u>Prior to construction of final design</u>, SPLNG should file facility plan drawings and a list of the fixed and wheeled dry-chemical, hand-held fire extinguishers, and other hazard control equipment. Plan drawings should clearly show the location and elevation by tag number of all fixed dry chemical systems in accordance with NFPA 17, and wheeled and hand-held extinguishers location travel distances are along normal paths of access and egress and in compliance with NFPA 10. The list should include the equipment tag number, manufacturer and model, elevations,**

agent type, agent capacity, discharge rate, automatic and manual remote signals initiating discharge of the units, and equipment covered.

- **Prior to construction of final design, SPLNG should specify the use of potassium bicarbonate extinguishers in areas where LNG is handled and the use of ABC extinguishers in areas where ordinary combustibles are stored and handled.**
- **Prior to construction of final design, SPLNG should file a design that includes clean agent systems in the instrumentation and electrical buildings.**
- **Prior to construction of final design, SPLNG should file drawings and specifications for the structural passive protection systems to protect equipment and supports from cryogenic releases.**
- **Prior to construction of final design, SPLNG should file calculations or test results for the structural passive protection systems to protect equipment and supports from cryogenic releases.**
- **Prior to construction of final design, SPLNG should file drawings and specifications for the structural passive protection systems to protect equipment and supports from pool and jet fires. The information should demonstrate that the passive fire protection design for the marine areas is consistent with the requirements of NFPA 307 and federal regulations.**
- **Prior to construction of final design, SPLNG should file a detailed quantitative analysis to demonstrate that adequate mitigation would be provided for each significant component within the 4,000 Btu/ft^2-hr zone from pool or jet fires that could cause failure of the component. A combination of passive and active protection for pool fires and passive and/or active for jet fires should be provided and demonstrate the effectiveness and reliability. Effectiveness of passive mitigation should be supported by calculations or test results for the thickness limiting temperature rise and effectiveness of active mitigation should be justified with calculations or test results demonstrating flow rates and durations of any cooling water would mitigate the heat absorbed by the component.**
- **Prior to construction of final design, SPLNG should demonstrate that the marine buildings housing electrical, instrument, and control systems that activate emergency systems would be designed to withstand a 20-minute fire exposure per UL 1709.**
- **Prior to construction of final design, SPLNG should file facility plan drawings showing the proposed location of the firewater system. Plan drawings should clearly show the location of firewater piping, post indicator valves, and the location and area covered by, each monitor, hydrant, hose, water curtain, deluge system, water-mist system, and sprinkler. The drawings should demonstrate that each process area, fire zone, or other sections of firewater piping can be isolated with post indicator valves such that no more than several users (e.g., NFPA 24 indicates max of six users) would be affected by a single isolation. The drawings should also provide hydrants or monitors covering all areas that contain flammable or combustible fluids, including along the entire length of the marine transfer piping.**

The coverage circles should take into account obstructions to the firewater coverage and should reflect the number of firewater needed to reach and cool exposed surfaces potentially subjected to damaging radiant heats from a fire. Drawings should also include piping and instrumentation diagrams of the firewater systems.

- **<u>Prior to construction of final design,</u> SPLNG should file drawings and documentation showing the location of all internal road vehicle protections, such as guard rails, barriers, and bollards to protect transfer piping, etc. to ensure that they are located away from roadway or protected from inadvertent damage from vehicles.**
- **<u>Prior to commissioning</u>, SPLNG should file 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. SPLNG 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>, SPLNG should file detailed plans and procedures for: testing the integrity of onsite mechanical installation; functional tests; introduction of hazardous fluids; operational tests; and placing the equipment into service.**
- **<u>Prior to commissioning</u>, SPLNG should file the operation and maintenance procedures and manuals, as well as safety procedures, hot work procedures and permits, abnormal operating conditions reporting procedures, simultaneous operations procedures, and management of change procedures and forms.**
- **<u>Prior to commissioning</u>, SPLNG should file 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, and should provide justification if not using an inert or non-flammable gas for clean-out, dry-out, purging, and tightness testing.**
- **<u>Prior to commissioning</u>, SPLNG 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>, SPLNG should file a plan to maintain a detailed training log to demonstrate that operating, maintenance, and emergency response staff has completed the required training.**
- **<u>Prior to commissioning</u>, SPLNG should file the procedures for pressure/leak tests which address the requirements of ASME B31.3. In addition, SPLNG should file a line list with pneumatic and hydrostatic test pressures.**
- **<u>Prior to introduction of hazardous fluids</u>, SPLNG should complete and document a pre-startup safety review to ensure that installed equipment meets the design and operating intent of the facility. The pre-startup safety review should include any changes since the last hazard review, operating procedures, and operator training. A copy of the review with a list of recommendations, and actions taken on each recommendation, should be filed.**

- **Prior to introduction of hazardous fluids, SPLNG should complete and document all pertinent tests (Factory Acceptance Tests, Site Acceptance Tests, Site Integration Tests) associated with the DCS and SIS that demonstrates full functionality and operability of the system.**
- **Prior to introduction of hazardous fluids, SPLNG should update and implement an alarm management program to reduce alarm complacency and maximize the effectiveness of operator response to alarms.**
- **Prior to introduction of hazardous fluids, SPLNG should complete and document a firewater monitor and hydrant coverage test. The actual coverage area from each monitor and hydrant should demonstrate it meets or exceeds the final design coverage area.**
- **SPLNG should file a request for written authorization from the Director of OEP prior to unloading or loading the first LNG cargo. SPLNG should file weekly reports on the commissioning of the proposed systems that detail the progress toward demonstrating the facilities can safely and reliably operate at or near the design flow rates. The reports should include a summary of activities, problems encountered, and remedial actions taken. The weekly reports should also include a status and list of all planned and completed safety and reliability tests, work authorizations, and punch list items. Problems of significant magnitude should be reported to the FERC within 24 hours.**
- **Prior to commencement of service, SPLNG should file a request for written authorization from the Director of OEP. Such authorization would only be granted following a determination by the Coast Guard, under its authorities under the Ports and Waterways Safety Act, the Magnuson Act, the MTSA of 2002, and the Security and Accountability For Every Port Act, that appropriate measures to ensure the safety and security of the facility and the waterway have been put into place by SPLNG or other appropriate parties.**
- **Prior to commencement of service, SPLNG should notify the FERC staff of any proposed revisions to the security plan and physical security of the plant.**
- **Prior to commencement of service, SPLNG should label piping with fluid service and direction of flow in the field, in addition to the pipe labeling requirements of NFPA 59A.**
- **Prior to commencement of service, SPLNG should file plans for any preventative and predictive maintenance program that performs periodic or continuous equipment condition monitoring.**
- **Prior to commencement of service, SPLNG should develop procedures for handling offsite contractors including responsibilities, restrictions, and limitations and for supervision of these contractors by SPLNG staff.**

In addition, we recommend that the following measures should apply throughout the life of the SPLNG Third Berth facilities.

- **The facility should 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, SPLNG 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 (e.g., LNG marine vessel arrivals, quantity and composition of imported and exported LNG, liquefied and vaporized quantities, boil off/flash gas); and plant modifications, including future plans and progress thereof. Abnormalities should include, but not be limited to, unloading/loading/shipping problems, potential hazardous conditions from offsite 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 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)" should be included in the semi-annual operational reports. Such information would provide the FERC staff with early notice of anticipated future construction/maintenance at the LNG facilities.**

- **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 the FERC staff. In the event that 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 the 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 5 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 maximum allowable operating pressure (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 from hazardous fluids transportation 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, the 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.

9.1.7 Conclusions on LNG Facility and LNG Marine Vessel Reliability and Safety

As part of the NEPA review and NGA determinations, Commission staff assesses the potential impact to the human environment in terms of safety and whether the proposed facilities would operate safely, reliably, and securely.

As a cooperating agency, the USDOT PHMSA assists the FERC by determining whether SPLNG's proposed design would meet the USDOT PHMSA's 49 CFR 193, Subpart B siting requirements. On July 24, 2019, the USDOT provided the LOD on the Project's compliance with 49 CFR 193, Subpart B. This determination has been provided to the Commission as further consideration in its decision to authorize or deny the Project. If the Project is authorized, constructed, and operated, the facility would be subject to the USDOT PHMSA'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 the USDOT PHMSA staff.

As a cooperating agency, the Coast Guard also assisted the FERC staff by reviewing the proposed LNG terminal and the associated LNG marine vessel traffic. The Coast Guard reviewed a WSA submitted by SPLNG Third Berth that focused on the navigation safety and maritime security aspects of LNG marine vessel transits along the affected waterway. On May 21, 2019, the Coast Guard issued a LOR to FERC staff indicating the Sabine-Neches Waterway would be considered suitable for accommodating the type and frequency of LNG marine traffic associated with this Project, based on the WSA and in accordance with the guidance in the Coast Guard's NVIC 01-11. If the Project is authorized and constructed, the facilities would be subject to the Coast Guard's inspection and enforcement program to ensure compliance with the requirements of 33 CFR 105 and 33 CFR 127.

FERC staff conducted a preliminary engineering and technical review of the SPLNG Third Berth design, including potential external impacts based on the site location. Based on this review, we recommend a number of mitigation measures, which would ensure continuous oversight 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 life of the facility, in order to enhance the reliability and safety of the facility to mitigate the risk of impact on the public. With the incorporation of these mitigation measures and oversight, FERC staff concluded that SPLNG Third Berth's design would include acceptable layers of protection or safeguards that would reduce the risk of a potentially hazardous scenario from developing into an event that could impact the offsite public.

10.0 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 Project are superimposed on or added to impacts associated with past, present, and reasonably foreseeable future actions. Cumulative impacts can result from individually minor, but collectively significant, actions taking place over a period of time.

The Project-specific impacts are discussed in detail in other sections of this EA. The purpose of this section is to identify and describe cumulative impacts that would potentially result from implementation of the Project along with other projects that could affect the same resources in the same approximate timeframe. 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 Project;
- impact that resource within all or part of the timespan encompassed by the proposed or reasonably expected construction and operation schedule of the Project; and
- impact that resource within all or part of the same geographic area affected by the Project. The geographic area considered varies depending on the resource being discussed, which is the general area (geographic scope) in which the Project could contribute to cumulative impacts on that particular resource.

The resources that would be affected as a result of the Project include geological resources and soils; recreation; surface water and wetlands; threatened, endangered, and other special status species; essential fish habitat; vessel traffic; marine dredging; socioeconomics; air quality; and noise.

The Project would be an expansion of the existing SPLNG Terminal. The majority of the area used for construction of the Project would be within existing industrial/commercial land used for the existing and approved facilities or open water and wetlands.

The regional landscape in the Project area is undeveloped, with the nearest residences and schools located 1 mile west of the Project in Sabine Pass, Texas. The nearest residence in Louisiana is over 5 miles east in Cameron Parish, Louisiana.

10.1 Temporal and Geographic Distribution (Geographic Scope)

For the purpose of this analysis, the temporal extent of other projects would start in the recent past and extend out for the expected duration of the impacts caused by the Project. Some Project impacts from construction could occur as soon as site preparation begins and occur over about 48 months, while operational impacts are assumed to exist throughout the life of the facility. SPLNG proposes to begin operations in 2022 and the facilities would be designed and capable of operating for an indefinite period of time with proper maintenance.

The geographic distribution of the area considered in the cumulative effects analysis varies by project and by resource. The cumulative impact analysis area, or geographic scope, for a resource may be substantially greater than the corresponding project-specific area of impact in order to consider an area large enough to encompass likely effects from other projects on the same resource. The CEQ (1997) recommends setting the geographic scope based on the natural boundaries of the resource affected, rather than jurisdictional boundaries. Resource-specific geographic scopes are provided in table B.10.1-1 and used to assess cumulative impacts for each resource.

Based on our analysis in the previous sections, we conclude that the Project would have little or no impacts on the following resources: environmental justice communities and cultural resources. Because the Project does not contribute to impacts on these resources, we do not consider them further in this analysis.

Table B.10.1-1
Resource-specific Geographic Scopes

Environmental Resource	Geographic Scope
Geological resources and soils	Area affected by and adjacent to the Project site
Water Resources	HUC 8 Watershed
Vegetation, Wildlife, and Fisheries	HUC 8 Watershed
Land use and Visual Resources	0.50 mile from the Project site
Recreation	Immediate area surrounding the SPLNG Terminal and along the Sabine Pass Channel from the new berth downstream to the Gulf of Mexico
Socioeconomics	Cameron Parish, LA and Jefferson County, TX
Air quality – construction[35]	0.25 mile from the Project
Air quality – operation	Air emission sources within a 31-mile (50-kilometer) radius of proposed sources of operational emissions from LNGCs berthed at the SPLNG Terminal
Noise	NSAs that could be affected during construction and operation; up to 1.0 mile from Project site

10.2 Projects and Activities Considered

With respect to past actions, CEQ guidance (2005) allows agencies to adopt a broad, aggregated approach without "delving into the historical details of individual past actions." Past projects that are no longer contributing to changes in the environment are included as part of the environmental baseline. Past, present, and reasonably foreseeable projects within the geographic scope for the Project, that might cause cumulative impacts when considered with the Project, are discussed in this section. FERC-regulated 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. Planned projects also include projects not under the FERC's jurisdiction that have been identified through publicly available information such as press releases, internet searches, and the applicant's communications with local agencies. As discussed in section A.9.0, there are no non-jurisdictional facilities associated with the Project.

[35] We note that GHGs do not have a localized geographic scope. GHG emissions from the Project would combine with projects world-wide to increase CO_2, methane, and other GHG concentrations in the atmosphere.

Other projects considered for cumulative impacts are defined within 40 CFR 1508.7 as, "those projects within the geographic scope and timeframe of the Project that are not considered speculative." Projects are not considered speculative if there are existing proposals, a commitment of resources or funding, or those for which the permitting process has commenced. Present effects of past actions with the potential to cumulatively interact with the Project were considered for the cumulative analysis.

The majority of impacts from the Project would be contained within or adjacent to the boundaries of the Project construction, staging areas, and site boundaries. For example, the use of the FERC Plan and Procedures, as well as SPLNG's Project-specific plans such as its erosion and sedimentation control plan, would help ensure that ground disturbance and site-stabilization activities would remain within work areas. The implementation of these plans would also limit the cumulative impacts on other resources by restoring vegetation communities once construction is complete. As described in the impact analysis in section B, the impacts for the Project are generally localized and within previously disturbed areas. As the impacts from the Project would be localized, they would not be expected to contribute significantly to the cumulative impact in the region. As a result, we have related the scope of our analysis to the magnitude of the aforementioned environmental impacts described in the impact analysis.

Projects within the geographic scope of analysis are shown on figure B.10.2-1 and listed in table B.10.2-1, and include the following: FERC-jurisdictional projects, other industrial facilities, federal and state agency projects, and road projects. These projects were identified through an independent review of publicly available information, aerial and satellite imagery, consultations with federal agencies, and information provided by SPLNG.

Table B.10.2-1 lists the other projects considered in the cumulative impacts analysis that could contribute to cumulative impacts on the following resources: groundwater, surface water, wetlands, vegetation, wildlife (aquatic and terrestrial), land use, visual resources, air quality, and noise. This table identifies the type of project, the distance from the Project, a short description of the project scope, the construction and operation timeline, the number of workers required, and the approximate size of the action. Finally, the table identifies resources potentially affected by each project.

Table B.10.2-1

Authorized, Planned, or Recently Completed Major Projects in the Vicinity of the Project Considered for Cumulative Analysis

Project	Description	Land Disturbance	Wetland Disturbance	Construction Status	Estimated Workforce	Location Relative to Third Berth Expansion Project	Environmental Resources with Potential Cumulative Impact
Sabine Pass Liquefaction Project CP11-72	Addition of four liquefaction trains (Stage 1 and 2) at the existing SPLNG Terminal transforming it into a bi-directional facility capable of vaporizing foreign-sourced LNG or liquefying domestic natural gas for foreign export.	Construction: 288.21 acres Operation: 191.2 acres	Temporary Impacts: 136.28 acres Permanent Impacts: 136.28 acres	In-service (2016-2017)	Average Construction Workforce: 1,200 Additional Operational Workforce: 110 - 150	Projects overlap	Geological Resources and Soils; Water Resources; Vegetation, Wildlife, and Fisheries; Socioeconomics; Land Use and Visual Resources; Recreation; and Air Quality & Noise (operation)
Sabine Pass Liquefaction Project Modification CP13-2	Addition of facilities and work space at the SPLNG Terminal to enhance operability and reliability of the project.	Construction: 401.15 acres Operation: 401.15 acres	Temporary Impacts: 153.53 acres Permanent Impacts: 153.53 acres	In-service (2016-2017)	Average Construction Workforce: 941 Additional Operation Workforce: 120	Projects overlap	Geological Resources and Soils; Water Resources; Vegetation, Wildlife, and Fisheries; Socioeconomics; Land Use and Visual Resources; Recreation; and Air Quality & Noise (operation)

Table B.10.2-1

Authorized, Planned, or Recently Completed Major Projects in the Vicinity of the Project Considered for Cumulative Analysis

Project	Description	Land Disturbance	Wetland Disturbance	Construction Status	Estimated Workforce	Location Relative to Third Berth Expansion Project	Environmental Resources with Potential Cumulative Impact
Sabine Pass Expansion Project CP17-22	Modifications of existing facilities and construction and operation of new facilities, including modifications at four existing meter stations, installation of a new 36-inch tap and appurtenances and 1,200-foot 36-inch-diameter lateral at the SPLNG Terminal, installation of additional compressor units at Compressor Station 760, and installation of a 6,400-foot 36-inch-diameter pipeline and 700-foot 24-inch-diameter header pipeline.	Construction: 52.9 acres Operation: 28.2 acres	No Wetland Impacts	In-service (December 2018).	Upper-limit Construction Workforce: 140 - 170 Additional Operation Workforce: 3	Projects overlap	Geological Resources and Soils; Water Resources; Vegetation, Wildlife, and Fisheries; Socioeconomics; Land Use and Visual Resources; Recreation; and Air Quality & Noise (operation)

Table B.10.2-1

Authorized, Planned, or Recently Completed Major Projects in the Vicinity of the Project Considered for Cumulative Analysis

Project	Description	Land Disturbance	Wetland Disturbance	Construction Status	Estimated Workforce	Location Relative to Third Berth Expansion Project	Environmental Resources with Potential Cumulative Impact
Sabine Pass Compression Project CP18-487	Construction and operation of a new natural gas compressor station situated on a new elevated 43,200 square-foot onshore platform, including the installation of a new tie-in facility and minor modifications at an existing valve. The new compressor station site and tie-in facility are adjacent to the SPLNG Terminal and the existing valve is approximately 61 miles northeast of the proposed compressor station site.	Construction: 24.28 acres Operation: 3.31 acres	Temporary Impacts: 2.79 acres Permanent Impacts: 2.69 acres	Anticipate starting construction late 2019	Average Construction Workforce: 80 Additional Operation Workforce: 0	Projects overlap	Geological Resources and Soils; Water Resources; Vegetation, Wildlife, and Fisheries; Socioeconomics; Land Use and Visual Resources; Recreation; and Air Quality & Noise (operation)
Sabine Pass Liquefaction Expansion Project CP13-552	Construction and operation of two liquefaction trains (Stage 3) at the existing SPLNG Terminal and approximately 104 miles of pipeline, including two loops, an extension, four laterals, four metering and regulating stations, and a new compressor station.	Construction: 2,097.61 acres Operation: 785.87 acres	Temporary Impacts: 153.5 acres Permanent Impacts: 153.5 acres	Under construction (Train 5 in-service August 2019; Train 6 in-service November 2022)	Average Construction Workforce: 1,441 Additional Operation Workforce: 123	Projects overlap	Geological Resources and Soils; Water Resources; Vegetation, Wildlife, and Fisheries; Socioeconomics; Land Use and Visual Resources; Recreation; and Air Quality & Noise (operation)

Table B.10.2-1

Authorized, Planned, or Recently Completed Major Projects in the Vicinity of the Project Considered for Cumulative Analysis

Project	Description	Land Disturbance	Wetland Disturbance	Construction Status	Estimated Workforce	Location Relative to Third Berth Expansion Project	Environmental Resources with Potential Cumulative Impact
Gulf Trace Expansion Project CP15-29	Installation of an 8-mile 36-inch-diameter lateral and two new compressor stations.	Construction: 263.43 acres Operation: 75.60 acres	Temporary Impacts: 121.5 acres Permanent Impacts: 9.86 acres	In-service (2017)	Average Construction Workforce: 347 Additional Operational Workforce: 0	Projects overlap	Geological Resources and Soils; Water Resources; Vegetation, Wildlife, and Fisheries; Socioeconomics; Land Use and Visual Resources; Recreation; and Air Quality & Noise (operation)

Table B.10.2-1

Authorized, Planned, or Recently Completed Major Projects in the Vicinity of the Project Considered for Cumulative Analysis

Project	Description	Land Disturbance	Wetland Disturbance	Construction Status	Estimated Workforce	Location Relative to Third Berth Expansion Project	Environmental Resources with Potential Cumulative Impact
Calcasieu Pass LNG/ TransCameron Pipeline CP15-550/CP15-551	Construction and operation of a new LNG export facility at the juncture of Calcasieu Ship Channel and Gulf of Mexico, including two 200,000-m^3 storage tanks and a marine berth with two loading docks. In addition, the project will include 24 miles of 42-inch-diameter pipeline.	930 acres	Temporary Impacts: 345.1 Permanent Impacts: 431.3 acres	Under construction In-service (December 2019)	Average Construction Workforce: 1,575 Additional Operational Workforce: 130	32 miles east of SPLNG Terminal	Air Quality (operation)
Port Arthur Liquefaction Project CP17-20	Construction and operation of a new LNG and export facility on Sabine-Neches Ship Channel, including feed gas pre-treatment facilities, two 4.5 MTPA capacity liquefaction trains, two 160,000-m^3 LNG storage tanks, condensate product storage, and combustion turbine generators for captive electricity generation.	Construction: 7,140 acres Operation: 6,995.40 acres	Temporary Impacts: 1,661.90 acres Permanent Impacts: 724.0 acres	Anticipate starting construction in 2019	Average Construction Workforce: 1,300 Additional Operational Workforce: 200	8 miles north of SPLNG Terminal	Water Resources; Vegetation, Wildlife, and Fisheries; Socioeconomics; Recreation; Air Quality (operation)

Table B.10.2-1

Authorized, Planned, or Recently Completed Major Projects in the Vicinity of the Project Considered for Cumulative Analysis

Project	Description	Land Disturbance	Wetland Disturbance	Construction Status	Estimated Workforce	Location Relative to Third Berth Expansion Project	Environmental Resources with Potential Cumulative Impact
Texas Connector Project CP18-7	Construction and operation of 34.2 miles of new 42-inch-diameter diameter natural gas pipeline, two compressor stations, six lateral pipelines, six meter stations, and associated facilities.	Construction: 664.70 acres Operation: 186.10 acres	Temporary Impacts: 238.10 acres Permanent Impacts: 66.8 acres	Anticipate starting construction in 2019	Average Construction Workforce: 623 Additional Operational Workforce: 20	Projects overlap	Geological Resources and Soils; Water Resources; Vegetation, Wildlife, and Fisheries; Socioeconomics; Land Use and Visual Resources; Recreation; and Noise (construction)
Louisiana Connector Project CP18-7-000	Construction and operation of 130.8 miles of new 42-inch-diameter natural gas pipeline, a compressor station, 7 lateral pipelines, 17 tie-in pipelines, 9 meter stations, and associated facilities.	Construction: 2,807 acres Operation: 771 acres	Temporary Impacts: 636.90 acres Permanent Impacts: 244.10 acres	Anticipate starting construction in 2019	Average Construction Workforce: 474 Additional Operational Workforce: 10	4 miles northwest of SPLNG Terminal	Water Resources; Vegetation, Wildlife, and Fisheries; Socioeconomics
Commonwealth LNG PF17-8	Construction and operation of eight single liquefaction trains with capacity of 9 MTPA, a single berth marine facility, six 40,000-m^3 capacity storage tanks, and a 4-mile 30-inch-diameter pipeline.	Construction: 159.6 acres Operation: 136.5 acres	88 acres	Construction: 1st quarter 2022 Proposed In-service 2nd quarter 2024	Average Construction Workforce: 800 Additional Operational Workforce: 50-60	31 miles east of SPLNG Terminal	Air Quality (operation)

Table B.10.2-1

Authorized, Planned, or Recently Completed Major Projects in the Vicinity of the Project Considered for Cumulative Analysis

Project	Description	Land Disturbance	Wetland Disturbance	Construction Status	Estimated Workforce	Location Relative to Third Berth Expansion Project	Environmental Resources with Potential Cumulative Impact
Golden Pass Products CP14-517	Construction and operation of three liquefaction process trains, each with a nominal throughput of 5.2 million MTPA, associated treatment, power and utility systems, and interconnections to existing import facilities and controls.	Construction: 1,017 acres Operation: 838 acres	Temporary Impacts: 400.8 acres Permanent Impacts: 385.8 acres	Approved – not under construction Proposed In-service (2022)	Average Construction Workforce: 1,888 Additional Operational Workforce: 200	3 miles northwest of SPLNG Terminal	Water Resources; Vegetation, Wildlife, and Fisheries; Socioeconomics; Recreation, Air Quality (operation)
Texas DOT SWG-2012-00680	Discharge of an estimated total of 891 y^3 of fill material below the mean high tide (MHT) line of the Port Arthur Ship Canal during installation of extended culverts, bedding, riprap, and sheet pile as bank stabilization and erosion prevention along a 3.1-mile distance of SH 87.	Approximately 20 acres	Greater than 3 acres	Construction has not yet commenced.	TBD – currently unavailable to public	6.5 miles northwest of SPLNG Terminal	Water Resources; Vegetation, Wildlife, and Fisheries; and Socioeconomics.

Table B.10.2-1

Authorized, Planned, or Recently Completed Major Projects in the Vicinity of the Project Considered for Cumulative Analysis

Project	Description	Land Disturbance	Wetland Disturbance	Construction Status	Estimated Workforce	Location Relative to Third Berth Expansion Project	Environmental Resources with Potential Cumulative Impact
Golden Triangle Properties SWG-2014-00661	Construction and operation of an offloading facility for railroad tank cars.	Total footprint is approximately 250 acres.	Temporary Impacts: 19.5 acres Permanent Impacts: 17.7 acres	TBD – currently unavailable to public.	TBD – currently unavailable to public	12 miles northwest of SPLNG Terminal	Water Resources; Vegetation, Wildlife, and Fisheries; and Socioeconomics.
Sunoco Pipeline, LP SWG-2015-00172	The applicant proposes to convert the previously verified (under SWG-2015-00172) temporary workspace areas for pipeline installation to a permanent access road.	1.72 acres	Temporary Impacts: 0.83 acre Permanent Impacts: 0.81 acre	Construction has not yet commenced.	TBD – currently unavailable to public	16 miles north of SPLNG Terminal	Water Resources; Vegetation, Wildlife, and Fisheries; and Socioeconomics.
Oiltanking Beaumont SWG-2000-02956	Construct a ship berthing area adjacent to existing docking facility. Activities include dredging, construction of a revetment for erosion control, a new finger pier dock in the dredged basin with an 8,000-square-foot loading platform, a new roadway and pipe rack, a new concrete approachway and pipe rack, and associated mooring and breasting structures.	24.44 acres	Temporary Impacts: 13.14 acres Permanent Impacts: 13.14 acres	In-service	TBD – currently unavailable to public	23 miles northwest of SPLNG Terminal	Water Resources; Vegetation, Wildlife, and Fisheries; Socioeconomics; Recreation, Air Quality (operation)

Table B.10.2-1 Authorized, Planned, or Recently Completed Major Projects in the Vicinity of the Project Considered for Cumulative Analysis							
Project	**Description**	**Land Disturbance**	**Wetland Disturbance**	**Construction Status**	**Estimated Workforce**	**Location Relative to Third Berth Expansion Project**	**Environmental Resources with Potential Cumulative Impact**
USA Rail Terminals, LLC SWG-2017-00078	Construction of a railroad spur and side rails that will connect to an existing railroad. The newly constructed facilities will include 21 rail siding lines, varying from 2,580 to 3,507 feet in length, and a 1.03-mile emergency vehicle access road at the project site.	56.8 acres	Temporary Impacts: 1.25 acres Permanent Impacts: 1.25 acres	Construction has not yet commenced	TBD – currently unavailable to public	23 miles northwest of SPLNG Terminal	Water Resources; Vegetation, Wildlife, and Fisheries; Socioeconomics; Air Quality (operation)

Table B.10.2-1

Authorized, Planned, or Recently Completed Major Projects in the Vicinity of the Project Considered for Cumulative Analysis

Project	Description	Land Disturbance	Wetland Disturbance	Construction Status	Estimated Workforce	Location Relative to Third Berth Expansion Project	Environmental Resources with Potential Cumulative Impact
Martin Midstream Partners, LP SWG-2015-00020	The applicant proposes to expand an existing chemical storage facility. Activities include installing a new ship dock with breasting dolphins, mooring dolphins, dock platform, and dock access trestle, riprap along shoreline for bank stabilization, and dredging.	TBD – currently unavailable to public	TBD – currently unavailable to public	TBD – currently unavailable to public	TBD – currently unavailable to public	26 miles northwest of SPLNG Terminal	Water Resources; Vegetation, Wildlife, and Fisheries; Socioeconomics; Recreation, Air Quality (operation)
City of Beaumont SWG-2012-01006	The applicant proposes to retain 27,100 y^3 of fill material that was discharged into Lawson's Canal, to create an equipment staging area in preparation for hurricane or other disaster response.	1.377 acres	No Wetland Impacts	TBD – currently unavailable to public	TBD – currently unavailable to public	30 miles northwest of SPLNG Terminal	Water Resources; Vegetation, Wildlife, and Fisheries; Socioeconomics; Air Quality (operation)

Table B.10.2-1

Authorized, Planned, or Recently Completed Major Projects in the Vicinity of the Project Considered for Cumulative Analysis

Project	Description	Land Disturbance	Wetland Disturbance	Construction Status	Estimated Workforce	Location Relative to Third Berth Expansion Project	Environmental Resources with Potential Cumulative Impact
SNWW Deepening Project	Improvements to the SNWW, including deepening of the SNWW to Beaumont with an extension of the Entrance Channel, deepening and widening of Taylor Bayou Channel and turning basins, and tapering the Sabine Bank Channel, addition/enlargement of turning and anchorage basins along the Neches River Channel, and bend easing performed on the Sabine-Neches Canal and Neches River Channel.	2,000-square-mile study area	Permanent Impacts: 86 acres of fresh marsh Creating 2,853 acres of emergent marsh vegetation, improving 871 acres of open water habitat, and nourishing 1,234 acres of existing marsh in Texas.	Pre-construction, engineering, and design phase	TBD – employment opportunities available in the area are not expected to change from current trends.	Adjacent to the SPLNG Terminal	Geological Resources and Soils; Water Resources; Vegetation, Wildlife, and Fisheries; Socioeconomics; Land Use and Visual Resources; Recreation; and Air Quality & Noise

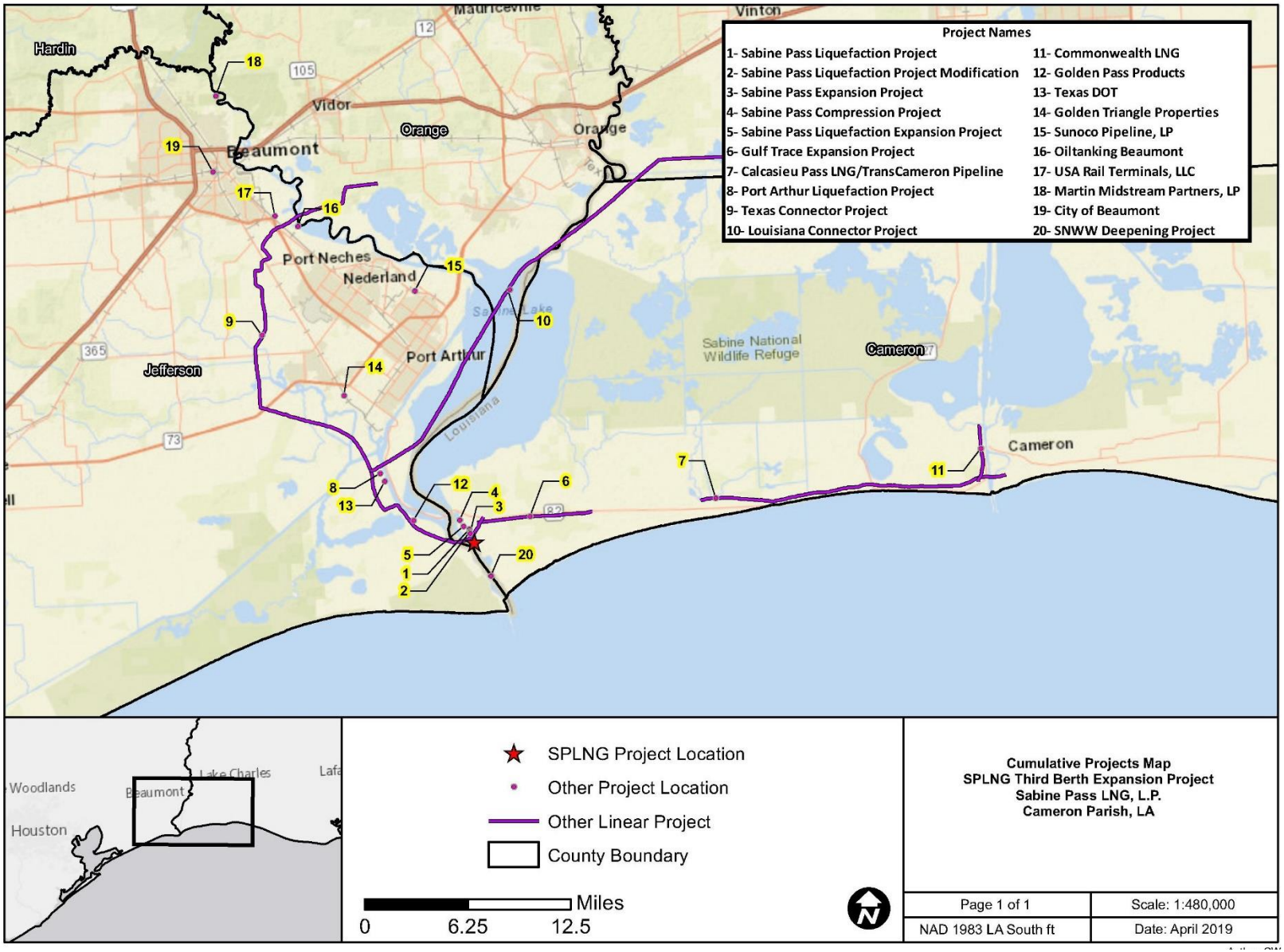

Figure B.10.2-1 Projects Evaluated for Cumulative Impact Analysis

10.3 Analysis of Cumulative Impacts

10.3.1 Geological Resources and Soils

The geographic scope for cumulative impacts on geological resources and soils was considered to be the area overlapping and adjacent to the Project workspaces. Other projects within the geographic scope for geological resources and soils that are included in the cumulative impacts analysis are identified in table B.10.2-1. In addition to overlapping and adjacent workspaces, projects must be constructed within the same or nearly the same timeframe in order to contribute towards a cumulative impact on geological resources and/or soils.

Construction of the Third Berth Project would result in permanent changes to the topographic contours at the site. Similarly, the Sabine Neches Waterway (SNWW) Deeping Project, located adjacent to the SPLNG Terminal, would also permanently alter topographic contours through dredging activities. The remaining projects within the geographic scope for cumulative impacts on geologic resources would likely result in minor alterations of the topographic contours within and adjacent to the SPLNG Terminal. The natural topography in the vicinity has been altered during previous activities. Therefore, the construction and operation of the Project, when combined with other projects in the geographic scope, would not result in significant cumulative impacts on geologic resources.

The majority of the Project area consists of existing, permanently graveled areas; impacts on native soils would be limited to the non-graveled portions of the Third Berth (see section B.2.0). Through implementation of best management practices outlined in the FERC Plan and Procedures, including use of erosion control devices, SPLNG would minimize the potential for soil impacts to extend beyond the Project area. Cumulative impacts on soils may occur when adjacent projects increase the area of soil disturbance resulting in greater potential for the adverse impacts, or when projects disturb the same area in succession. In the latter circumstance, soil disturbance may be prolonged and revegetation delayed such that soils are not sufficiently stabilized, resulting in increased potential for runoff and erosion. In addition, the prolonged exposure of soils can provide additional opportunity for the establishment of invasive plant species.

The Third Berth would be constructed within and/or adjacent to workspaces for the Sabine Pass Liquefaction Project, Sabine Pass Liquefaction Project Modification, Sabine Pass Expansion Project, Sabine Pass Compression Project, Sabine Pass Liquefaction Expansion Project, Gulf Trace Expansion Project, and Texas Connector Project (associated with the Port Arthur LNG Project). The Sabine Pass Liquefaction Project, Sabine Pass Liquefaction Project Modification, Sabine Pass Expansion Project, and Gulf Trace Expansion Project are all in-service and it is anticipated that restoration and stabilization of soils would be completed prior to construction of the Third Berth. In addition, no new permanent impacts would be associated with the other Sabine Pass Liquefaction projects as land for these projects would already be converted from soil to gravel or pavement and previously disturbed, and cumulative impacts resulting from these projects are not anticipated. Construction of the Sabine Pass Compression Project and the Texas Connector Project would be adjacent to and concurrent with the

construction of the Project; therefore, cumulative impacts on soils would occur as a result of the continued use of these areas during construction of these projects.

The other projects considered for cumulative impacts on soils are also regulated by FERC and would implement erosion controls similar to those that would be used by SPLNG. Through the implementation of SPLNG's proposed mitigation measures, impacts on geological resources and soils from the Project would be permanent but not significant, contributing to minor cumulative impacts.

10.3.2 Water Resources

Groundwater Resources

The geographic scope for cumulative impacts on groundwater resources was considered to be the HUC 8 watershed affected by the Project. Other projects within the geographic scope for groundwater resources that are included in the cumulative impacts analysis are identified in table B.10.2-1.

Cumulative impacts on groundwater may occur through construction activities, including clearing and grading; dewatering; contamination through fuel and other hazardous material spills; and groundwater withdrawal. As discussed in section B.3.1, the majority of potential impacts on groundwater resources associated with the Project would be temporary, with groundwater effects limited to water table elevations in the immediate vicinity of the Project. The majority of the other projects considered for cumulative impacts on groundwater would involve ground disturbing activities that could temporarily affect groundwater levels. The Project could contribute to cumulative impacts on groundwater use, but the minor volume of water proposed per day during operations would not result in a significant impact on groundwater resources (see section B.3.1).

Shallow groundwater could be vulnerable to contamination from inadvertent surface spills of hazardous materials and petroleum products (e.g. fuels, lubricants, and coolants) used during construction and operation of the Project and other projects within the HUC 8 watershed. However, SPLNG would implement its Plan and Procedures, as well as its Project-specific SPCC Plan during construction and SPC-SPCC Plan during operation to minimize the risk of spills and mitigate potential impacts. Therefore, the potential impacts on groundwater as a result of contamination, if any, are anticipated to be temporary, localized, and minor. Other projects considered are anticipated to implement similar measures to prevent spills of hazardous materials and petroleum products from contaminating groundwater; therefore, we have determined that cumulative impacts on groundwater quality would be minor.

Surface Water Resources

The geographic scope for surface water resources was considered to be the HUC 8 watershed. Several of the projects listed in table B.10.2-1 could be under construction at the same time as the Project, and there is potential for cumulative impacts on water quality within the HUC 8 watershed.

Construction of the Project would impact surface water resources as a result of dredging, stormwater runoff, increased vessel traffic, and increased potential for fuel spills. Other projects considered for cumulative impacts would have similar impacts on surface waterbodies.

In addition to the Project, other projects on the SNWW (e.g., Sabine Pass Liquefaction Project, Port Arthur LNG, Oiltanking Beaumont, Martin Midstream Partners, LP, SNWW Deepening Project) that would require dredging within the HUC 8 watershed would contribute to a minor cumulative impact of elevated turbidity levels at the Project site and within the SNWW, which will be determined in part by sediment characteristics at each dredge location. Increased turbidity from the Project's dredging operations, combined with concurrent dredging operations from other projects listed in Table B.10.2-1, within the SNWW, would result in a temporary cumulative impact on water quality. Clean, coarse sands settle quickly and generate relatively low turbidity. In contrast, loose silts are easily suspended and do not settle quickly, creating higher turbidity levels around the dredge. Bottom sediments in the Sabine Pass Channel are fine, consisting of sand, silt, and clay materials (COE, 2006). The water column is turbid, due to the high sediment load of inflowing waters and disturbance of bottom sediments by wind action and vessel traffic. Modeling produced for the dredging operations at the Third Berth shows that after the dredging operations stop, the concentrations return to background levels within 24 hours inside the slip and at the channel. In addition, SPLNG would be required to implement the measures incorporated into the COE permit, including any special requirements or procedures that may further minimize impacts on water quality as a result of dredging. It is anticipated that proponents of the other projects on the SNWW listed above would be required to implement similar measures as a result of their respective COE permits. Due to the temporary and primarily localized impacts, dredging activities from the Project when combined with the other projects are not likely to result in significant cumulative impacts.

The concurrent construction of other projects involving clearing, grading, or other earthwork may also increase the potential for cumulative impacts on water quality from increased stormwater runoff. All project proponents would be required to adhere to state and federal regulations regarding hydrostatic, construction, and industrial stormwater and wastewater discharges. By SPLNG and other project proponents enforcing compliance with these regulations, and with the implementation of best management practices, including SPLNG's ESMP and Project-specific SPCC Plan, and our Procedures, potential cumulative impacts on surface water resources from stormwater runoff and wastewater discharges would be minimized. Similarly, it can be reasonably assumed that all projects considered in the cumulative impacts analysis for surface water resources would be utilizing equipment and or materials that could be hazardous to the environment in the event of a spill. However, it is anticipated that all of these projects would prepare and implement a SPCC Plan or similar plan to prevent spills of hazardous materials from reaching surface water resources, as well as the measures to be implemented if such a spill occurs. Therefore, cumulative impacts on surface water resources from stormwater runoff and spills resulting from the construction of the Project and other projects in the HUC 8 watershed are anticipated to be short-term and minor.

The Project's proposed increase of 180 LNGCs annually, would result in impacts on surface water quality within the Sabine Pass Channel from ballast water discharge, cooling water discharge, and increased potential for fuel spills. With the exception of the Liquefaction Projects at the SPLNG Terminal involving expansions of LNG facilities or construction of new LNG export facilities, the Port Arthur Liquefaction Project, Golden Pass Products Project, and the SNWW Deepening Project, none of the other projects considered for cumulative impacts on surface water quality (see table B.10.2-1) are anticipated to result in increased vessel traffic or direct impacts on the Sabine Pass Channel. It is anticipated that other vessels using the Sabine Pass Channel would conduct cooling water and ballast water exchanges when moored at their various destinations. Cooling water exchanges would result in minor changes in water temperature at the point of discharge, but these impacts are not anticipated to extend beyond the immediate area (e.g., the Third Berth for the proposed Project), with temperatures quickly returning to ambient temperatures. The Coast Guard requires that all vessels carry out an open-ocean ballast water exchange prior to calling at U.S. ports. Ballast water can affect water quality by discharging water that differs in the physiochemical properties of the ambient water, including pH, salinity, and temperature. Similar to cooling water, impacts on water quality from ballast water exchange are anticipated to be localized. Increased vessel traffic could also increase the potential for spills. All vessels are required to maintain a SOPEP on board to minimize impacts from a potential spill. Therefore, cumulative impacts on water quality as a result of increased vessel traffic are not anticipated to be significant.

In addition, the Project would impact surface water resources during operation through the discharge of industrial wastewater and stormwater. As discussed above, SPLNG and other project proponents requiring the discharge of stormwater and wastewater would be required to adhere to federal and state regulations to minimize impacts on surface water resources. Therefore, cumulative impacts on water quality as a result of operation of the Project are not anticipated to be significant.

Wetlands

The geographic scope for cumulative impacts on wetlands was determined to be the HUC 8 watershed. Wetlands provide important ecosystem functions due to their ability to retain water, minimizing flooding and improving water quality by filtering contaminants before reaching surface waterbodies. Therefore, conversion of wetlands to uplands or developed land can affect water quality, as well as flooding, within a watershed. Wetlands also provide valuable wildlife habitat.

The COE issues permits under Section 404 of the CWA for construction in jurisdictional Waters of the U.S., including wetlands, and requires mitigation or compensation to ensure there is no net loss of wetlands or wetland functions. If approved and constructed, the Project, combined with these other projects identified in table B.10.2-1, could result in a cumulative impact on the quantity, function, quality, and/or types of wetlands within the HUC 8 watershed. Other projects within the HUC 8 watershed that were constructed within the past three years (and/or will be constructed concurrently with or up to three years beyond completion of the Project) could contribute to a cumulative impact on wetlands in the same watershed as the

Project. The Project and other projects in the surrounding area would impact emergent and shrub scrub wetlands and these types of wetlands were assumed to have an approximate three-year revegetation time. Forested wetlands would have a longer regeneration time, but no forested wetlands are impacted by the Project.

Temporary impacts associated with construction include the potential for runoff from construction areas that could temporarily increase turbidity and sedimentation in adjacent wetlands. Several of the projects identified propose fill or modifications to wetlands, resulting in permanent loss or conversion to other habitat types. These impacts would be offset by compensatory mitigation either through the purchase of credits from established mitigation banks or in lieu mitigation. For those projects under the jurisdiction of FERC, project proponents will be required to comply with the FERC Procedures to minimize impact on wetlands. For those projects solely under the jurisdiction of the COE, the COE would require that best management practices be implemented. Therefore, cumulative impacts associated with construction of the Project and other projects within the HUC 8 watershed would be mitigated to the extent possible. Table B.10.3-1 below quantifies impacts on wetlands for the other projects within the HUC 8 watershed.

Table B.10.3-1
Wetland Impacts for Other Projects Occurring within same Temporal and Geographic Scope for Water Resources as the SPLNG Third Berth Expansion Project

Project	Temporary Wetland Impacts (acres)	Permanent Wetland Impacts (acres)
Sabine Pass Liquefaction Project	136.28	136.28
Sabine Pass Liquefaction Project Modification	153.53	153.53
Sabine Pass Expansion Project	0.0	0.0
Sabine Pass Compression Project	2.79	2.69
Sabine Pass Liquefaction Expansion Project (Stage 3)	153.5	153.5
Gulf Trace Expansion Project	121.5	9.86
Port Arthur Liquefaction Project/Texas Connector Project/Louisiana Connector Project	758.3	725.7
Golden Pass Products	400.8	385.8
Texas DOT	>3.0	>3.0
Golden Triangle Properties	19.5	17.7
Sunoco Pipeline, LP	0.83	0.81
Oiltanking Beaumont	13.14	13.14

Table B.10.3-1 Wetland Impacts for Other Projects Occurring within same Temporal and Geographic Scope for Water Resources as the SPLNG Third Berth Expansion Project		
Project	**Temporary Wetland Impacts (acres)**	**Permanent Wetland Impacts (acres)**
USA Rail Terminals, LLC	1.25	1.25
Martin Midstream Partners, LP	Unknown	Unknown
City of Beaumont	0.0	0.0
SNWW Deepening Project	86	86
Totals	**1,850.42**	**1,689.26**

The SNWW project would result in beneficial impacts from the creation and improvement of wetland habitats. Approximately 748,000,000 y^3 of material would be dredged from the channel and placed in various beneficial use sites within the HUC 8 watershed. The proposed Neches River and Gulf Shore beneficial use features would create 2,853 acres of emergent marsh vegetation, improve 871 acres of open water habitat, and nourish 1,234 acres of existing marsh in Texas. Beneficial use would have a positive cumulative impact to wetland habitats within the watershed and would help to offset the permanent impacts to wetlands from the Project and the other projects identified in table B.10.2-1. All projects and activities listed in table B.10.2-1 that would impact jurisdictional wetlands would be required to comply with the CWA by avoiding, minimizing, or mitigating wetland impacts. Due to the requirement of the proposed Project and other projects considered for cumulative impacts to mitigate for wetland loss, we conclude that cumulative impacts on wetlands would not be significant.

10.3.3 Vegetation, Wildlife, and Aquatic Resources

The geographic scope for cumulative impacts on vegetation, wildlife, and threatened and endangered species was considered to be the HUC 8 watershed. Other projects located within the geographic scope for vegetation, wildlife, and fisheries that are included in the cumulative impacts analysis are identified in table B.10.2-1.

Vegetation and Wildlife

Vegetation plays an important role in an ecosystem, providing wildlife habitat, stabilizing soils, assisting in drainage, and providing filtration of stormwater within the watershed. Removal of vegetation can lead to loss or degradation of wildlife habitat, increased stormwater runoff, decreased water quality, increased erosion, and increased flooding.

Concurrent construction and operation of the Project with other projects included in table B.10.2-1, would result in temporary and permanent conversion of vegetated areas to unvegetated industrial land. The vegetation communities that would be affected by the Project would primarily be wetland and marsh habitat.

Increased development and loss of habitat within the geographic scope would cause wildlife to either adapt to new conditions (in the case of generalist species) or relocate to undisturbed suitable habitat. Displacement of wildlife could result in additional stress and increased competition in available habitats. In addition, direct mortality of less mobile species may occur as a result of development activities. Concurrent construction and operation of the Project with other projects included in table B.10.2-1, would result in temporary and permanent disturbance of habitat, increased noise and lighting, and increased traffic that could disturb wildlife in the area.

A majority of the projects listed in table B.10.2-1 have potential to contribute towards a cumulative impact on vegetation and wildlife when combined with the impacts from the Project. These projects, if constructed in the same general location and timeframe, could have a cumulative impact on local vegetation communities but would not have a significant impact on regional vegetation.

Construction and operation of the Project and other industrial facilities would result in permanent impacts on wildlife from habitat loss and increased noise and lighting. Dredging for the Project and other projects considered would result in the conversion of terrestrial wildlife habitat to open water habitat. Dredged material from the Project would be disposed at a selected mitigation site and approved DMPA location (see section A.8.2.1). The placement of dredged material at these sites will provide shoreline protection and additional wildlife habitat. The Project would be constructed within and adjacent to an existing industrial site that likely provides poor quality habitat for wildlife. In addition, the overall acreage of affected habitat of projects considered for cumulative impacts on wildlife (see table B.10.2-1) is relatively small compared to the total available habitat in the geographic scope. Therefore, we conclude that cumulative impacts on wildlife are not significant and that the Project when considered with the other projects in the HUC 8 watershed would not contribute to significant cumulative impacts on wildlife resources.

Aquatic Resources

Impacts on aquatic resources as a result of the Project would primarily be limited dredging and pile driving during construction and the increase of 180 LNGCs calling on the SPLNG terminal annually. While pile driving during construction of the Project would impact aquatic resources (see section B.4.2.2), it is not anticipated that other projects in the area would require pile driving. During pile driving and dredging associated with the project, it is anticipated that fish and other mobile aquatic resources would relocate to nearby suitable habitat. If dredging or other in-water activities associated with the other projects considered, occur concurrent with the proposed Project activities, available undisturbed habitat in the Project vicinity could be limited; thereby increasing density and competition in adjacent habitats. Due to the generally localized and temporary impact on water quality that could affect aquatic resources associated with dredging, as discussed above for cumulative impacts on surface water, cumulative impacts on aquatic resources during construction are not anticipated to be significant.

The increase of 180 LNGCs annually associated with operation of the Third Berth Facilities would impact aquatic resources by increasing the potential for vessel strikes by transiting LNGCs in the Gulf of Mexico and the Sabine Pass Channel, impingement and entrainment of aquatic resources during cooling water intake, and alteration of water quality during ballast water and cooling water discharges. With the exception of the Liquefaction Projects at the SPLNG Terminal involving expansions of LNG facilities or construction of new LNG export facilities, the Port Arthur Liquefaction Project, Golden Pass Products Project, and the SNWW Deepening Project, none of the other projects considered for cumulative impacts are known to result in increases in vessel traffic. The SNWW Deepening Project will not directly add new industrial facilities and shipping berths, but the deepening will indirectly result in increased shipping traffic and larger vessels entering the waterway. All LNGCs calling on the SPLNG Terminal as a result of the Project, the Liquefaction Projects, and the SNWW Deepening Project would transit existing vessel transit routes and would implement the NMFS *Vessel Strike Avoidance Measures and Reporting for Mariners* (2008) to minimize the potential for vessel strikes. The operation of an additional 180 LNGCs within the existing marine berth at the SPLNG terminal would result in more frequent ballast water and cooling water discharges, and cooling water intakes. These impacts are anticipated to be limited to the marine berth (see section B.4.2.2), and therefore, cumulative impacts on aquatic resources as a result of the Third Berth Facilities are not anticipated to be significant.

Threatened and Endangered Species

The Project, and all projects listed in table B.10.2-1 would be required to comply with the ESA and all projects requiring federal permits would be required to adhere to Section 7 of the ESA. As part of the Section 7 consultation process, the FWS and NMFS would review each project's potential impacts on federally listed species. Because the Project would have no effect on or be not likely to adversely affect threatened, endangered, and other special status species and because the other projects would also be required to comply with the ESA, we conclude that the Project, when considered with the other projects in the HUC 8 watershed, would not contribute to significant cumulative impacts on threatened, endangered, and other special status species.

10.3.4 Socioeconomics

The geographic scope for the assessment of cumulative impacts for the Project on socioeconomic resources includes Cameron Parish, Louisiana and Jefferson County, Texas where the majority of the Project workforce is anticipated to reside. While many of the projects listed in table B.10.2-1 have the potential to contribute to cumulative impacts on socioeconomic resources within the geographic scope, these impacts would be greatest during concurrent construction of projects with large construction workforces, such as the Golden Pass Products Project. For the purposes of this analysis, the review of cumulative impacts focused on projects that are anticipated to be constructed concurrently with the Project, when socioeconomic cumulative impacts would be greatest.

SPLNG anticipates that the Project workforce would primarily consist of local individuals. However, the concurrent construction of other large industrial projects, such as the Golden Pass Products Project, could limit the availability of local workers. In addition, the construction and operation workforces required for major industrial projects in Cameron Parish, Louisiana and Jefferson County, Texas could result in increased demand for housing and public services such as schools, health care facilities, social services, utilities, and emergency services if non-local workers relocate to the area with their families. Based on the number of available rental units and motels/hotels in the Project area, it is anticipated that there would be sufficient housing available, even if additional non-local workers were needed. Further, if more non-local construction workers relocate to the area with their families, including school age children, than are anticipated, this would increase the population in some schools where the non-local workers reside. However, it is likely that those families would be housed throughout many school districts in various counties and the increase in school population would be distributed through many schools. SPLNG and other large industrial projects would work directly with local law enforcement, fire departments, and emergency medical services to coordinate for effective emergency response. For the reasons listed, we conclude that cumulative impacts on public services and housing would be short-term and not significant. Operation workforces would be much smaller than construction workforces and are not anticipated to result in significant cumulative impacts.

The Project along with the other projects would contribute to the local, regional, and state economy in terms of direct payroll expenditures, purchase of supplies and materials, indirect employment in the service sector, and taxes. With the increase in local taxes and government revenue associated with the Project as well as the other projects, the overall cumulative impact on taxes and revenue during construction and operation of the Project is anticipated to be generally positive.

Where other projects are constructed at the same time as the proposed Project, the potential for additional traffic congestion exists, particularly where the projects share routes for workers and/or site deliveries. Construction of the Project would have the greatest impact on traffic, especially during peak construction. Cumulative impacts on traffic from concurrent construction of the Golden Pass LNG Project and the Port Arthur LNG Project are not anticipated, as these projects would be located in Texas and would not use the same primary roads as the Project. The Louisiana Connector Project would use SPLNG's Duck Blind Road and portions of Staging Area 2 to access the project. Similarly, the Sabine Pass Compression Project would also utilize SH 82 near the SPLNG Terminal. There would be a cumulative impact on traffic along SH 82 if these projects are constructed concurrently. SPLNG stated that they are coordinating with both Port Arthur LNG (Louisiana Connector Project) and Natural Gas Pipeline Company of America LLC (Sabine Pass Compression Project) regarding timing and schedule for use of area roadways. Due to staggered project schedules, the distance of the various projects listed in table B.10.2-1 from the Project, and SPLNG's commitment to coordinate with other projects in the area, cumulative impacts on traffic are anticipated to be localized and not significant.

Other projects that would result in an increase in vessel traffic within the Sabine Pass Channel due to expansions of LNG facilities or construction of new LNG export facilities or new shipping berths include the Sabine Pass Liquefaction Project, Sabine Pass Liquefaction Modification Project, Sabine Pass Liquefaction Expansion Project, Port Arthur Liquefaction Project, Golden Pass Products, Oiltanking Beaumont, Martin Midstream Partners, LP, and SNWW Deepening Project.

The SNWW Deepening Project will not directly add new LNG facilities and shipping berths, but the deepening will indirectly result in increased shipping traffic and larger vessels entering the waterway. The anticipated increase in LNGCs resulting from the Golden Pass Products Project and the Port Arthur LNG terminal projects would collectively add up to 600 additional LNGCs per year (along the SNWW). The shipping traffic study that was completed for the Project (Lanier, 2018) describes the existing capacity and infrastructure of the SNWW and states that the current conditions of the Waterway are such that increases in LNGC traffic (180 per year from the proposed Project plus 600 per year from the two other projects mentioned above) along with the addition of normal traffic growth over the next 10 years, the existing infrastructure will be adequate to handle more than 1,200 LNGCs per year by the year 2028. The number 1,200 is a projection of how many LNGCs may pilot the SNWW by 2028, based on passible future growth within the region served by the SNWW. The other projects listed above combined with the additional 180 SPLNG vessels per year from the Project, would result in a cumulative increase in vessel traffic within the Sabine Pass Channel, and also along international shipping routes. However, the LOR issued for the Project stated that the Sabine Pass Channel is considered suitable for the increased LNGC traffic associated with the Project (see section B.7.4.2). Therefore, we conclude that cumulative impacts on marine traffic would not be significant.

10.3.5 Land Use and Visual Resources

The geographic scope for land use and visual resources includes a 0.5-mile-radius around the Project facilities.

Land Use

Construction of the projects would result in temporary and permanent changes to land use. Land would be cleared and disturbed for installation of the project facilities and land would be permanently converted from previous use to industrial use for operation of the Project facilities. Projects with permanent aboveground components (e.g., buildings) and roads would generally have the greatest impacts on land use. New aboveground facilities proposed as part of the Project include the new loading platform and LNG transfer lines, breasting and mooring dolphins, and two new buildings (Jetty Marine Building and Customs/Security Building).

The major change in land use related to the Project would be the conversion of existing marsh to open water habitat. During construction, best management practices would be employed as required by federal and state regulatory agencies. Impacts to wetlands and waterbodies from construction of the projects would also require approval from the COE and

state regulatory agencies. Other areas affected by Project construction are within the footprint of the previously certificated SPLNG Terminal boundaries. The other projects identified in the same geographic scope (0.5 mile) as the Project site are all within this same previously certified footprint of SPLNG Terminal and would all have similar industrial proposed land use to the existing facility and the Project. Therefore, we conclude that cumulative impacts on land use would not be significant.

Visual Resources

Cumulative impacts on visual resources would be greatest near aboveground facilities. Clearing of tall vegetation such as trees can also result in impacts on visual resources.

The Project is proposed for construction adjacent to the existing SPLNG Terminal berthing area, and all new facilities would be located within an industrial area and are consistent with the surrounding viewshed. Therefore, we conclude that cumulative impacts on visual resources would be negligible.

10.3.6 Recreation

Other projects, as well as the Project, that result in increased vessel traffic within the Sabine Pass Channel, would contribute towards a cumulative impact on fishing, boating, or other recreational activities along the shoreline. Although the Sabine Pass Channel is primarily used as a major shipping route for large vessels, some recreational fishing and boating still occurs within the waterway as well as fishing from the shoreline. Therefore, anyone who uses the Sabine Pass Channel for recreational fishing, would notice an increase in vessel traffic. When combined with the other projects identified in table B.10.2-1, we conclude the Project would not result in significant cumulative impacts on recreation.

10.3.7 Air and Noise Quality

Air

Emissions of criteria air pollutants and HAPs (i.e., non-GHG pollutants) from sources in the vicinity of the Project would be additive. The cumulative impact area for air quality during the construction phase of the Project is the area adjacent to and near the boundary of the Project site. More specifically, the geographic scope for construction air emissions was a 0.25-mile radius around Project facilities. Typically, the geographic scope for operations air emissions is a 50-kilometer radius around project facilities. However, it should be noted that for this Project, no new emission sources (only increases of emissions from the existing Enclosed Ground Marine Flare and pipeline fugitives) are being added at the SPLNG Terminal. The primary emissions increase associated with the Project is from the additional 180 LNGCs that will be calling at the SPLNG Terminal annually. To get an understanding of the potential cumulative effects from that additional marine traffic, an analysis conducted for the Port Arthur Liquefaction Project Environmental Impact Statement (EIS) is referenced. (Note that the Port Arthur Liquefaction Project is located 8 miles north of the SPLNG Terminal.) That analysis for the Port Arthur

Liquefaction Project found that the increase in marine vessel traffic would be less than one percent of the total marine vessel traffic through Sabine Pass.

Although FERC typically uses 50 km to define the geographic scope around the Project site for cumulative impacts assessment of criteria pollutants and HAPs, FERC does not use such a geographic scope to evaluate GHG emissions. GHGs were identified by the EPA as pollutants in the context of climate change. GHG emissions do not directly cause local ambient air quality impacts. GHG emissions result in fundamentally global impacts that feedback to localized climate change impacts. Thus, the geographic scope for cumulative analysis of GHG emissions is global rather than local or regional. For example, a project 1 mile away emitting 1 ton of GHGs would contribute to climate change in a similar manner as a project 2,000 miles distant also emitting 1 ton of GHGs.

Construction of the Project and many of the past, present, or future projects listed in table B.10.2-1 would involve the use of construction equipment that generates air pollution; including fugitive dust. Temporary cumulative impacts on local air quality from non-GHG pollutants would result from overlapping construction schedules and geographies for other projects with the Project. In general, the emissions from construction activities for the Project and other projects in the region would result in short-term cumulative emissions that would be substantially localized to each project area. Operation of construction equipment for the Project would be primarily restricted to daylight hours and would be minimized through typical controls and practices, some of which are required under LDEQ rules; therefore, construction emissions are not expected to have a significant cumulative impact on local or regional air quality.

Operation of the Project, most notably the additional 180 LNG carriers and associated support vessels in the vicinity of the pier, would contribute cumulatively to non-GHG air pollutant levels in combination with the existing SPLNG Terminal. As discussed in section B.8.1, a detailed air quality impact analysis was conducted by SPLNG to quantitatively evaluate the combined impacts from operation of the Project (including marine vessels) and the existing SPLNG Terminal emission sources, plus representative pollutant background concentrations. Those combined impacts were compared against the NAAQS, which are designed to be protective of human health and welfare, including the environment. The results of the air quality impact analyses demonstrated that the Project emissions would not cause or contribute to an exceedance of the NAAQS. Based on this result, we conclude that the Project would not have a significant cumulative air quality impact within the 50-kilometer radius around the Project location.

Newly proposed (future) projects in the region would contribute cumulatively to air quality impacts from non-GHG pollutants through construction and operation activities. Each of these projects would need to comply with federal, state, and local air quality regulations, which may require controls to limit the emissions of certain criteria pollutants or HAPs. Although outside the scope of our analysis, it is anticipated that these project activities would result in increased permanent emissions of criteria pollutants, HAPs, and GHGs within the region. The Project's associated operating emissions, which essentially are limited to increases in emissions from existing sources at the SPLNG Terminal, would be mitigated by compliance with conditions in federal and state permits and approvals. Thus, Project operations are not

anticipated to contribute to the cumulative impact of non-GHG air pollutants on local or regional air quality.

Climate Change

Climate change is the variation in climate (including temperature, precipitation, humidity, wind, and other meteorological variables) over time, whether due to natural variability, human activities, or a combination of both, and cannot be characterized by an individual event or anomalous weather pattern. For example, a severe drought or abnormally hot summer in a particular region is not a certain indication of climate change. However, a series of severe droughts or hot summers that statistically alter the trend in average precipitation or temperature over decades may indicate climate change. Recent research has begun to attribute certain extreme weather events to climate change (U.S. scientific body on climate change is the U.S. Global Change Research Program [USGCRP], 2018).

The leading U.S. scientific body on climate change is the USGCRP, composed of representatives from thirteen federal departments and agencies.[36] The Global Change Research Act of 1990 requires the USGCRP to submit a report to the President and Congress no less than every four years that "1) integrates, evaluates, and interprets the findings of the Program; 2) analyzes the effects of global change on the natural environment, agriculture, energy production and use, land and water resources, transportation, human health and welfare, human social systems, and biological diversity; and 3) analyzes current trends in global change, both human-induced and natural, and projects major trends for the subsequent 25 to 100 years." These reports describe the state of the science relating to climate change and the effects of climate change on different regions of the U.S. and on various societal and environmental sectors, such as water resources, agriculture, energy use, and human health.

In 2017 and 2018, the USGCRP issued its *Climate Science Special Report: Fourth National Climate Assessment*, Volumes I and II (Fourth Assessment Report) (USGCRP, 2017; and USGCRP, 2018, respectively). The Fourth Assessment Report states that climate change has resulted in a wide range of impacts across every region of the country. Those impacts extend beyond atmospheric climate change alone and include changes to water resources, transportation, agriculture, ecosystems, and human health. The U.S. and the world are warming; global sea level is rising and acidifying; and certain weather events are becoming more frequent and more severe. These changes are driven by accumulation of GHG in the atmosphere through combustion of fossil fuels (coal, petroleum, and natural gas), combined with agriculture, clearing of forests, and other natural sources. These impacts have accelerated throughout the end of the 20th and into the 21st century (USGCRP 2018).

[36] The USGCRP member agencies are: Department of Agriculture, Department of Commerce, Department of Defense, Department of Energy, Department of Health and Human Services, Department of the Interior, Department of State, Department of Transportation, Environmental Protection Agency, National Aeronautics and Space Administration, National Science Foundation, Smithsonian Institution, and U.S. Agency for International Development.

Climate change is a global phenomenon; however, for this analysis, we will focus on the existing and potential cumulative climate change impacts in the Project area. The USGCRP's Fourth Assessment Report notes that the following observations of environmental impacts are attributed to climate change in the Southern Great Plains and U.S. Gulf Coast regions (USGCRP, 2017; USGCRP, 2018):

- The region has experienced an increase in annual average temperature of 1-2°F since the early 20th century, with the greatest warming during the winter months. There have been increasing number of days above 95 °F and nights above 75 °F, with a decreasing number of extremely cold days since the 1970s.
- The region has experienced an increase in precipitation. Most notably, fall precipitation has increased by 40 percent since 1948. The number of heavy downpours has increased throughout the region.
- The number of strong (Category 4 and 5) Atlantic hurricanes (including the Gulf of Mexico) has increased since the early 1980s.
- Along the Gulf Coast, sea levels have risen 5-17 inches over the past 100 years depending on local topography and subsidence.
- Many coastal areas in Texas and Louisiana are subsiding; local land elevation is sinking relative to sea level. Observed subsidence rates in the southeast are significant. The highest rise in relative sea level in the U.S. is found in Louisiana (0.3 to 0.4 inch per year) and Texas (0.2 to 0.3 inch per year).

The USGCRP's Fourth Assessment Report notes the following projections of climate change impacts in the Project region with a high or very high level of confidence[37] (USGCRP, 2018):

- Annual average temperatures in the Southern Great Plains are projected to increase by 3.6°–5.1°F by the mid-21st century and by 4.4°-8.4°F by the late 21st century, compared to the average for 1976-2005.
- The change in the number of hot days and warm nights is projected to increase dramatically by mid-century for the Gulf Coast. The region is projected to experience an additional 30 to 60 days per year above 100 °F than it does currently.
- Tropical storms are projected to be fewer in number globally, but stronger in force, exacerbating the loss of barrier islands and coastal habitats.

[37] The report authors assessed current scientific understanding of climate change based on available scientific literature. Each "Key Finding" listed in the report is accompanied by a confidence statement indicating the consistency of evidence or the consistency of model projections. A high level of confidence results from "moderate evidence (several sources, some consistency, methods vary and/or documentation limited, etc.), medium consensus." A *very* high level of confidence results from "strong evidence (established theory, multiple sources, consistent results, well documented and accepted methods, etc.), high consensus." https://science2017.globalchange.gov/chapter/front-matter-guide/

- The region is projected to see longer dry spells, although the number of days with heavy precipitation is expected to increase by mid-century. Longer periods of time between rainfall events may lead to declines in recharge of groundwater, which would likely lead to saltwater intrusion into shallow aquifers and decreased freshwater availability.
- Sea level rise along the Gulf of Mexico during the remainder of the 21st century is likely to be greater than the projected global average of 1-4 feet or more, which would result in the loss of a large portion of remaining coastal wetlands. Combined with sea level rise, local subsidence will lead to a higher "relative" change in the sea level at the local scale.

It should be noted that while the impacts described above taken individually may be manageable for certain communities, the impacts of compound extreme events (such as simultaneous heat and drought, wildfires associated with hot and dry conditions, or flooding associated with high precipitation on top of saturated soils) can be greater than the sum of the parts (USGCRP, 2018).

The GHG emissions associated with construction and operation of the Project are presented in section B.8.1. Construction and operation of the Project would increase the atmospheric concentration of GHGs, in combination with past, current, and future emissions from all other sources globally and contribute incrementally to future climate change impacts.

Currently, there is no universally accepted methodology to attribute discrete, quantifiable, physical effects on the environment to a project's incremental contribution to GHGs. We have looked at atmospheric modeling used by the EPA, National Aeronautics and Space Administration, the Intergovernmental Panel on Climate Change, and others and we found that these models are not reasonable for project-level analysis for a number of reasons. For example, these global models are not suited to determine the incremental impact of individual projects, due to both scale and overwhelming complexity. We also reviewed simpler models and mathematical techniques to determine global physical effects caused by GHG emissions, such as increases in global atmospheric CO_2 concentrations, atmospheric forcing, or ocean CO_2 absorption. We could not identify a reliable, less complex model for this task and we are not aware of a tool to meaningfully attribute specific increases in global CO_2 concentrations, heat forcing, or similar global impacts to project-specific GHG emissions. Similarly, it is not currently possible to determine localized or regional impacts from GHG emissions from the Project.

Absent such a method for relating GHG emissions to specific resource impacts, we are not able to assess potential GHG-related impacts attributable to this project. Additionally, we have not been able to find any GHG emission reduction goals established either at the federal level[38] or by the State of Louisiana. Without either the ability to determine discrete resource

[38] The national emissions reduction targets expressed in the EPA's Clean Power Plan were repealed in June 2019 and the Paris climate accord is pending withdrawal.

impacts or an established target to compare GHG emissions against, we are unable to determine the significance of the Project's contribution to climate change.

Noise

The geographic scope for cumulative impacts on noise was considered to be a 1 -mile radius of the Project site. Noise impacts are generally localized and attenuate significantly as the distance from the sound source increases. Cumulative noise impacts on residences and other NSAs are related to the distance from the disparate noise sources as well as the timing of each noise source. For instance, construction activities would not have any cumulative noise impact unless they are taking place simultaneously. There is the potential for operations noise from nearby projects to contribute to cumulative sound level impacts at NSAs, depending on the distance and direction of the projects to each other and the NSAs.

Seven of the other projects identified in the cumulative impacts analysis, as presented in table B.10.2-1, occur within the geographic scope for noise and include the Texas Connector Project, Sabine Pass Expansion Project, Sabine Pass Compression Project, Sabine Pass Liquefaction Project, Sabine Pass Liquefaction Project Modification, Liquefaction Expansion Project, and SNWW Deepening Project. While the Sabine Pass Liquefaction Project and the Sabine Pass Liquefaction Project Modification occur within the geographic scope for cumulative impacts on noise, these projects are currently in operation and the associated sound levels were included in the ambient measurements recorded during the Project sound level survey; therefore, the associated cumulative impacts have already been addressed in the analysis in section B.8.2 of this EA. In addition, the Sabine Pass Expansion Project components located within the geographic scope considered for noise include a new pipeline lateral and tap, which would not have any continuous operational noise impact. Further, the new pipeline lateral and tap associated with the Sabine Pass Expansion Project were placed in-service in August 2019. Therefore, construction and operation of these Sabine Pass Expansion Project facilities and the Project would not contribute to cumulative impacts on noise.

Construction of the Texas Connector Project is scheduled to begin in the fourth quarter of 2019 and be placed in-service in the third quarter of 2022, and therefore, would overlap with construction of the Project. The Texas Connector Project facilities located within the geographic scope considered for cumulative impacts on noise include a portion of a new natural gas pipeline, a natural gas pipeline lateral, and a meter station identified as the KMLP Meter Station. Cumulative noise impacts may occur due to the concurrent construction activities for these Texas Connector Project facilities and the proposed Project. However, pipeline construction activities are typically short-term at any given location, and the meter station construction activities would be temporary; therefore, cumulative construction noise impacts would be temporary. In addition, the combined operation of the KMLP Meter Station and the Project could result in cumulative noise impacts. However, based on noise analyses completed for the Texas Connector Project, operation of the KMLP Meter Station is not expected to have a noticeable impact on the ambient sound levels at the nearest NSA.

The Sabine Pass Liquefaction Expansion (SPLE) Project facilities located within the geographic scope for cumulative noise impacts consist of the construction and operation of two additional LNG trains, Trains 5 and 6, at the existing SPLNG Terminal. Construction of Train 6 for the SPLE Project began in November 2018 and is scheduled for completion in November 2022, which would overlap with Project construction. Therefore, cumulative impacts on noise may occur due to the concurrent construction of Train 6 for the SPLE Project and the proposed Project, as well as the combined operation of both Trains 5 and 6 and the Project.

A summary of the cumulative sound level impact resulting from concurrent construction of the Project and Train 6 for the SPLE Project is presented in table B.10.3-2 below.

Table B.10.3-2
Cumulative Sound Level Impact Evaluation for Construction of the Project and the Sabine Pass Liquefaction Expansion Project (Train 6)

NSA	Existing Ambient (dBA L_{dn})	Train 6 Construction Sound Levels (dBA L_{eq})	Train 6 Construction Sound Levels (dBA L_{dn})	Combined Project Day-Night Levels from Construction, Pile Driving, and Dredging (dBA L_{dn})	Cumulative Project Construction Levels with Train 6 Contribution (dBA L_{dn})	Cumulative Project Construction Levels with Train 6 Contribution and Ambient (dBA L_{dn})	Potential Increase Above Existing (dB)
1	55.9	40.3	37.3	47.2	47.6	56.5	0.6
2	53.3	41.1	38.1	58.2	58.3	59.5	6.2
3	53.6	40.8	37.8	39.9	41.9	53.8	0.3

As shown in table B.10.3-2, the cumulative construction sound levels at NSA 1 and NSA 3 would be below 55 L_{dn} as a result of concurrent construction of the Project and the SPLE Project. At NSA 2, the cumulative sound level from concurrent construction activities would exceed 55 L_{dn}, but based on SPLNG's cumulative noise impact evaluation, concurrent construction of both projects would result in an increase of only 0.1 dBA above the sound levels estimated for construction of the Project at NSA 2.

In addition to construction noise, operation of Trains 5 and 6 for the SPLE Project and the new Compressor Station 348 for the Sabine Pass Compression Project would result in cumulative impacts on noise when combined with operation of the Project. Natural Gas Pipeline Company of America LLC estimated the sound level contribution from operation of the new Compressor Station 348 at the nearest NSAs, as presented in Resource Report 9 for the Sabine Pass Compression Project.[39] The ambient sound level measurements recorded for the Project included noise from the operation of Trains 1 through 4 at the SPLNG Terminal and noise associated with construction of Train 5. The operational noise of Trains 1 through 4 at full load at the nearby NSAs was measured and reported in the post-construction noise survey for the project. SPLNG utilized this data to estimate the operational noise from Trains 5 and 6 by using

[39] Provided by Natural Gas Pipeline Company of America in Resource Report 9 of their Environmental Report filing on May 24, 2018, which is available on the FERC eLibrary website at https://elibrary.ferc.gov/idmws/search/fercadvsearch.asp under accession number 20180524-5038.

a distance adjustment and subtracting 3 dB to account for approximately half the number of noise sources for Trains 5 and 6 compared with Trains 1 through 4. By combining this estimate for Trains 5 and 6 with the predicted sound levels for operation of the Sabine Pass Compression Project and the proposed Project, SPLNG estimated the total cumulative sound level impact for operation of the Project, Compressor Station 348, and Trains 1 through 6 at the SPLNG Terminal, as presented in table B.10.3-3.

Table B.10.3-3

Cumulative Sound Level Impact Evaluation for Operation of the Project, Sabine Pass Compression Project, and SPLNG Terminal Trains 1 - 6

NSA	Existing Ambient dBA L_{dn}	Meas. Sound Level Contribution of Trains 1 – 4 (dBA L_{dn}) [a]	Dist. to Acoustic Center of Trains 1 - 4 (feet)	Dist. to Acoustic Center of Trains 5 - 6 (feet)	Dist. Adj. (dBA) [b]	Est. Train 5 - 6 Contribution (dBA L_{dn}) [c]	Compressor Station 348 Contribution (dBA L_{dn}) [d]	Project Contribution (dBA L_{dn})	Total Cumulative Future, SPLNG Trains 1 – 6 and Project (dBA L_{dn})	Total Future and Ambient (dBA L_{dn}) [e]	Potential Increase Above Existing (dB)
1	55.9	47.7	7,700	9,900	-2.2	42.5	35.0	37.3	49.3	56.2	0.3
2	53.3	44.5	8,500	9,200	-0.7	40.8	32.1	43.1	47.9	54.0	0.7
3	53.6	48.4	6,700	9,300	-2.8	42.6	42.3	32.5	50.3	54.2	0.6

[a] Provided by Sabine Pass Liquefaction, LLC and SPLNG in their Post Construction Sound Survey for the SPLNG Terminal filed on November 30, 2017, which is available on the FERC eLibrary website at https://elibrary.ferc.gov/idmws/search/fercadvsearch.asp under accession number 20171130-5101.

[b] The distance adjustment is calculated using a 20 x log (distance 1 / distance 2) and assumes hemispherical spreading without atmospheric absorption or additional ground absorption losses.

[c] An additional 3 decibels was subtracted from the Train 1 – 4 contribution to account for Trains 5 – 6 having half as many noise sources as Trains 1 – 4.

[d] Provided by Natural Gas Pipeline Company of America in Resource Report 9 of their Environmental Report filing on May 24, 2018, which is available on the FERC eLibrary website at https://elibrary.ferc.gov/idmws/search/fercadvsearch.asp under accession number 20180524-5038.

[e] The ambient measurements include the operation of Trains 1 – 4; therefore, this column is the sum of the existing ambient, operation of Trains 5 - 6, operation of Compressor Station 348 (Sabine Pass Compression Project), and the proposed Project contribution during operation.

As presented in table B.10.3-3, the estimated cumulative sound level for operation of the Project, Compressor Station 348, and Trains 1 through 6 at the SPLNG Terminal is below 55 dBA L_{dn} at all NSAs, and the noise increases range from 0.3 to 0.7 decibels. This indicates that the cumulative noise impact from operation of the Project, Compressor Station 348, and the SPLNG Terminal, including Trains 5 through 6 following completion of the Liquefaction Expansion Project, is minimal.

Construction of the SNWW Deepening Project is scheduled to overlap with construction of the Project. However, the SNWW Deepening Project is linear and construction activities would range across a large area, thus it is unlikely that construction activities would overlap with the Project in both time and proximity. Although unlikely, the cumulative impact on sound levels from concurrent construction of the Project and SNWW Project was estimated using conservative sound level data for the hopper dredges that are expected to be used during construction of the SNWW Deepening Project. Using these conservative estimates for the hopper dredges and the maximum construction sound level estimated for Project construction, the cumulative sound level impact at the closest NSA (NSA 2) to the Project would increase the estimated daytime and nighttime sound levels by 0.1 dBA and 3 dBA, respectively, above the sound levels estimated for construction of the Project alone. Therefore, the total cumulative sound levels estimated for concurrent construction of the Project and the SNWW Deepening Project at NSA 2 would be 61.2 dBA L_{eq} during the day and 48 dBA L_{eq} at night.

We conclude that the construction noise impact of the projects with potentially overlapping construction schedules with the Project is largely not additive with other ongoing construction and would only create a minor cumulative noise impact on the larger region. In addition, we conclude that the cumulative operational noise impacts from the identified reasonably foreseeable future actions in the area of the Project are likely to be minor.

SECTION C – ALTERNATIVES

In accordance with NEPA and FERC policy and EPA recommendations, we evaluated a range of alternatives to determine whether an alternative would be preferable to the proposed action. The range of alternatives evaluated include the No-Action Alternative, system alternatives, site alternatives, and design alternatives. Our criteria for determining if an alternative would be "preferable" are discussed in the following section.

1.0 EVALUATION PROCESS

The purpose of this evaluation is to determine whether an alternative would be preferable to the proposed action using three evaluation criteria, as discussed in greater detail below. These criteria include:

- the alternative meets the stated purpose of the project;
- is technically and economically feasible and practical; and
- offers a significant environmental advantage over a proposed action.

The alternatives were reviewed against the evaluation criteria in the sequence presented above. The first consideration for including an alternative in the analysis is whether or not it

could satisfy the stated purpose of the project. An alternative that cannot achieve the purpose for the project cannot be considered as an acceptable replacement for the project.

For further consideration, an alternative has to be technically and economically feasible. Technically practical alternatives, with exceptions, would generally require the use of common construction methods. An alternative that would require the use of a new, unique, or experimental construction method may not be technically practical because the required technology is not available or is unproven. Economically practical alternatives would result in an action that generally maintains the price competitive nature of the proposed action. Generally, the cost of an alternative as a critical factor is not considered unless the added cost to design, permit, and construct the alternative would render the project economically impractical.

Determining if an alternative provides a significant environmental advantage requires a comparison of the impacts on each resource as well as an analysis of impacts on resources that are not common to the alternatives being considered. The determination must then balance the overall impacts and all other relevant considerations. In comparing the impact between resources (factors), the degree of impact anticipated on each resource was also considered. Ultimately, an alternative that results in equal or minor advantages in terms of environmental impact would not compel us to shift the impacts from the current set of landowners to a new set of landowners.

A range of alternatives was considered in light of the Project's objectives, feasibility, and environmental consequences. Through environmental comparison and professional judgment, each alternative is considered to a point where it becomes clear whether the alternative could or could not meet the three evaluation criteria. To ensure a consistent environmental comparison and to normalize the comparison factors, desktop sources of information (e.g., publicly available data, aerial imagery) were generally used and the same general workspace requirements were assumed. Data collected in the field was evaluated if surveys were completed for both the proposed site and its corresponding alternative site. Where appropriate, site-specific information (e.g., detailed designs) was used. Environmental analysis and this evaluation consider quantitative data (e.g., counts, acreage, or mileage) and use common comparative factors such as land requirements.

The evaluation also considers impacts on both the natural and human environments. The natural environment includes water resources and wetlands, vegetation, wildlife and fisheries habitat, farmland soils, and geology. The human environment includes nearby landowners, residences, land uses and recreation, utilities, and industrial and commercial development near construction workspaces. In recognition of the competing interests and the different nature of impacts resulting from an alternative that sometimes exists (i.e., impacts on the natural environment versus impacts on the human environment), other factors are considered that are relevant to a particular alternative or discount or eliminate factors that are not relevant or may have less weight or significance. In our alternative's analyses, we often have to weigh impacts on one kind of resource (i.e., habitat for a species) against another resource (i.e., residential construction).

It is intended that each of the cooperating agencies, as discussed in section A.4.0, will review this alternatives analysis for consistency with their own administrative procedures, and those agencies with NEPA obligations may choose to adopt this analysis as part of their decision-making process.

1.1 No-Action Alternative

Under the no-action alternative SPLNG would not construct the Project. If the Project is not constructed, then neither the adverse environmental nor beneficial potential economic impacts described in this EA would occur. Implementing the no-action alternative would not allow SPLNG to meet the purpose and need as described in section A.2.0.

While the proposed Project would not increase the amount of LNG produced by the SPLNG Terminal, it would result in increased LNG export through additional LNGCs calling on the facility. It is reasonable to expect that if the Project is not constructed, other natural gas export companies would likely construct similar, new facilities to meet the demand for additional LNG exports. This would likely result in the transfer of environmental impacts from one project to another or increased impacts (if the new facilities are greenfield projects), but it would not likely eliminate or reduce impacts.

The no-action alternative would not alleviate demand for LNG in foreign nations, this alternative would likely result in development of new projects elsewhere, which would lead to greater environmental impacts due to the need for a new LNG export facility rather than modifications of an existing facility.

We conclude that the no-action alternative does not meet the Project objective and an alternative project to meet the market demand would likely not provide a significant environmental advantage over the proposed action. Therefore, we do not consider it further.

1.2 System Alternatives

System alternatives are those that would meet the stated objectives of the Project but uses a different (and often existing) facility or a different configuration of facilities that eliminates the need to construct all or part of the Project. Given the stated objective of the Project, to increase efficiency and reliability for the loading of LNGCs for transport from the SPLNG Terminal, no existing or proposed infrastructure was identified that would be a practicable system alternative. Therefore, we do not consider system alternatives further.

1.3 Site Alternatives

For the purposes of this analysis, site alternatives refer to the siting of the Third Berth at the existing SPLNG Terminal. As discussed above, the Project would need to be sited at the SPLNG Terminal to meet the stated Project purpose to increase efficiency and reliability for the loading of LNGCs for transport from the SPLNG Terminal. Three site locations for the Third Berth were evaluated based upon proximity to the existing berths, which would minimize the length of the LNG transfer piping, closeness to existing tug docks, and safety equipment as

shown below in figure C.1.3-1. The three site alternatives were compared for environmental impacts and feasibility (table C.1.3-1). The layout designs utilized in our evaluation of site alternatives include Sites 1 and 2, and the preferred design layout option for Site 3 (refer to section C.1.4).

1.3.1 Site 1

Site 1 would be located at the existing construction dock location and would require less dredging on the shore side when compared to Site 3 (Preferred Site) and would impact less wetlands. However, a portion of Point Hunt Island, a known bird rookery, would have to be removed. Additionally, this location would require longer interconnecting transfer piping as compared to the other two options. Finally, the construction dock is required for the completion of SPLNG's train six. Due to the potential dredging of an existing island and impacts on a known bird rookery, we determined that Site 1 does not provide a significant environmental advantage to the proposed Project site.

Figure C.1.3-1 SPLNG Third Berth Expansion Project Site Alternatives

1.3.2 Site 2

Site 2 would be located to the west of the existing berth and would provide a close connection to the transfer lines and would impact less wetlands. However, Site 2 would also require a portion of Point Hunt Island to be dredged. In addition, SPLNG does not have a long-term lease for this area, unlike the other two site locations. Due to the potential dredging of an existing island and impacts on a known bird rookery, we determined that Site 1 does not provide a significant environmental advantage to the proposed Project site.

1.3.3 Site 3 (Preferred Site)

Site 3 is east of and adjacent to the existing berth. This alternative would provide a close connection for tie-ins to the LNG transfer piping and boil-off gas system. While this site would impact the greatest number of wetlands, it would require the least amount of land, overall. Further, it would not require dredging of Point Hunt Island or otherwise impact any known bird rookeries. Therefore, we conclude that Site 3 is the preferred alternative.

Table C.1.3-1
Evaluation of Site Alternatives for the Third Berth

Attribute	Site 1	Site 2	Site 3 (Preferred Site)
Impact on upland/industrial areas (acres) [a]	10.95	29.00	13.36
Impact on wetlands (acres) [a, b,]	23.53	22.14	27.66
Impact on Sabine Pass Channel (acres) [a]	55.81	56.03	49.23
Impact on open water area (acres) [c]	1.31	0.00	0.00
Impact on known bird rookery	Yes	Yes	No
Total Acres Impacted	**91.60**	**107.17**	**90.25**

[a] Impacts are proposed permanent for operation.
[b] Estimated impacts for Sites 1 and 2 are based on wetland and upland boundaries as determined by an off-site background review of publicly-available data. Estimated impacts for Site 3 are based on data obtained during previous surveys and site visits.
[c] Open water area includes non-vegetated waterbody areas that are separated from the Sabine Pass Channel.

SECTION D – CONCLUSIONS AND RECOMMENDATIONS

Based on the analysis contained in this EA, we have determined that if SPLNG constructs and operates the Third Berth in accordance with its application and supplements and our recommended mitigation measures, approval of this proposal would not constitute a major federal action significantly affecting the quality of the human environment. We recommend that the Order contain a finding of no significant impact and include the following mitigation measures listed below as conditions to any authorization the Commission may issue.

1. SPLNG shall follow the construction procedures and mitigation measures described in its application and supplements (including responses to staff data requests) and as identified in the EA, unless modified by the Order. SPLNG must:

    a. request any modifications 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. The Director of OEP, or the Director's designee, has delegated authority to address any requests for approvals or authorizations necessary to carry out the conditions of the Order, and take whatever steps are necessary to ensure the protection of environmental resources during construction and operation of the Project. This authority shall allow:

    a. the modification of conditions of the Order;

    b. stop-work authority and authority to cease operation; and

    c. the imposition of any additional measures deemed necessary to ensure continued compliance with the intent of the conditions of the Order as well as the avoidance or mitigation of unforeseen adverse environmental impact resulting from the Project construction and operation.

3. **Prior to any construction**, SPLNG shall file an affirmative statement with the Secretary, certified by a senior company official, that all company personnel, EI(s), and contractor personnel will be informed of the EI's 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.

4. The authorized facility locations shall be as shown in the EA, as supplemented by filed maps. **As soon as they are available, and before the start of construction**, SPLNG shall file with the Secretary any revised detailed survey maps 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 maps.

5. SPLNG shall file with the Secretary detailed site plan drawings, maps, 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/aerial photographs. Each area 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 Commission's *Upland Erosion Control, Revegetation, and Maintenance Plan* and/or minor field realignments per landowner needs and requirements which 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.

6. **Within 60 days of the Order and before construction begins**, SPLNG shall file an Implementation Plan with the Secretary for review and written approval by the Director of OEP. SPLNG must file revisions to the plan as schedules change. The plan shall identify:

a. how SPLNG will implement the construction procedures and mitigation measures described in its application and supplements (including responses to staff data requests), identified in the EA, and required by the Order;

b. how SPLNG 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, and how the company 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 SPLNG will give to all personnel involved with construction and restoration (initial and refresher training as the Project progresses and personnel change), with the opportunity for OEP staff to participate in the training session(s);

f. the company personnel (if known) and specific portion of SPLNG's organization having responsibility for compliance;

g. the procedures (including use of contract penalties) SPLNG will follow if non-compliance occurs; and

h. for each discrete facility, a Gantt or PERT chart (or similar project scheduling diagram), and dates for:

(1) the completion of all required surveys and reports;

(2) the environmental compliance training of onsite personnel;

(3) the start of construction; and

(4) the start and completion of restoration.

7. SPLNG shall employ at least one EI for the Project. The EI 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 6 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.

8. Beginning with the filing of its Implementation Plan, SPLNG shall file updated status reports with the Secretary on a **monthly** basis until all construction and restoration activities are complete. Problems of a significant magnitude shall be reported to the FERC **within 24 hours**. 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 SPLNG's efforts to obtain the necessary federal authorizations;

b. Project schedule, including current construction status of the Project, 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, contractor nonconformance/deficiency logs, and each instance of noncompliance observed by the EI 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 and remedial actions implemented in response to all instances of noncompliance, nonconformance, or deficiency;

e. the effectiveness of all corrective and remedial actions implemented;

f. a description of any landowner/resident complaints which 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 SPLNG from other federal, state, or local permitting agencies concerning instances of noncompliance, and SPLNG's response.

9. SPLNG must receive written authorization from the Director of OEP **before commencing construction of any Project facilities**. To obtain such authorization, SPLNG must file with the Secretary documentation that it has received all applicable authorizations required under federal law (or evidence of waiver thereof).

10. SPLNG must receive written authorization from the Director of OEP **prior to introducing hazardous fluids into the Project 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.

11. SPLNG must receive written authorization from the Director of OEP **before placing the Project facilities into service**. Such authorization will only be granted following a determination that the facilities have been constructed in accordance with FERC approval, can be expected to operate safely as designed, and the rehabilitation and restoration of the areas affected by the Project are proceeding satisfactorily.

12. **Within 30 days of placing the authorized facilities in service**, SPLNG 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 in the Order SPLNG has 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.

13. **Following the completion of the initial in-water test piling phase and prior to initiating construction pile driving activities**, SPLNG shall file with the Secretary, for review and approval of the Director of OEP, the results of its underwater sound level measurements and any additional mitigation measures that it will implement to reduce noise to predicted levels. The test results and any associated mitigation shall also be filed with the NMFS.

14. **Prior to construction**, SPLNG shall file with the Secretary, documentation of correspondence with the FWS regarding the results of pre-construction rookery surveys and measures that SPLNG will implement in the event that rookeries are identified within the Project area, for review and written approval by the Director of OEP.

15. **Prior to construction**, SPLNG shall file with the Secretary, for review and written approval by the Director of OEP, measures it will implement to minimize impacts on the black rail. SPLNG shall also file documentation of correspondence with the FWS regarding these measures.

16. **During construction of the Project**, SPLNG shall implement the measures outlined in the NMFS 2006 *Sea Turtle and Smalltooth Sawfish Construction Conditions*.

17. SPLNG shall **not begin** construction activities **until**:

    a. the FERC staff receives comments from the FWS and the NMFS regarding the proposed action;

    b. the FERC staff completes ESA consultation with the FWS and NMFS; and

    c. SPLNG has received written notification from the Director of OEP that construction or use of mitigation may begin.

18. **Prior to construction**, SPLNG shall file with the Secretary, for review and written approval by the Director of OEP, mitigation measures to avoid or further minimize take of marine mammals during in-water pile driving, developed in consultation with NMFS.

19. SPLNG shall **not begin** Project construction activities and/or use of staging, storage, or temporary work areas and new or to-be-improved access roads **until:**

    a. SPLNG files with the Secretary:

        (1) remaining cultural resources survey report(s);

        (2) site evaluation report(s) and avoidance/treatment plan(s), as required; and/or

        (3) comments from the Texas SHPO.

    b. the Advisory Council on Historic Preservation is afforded an opportunity to comment if historic properties would be adversely affected; and

    c. the FERC staff reviews and the Director of OEP approves the cultural resources reports and plans, and notifies SPLNG in writing that treatment plans/mitigation measures (including archaeological data recovery) may be implemented and/or construction may proceed.

    All materials filed with the Commission containing **location, character, and ownership** information about cultural resources must have the cover and any relevant pages therein clearly labeled in bold lettering: "**CUI//PRIV- DO NOT RELEASE**."

20. **Prior to construction**, SPLNG shall file with the Secretary a copy of the LDNR's Coastal Zone Management Act consistency determination for the Project.

21. **Prior to initial site preparation**, SPLNG shall file with the Secretary a plan to install a permanent settlement monitoring system to measure uniform and differential settlement for the equipment in the proposed project that is stamped and sealed by the professional engineer of record in the state of Louisiana. The settlement record shall be reported in the

semi-annual operational reports.

22. **Prior to initial site preparation**, SPLNG shall file with the Secretary a detailed analysis that demonstrates external loads exerted by vehicular traffic and construction equipment will not exceed the maximum live load capability of buried pipelines at or adjacent to the Project. The analysis shall be stamped and sealed by the professional engineer-of-record, registered in Louisiana and shall include the depth of existing buried pipelines and evidence that the maximum load shall be higher than plant construction and operation activities require. In addition, provide construction and operations procedures to demonstrate that the maximum allowable weight will never be exceeded.

23. **Prior to construction of final design**, SPLNG shall file with the Secretary documentation of consultation with the USDOT PHMSA on whether using normally-closed valves as a storm water removal device on curbed areas would meet the requirements of 49 CFR 193.

24. **Prior to construction of final design**, SPLNG shall file with the Secretary the following information, stamped and sealed by the professional engineer-of-record registered in Louisiana. In addition, SPLNG shall file, in its Implementation Plan, the schedule for producing this information:

    a. site preparation drawings and specifications;

    b. LNG marine transfer piping and berth structures and foundation design drawings and calculations;

    c. seismic specifications for procured equipment prior to issuing requests for quotations; and

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

Conditions 25 through 100 shall apply to the SPLNG Third Berth facilities at the SPLNG Terminal. Information pertaining to these specific conditions shall be filed with the Secretary, for review and written approval by the Director of OEP, or the Director's designee, within the timeframe indicated by each condition. Specific engineering, vulnerability, or detailed design information meeting the criteria specified in Order No. 833 (Docket No. RM16-15-000), including security information, shall be submitted as critical energy infrastructure information pursuant to 18 CFR 388.113. See Critical Electric Infrastructure Security and Amending Critical Energy Infrastructure Information, Order No. 833, 81 Fed. Reg. 93,732 (December 21, 2016), FERC Stats. & Regs. 31,389 (2016). Information pertaining to items such as offsite emergency response, procedures for public notification and evacuation, and construction and operating reporting requirements shall be subject to public disclosure. All information shall be filed **a minimum of 30 days** before approval to proceed is requested.

25. **Prior to initial site preparation**, SPLNG shall file an overall Project schedule, which includes the proposed stages of the commissioning plan.

26. **Prior to initial site preparation**, SPLNG shall file procedures for controlling access

during construction.

27. **Prior to initial site preparation**, SPLNG shall file quality assurance and quality control procedures for construction activities.

28. **Prior to initial site preparation**, SPLNG shall file a corrosion mitigation plan for buried concrete and steel foundations.

29. **Prior to initial site preparation**, SPLNG shall file an updated Emergency Response Plan for the additional facilities of the Project

30. **Prior to initial site preparation**, SPLNG shall file an updated Cost-Sharing Plan identifying the mechanisms for funding all Project-specific security/emergency management costs that shall be imposed on state and local agencies. This comprehensive plan shall include funding mechanisms for the capital costs associated with any necessary security/emergency management equipment and personnel base. SPLNG shall notify FERC staff of all planning meetings in advance and shall report progress on the development of its Cost Sharing Plan at **3-month intervals**.

31. **Prior to construction of final design**, SPLNG shall file drawings and specifications for crash rated vehicle barriers at the facility entrance adjacent to the berth and Lighthouse Road for access control.

32. **Prior to construction of final design**, SPLNG shall file lighting drawings. The lighting drawings shall show the location, elevation, type of light fixture, and lux levels of the lighting systems that would service the Third Berth and shall be in accordance with the proposed specification to meet API 540 and provide illumination along the perimeter of the facility and along paths/roads of access and egress to facilitate security monitoring and emergency response operations.

33. **Prior to construction of final design**, SPLNG shall file security camera and intrusion detection drawings. The security camera drawings shall show the location, areas covered, and features of the camera (fixed, tilt/pan/zoom, motion detection alerts, low light, mounting height, etc.) to verify camera coverage of the entire perimeter with redundancies, and cameras interior to the terminal that will enable rapid monitoring of the Project areas. The drawings shall show or note the location of the intrusion detection to verify it covers the entire perimeter of the LNG plant.

34. **Prior to construction of final design**, SPLNG shall file fencing drawings. The fencing drawings shall provide details of fencing that demonstrates it will restrict and deter access around the entire facility (including Lighthouse Road) and has a setback from exterior features (e.g., power lines, trees, etc.) and from interior features (e.g., piping, equipment, buildings, etc.) that does not allow for the fence to be overcome.

35. **Prior to construction of final design**, SPLNG shall file change logs that list and explain any changes made from the front end engineering design provided in SPLNG'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.

36. **Prior to construction of final design**, SPLNG shall file a plot plan of the final design showing all major equipment, structures, buildings, and impoundment systems.

37. **Prior to construction of final design**, SPLNG shall file three-dimensional plant drawings to confirm plant layout for maintenance, access, egress, and congestion.

38. **Prior to construction of final design**, SPLNG shall file up-to-date PFDs and P&IDs. The PFDs shall include HMBs. The P&IDs shall 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.

39. **Prior to construction of final design**, SPLNG shall file P&IDs, specifications, and procedures that clearly show and specify the tie-in details required to safely connect subsequently constructed facilities with the operational facilities.

40. **Prior to construction of final design**, SPLNG shall file a car seal philosophy and a list of all car-sealed and locked valves consistent with the P&IDs.

41. **Prior to construction of final design**, SPLNG shall file a HAZOP prior to issuing the P&IDs for construction. A copy of the review, a list of the recommendations, and actions taken on the recommendations shall be filed.

42. **Prior to construction of final design**, SPLNG shall file the safe operating limits (upper and lower), alarm and shutdown set points for all instrumentation (i.e., temperature, pressures, flows, and compositions).

43. **Prior to construction of final design**, SPLNG shall file cause-and-effect matrices for the process instrumentation, fire and gas detection system, and emergency shutdown system for review and approval. The cause-and-effect matrices shall include alarms and shutdown functions, details of the voting and shutdown logic, and set points.

44. **Prior to construction of final design**, SPLNG shall file an up-to-date equipment list, process and mechanical data sheets, and specifications. The specifications shall include:

a. building specifications (e.g., control buildings, electrical buildings, ventilated buildings, blast resistant buildings);

b. mechanical specifications (e.g., piping, valve, insulation, other specialized equipment);

c. electrical and instrumentation specifications (e.g., power system, control system, SIS, cable, other electrical and instrumentation); and

d. security and fire safety specifications (e.g., security, passive protection, hazard detection, hazard control, firewater).

45. **Prior to construction of final design**, SPLNG shall file a list of all codes and standards and the final specification document number where they are referenced.

46. **Prior to construction of final design**, SPLNG shall file an evaluation of emergency shutdown valve closure times. The evaluation shall account for the time to detect an upset or hazardous condition, notify plant personnel, and close the emergency shutdown valve(s).

47. **Prior to construction of final design**, SPLNG shall demonstrate that, for hazardous fluids, piping and piping nipples 2 inches or less in diameter are designed to withstand external loads, including vibrational loads in the vicinity of rotating equipment and operator live loads in areas accessible by operators.

48. **Prior to construction of final design**, SPLNG shall specify that all emergency shutdown valves will be equipped with open and closed position switches connected to the Distributed Control System/Safety Instrumented System.

49. **Prior to construction of final design**, SPLNG shall file an evaluation of emergency shutdown valve closure times. The evaluation shall account for the time to detect an upset or hazardous condition, notify plant personnel, and close the emergency shutdown valve.

50. **Prior to construction of final design**, SPLNG shall file updated transient analysis on the dynamic pressure surge effects that the transfer line could experience during loading operations from valve opening and closure times and pump startup and shutdown operations.

51. **Prior to construction of final design**, SPLNG shall file documentation which demonstrates that the marine transfer area will have an emergency shutdown system that can be activated manually and is activated automatically when the fixed sensors measure LNG concentrations exceeding 40% of the lower flammable limit.

52. **Prior to construction of final design**, SPLNG shall file the sizing basis and capacity for the final design of the pressure relief valves.

53. **Prior to construction of final design**, SPLNG shall file an updated fire protection evaluation of the proposed facilities. A copy of the evaluation, a list of recommendations

and supporting justifications, and actions taken on the recommendations shall be filed. The evaluation shall justify the type, quantity, and location of hazard detection and hazard control, passive fire protection, emergency shutdown and depressurizing systems, firewater, and emergency response equipment, training, and qualifications in accordance with NFPA 59A. The justification for the flammable and combustible gas detection and flame and heat detection shall take into account the set points, voting logic, and different wind speeds and directions. The justification for firewater shall provide calculations for all firewater demands based on design densities, surface area, and throw distance and specifications for the corresponding hydrant and monitors needed to reach and cool equipment.

54. **Prior to construction of final design**, SPLNG shall file spill containment system drawings with dimensions and slopes of curbing, trenches, impoundments, and capacity calculations considering the useable LNG impoundment volume. The spill containment drawings shall show containment for all hazardous fluids, including all liquids handled above their flash point, from the largest flow from a single line for 10 minutes, including de-inventory, or the maximum liquid from the largest vessel (or total of impounded vessels) or otherwise demonstrate that providing spill containment is not required to reduce the flammable vapor dispersion or radiant heat consequences of a spill.

55. **Prior to construction of final design**, SPLNG shall file detailed calculations to confirm that the final fire water volumes will be accounted for when evaluating the capacity of the impoundment system during a spill and fire scenario.

56. **Prior to construction of final design**, SPLNG shall demonstrate the maximum flowrate used in the basis of design of its impoundment system is the maximum flowrate hydraulically achievable unless the flowrate is limited by SIL 2 or 3 rated systems or equivalent.

57. **Prior to construction of final design**, SPLNG shall provide a plot plan with scale depicting all tie-in locations (including main LNG loading line, cooldown line, etc.) and identify the length of each piping segment to determine the de-inventory volumes for spill sizing calculations.

58. **Prior to construction of final design**, SPLNG shall demonstrate how releases from the marine areas will be prevented from entering the water and indicate which size of releases will not be captured by the marine area spill containment system.

59. **Prior to construction of final design**, SPLNG shall provide drawings and dimensions of the jetty spill containment system (i.e., spill curbing) on the jetty that will prevent spills from entering the water.

60. **Prior to construction of final design**, SPLNG shall provide the minimum and maximum trench height as well as the length of each section of the trench system evaluated in its Impoundment Swale Hydraulics analysis and demonstrate that the maximum sizing spill could be contained without overtopping each trench segment.

61. **Prior to construction of final design**, SPLNG shall provide documentation

demonstrating that the impoundment basin will have automatic rainwater pumps with redundant automatic shutdown controls to prevent pumping when LNG is present.

62. **Prior to construction of final design**, SPLNG shall file finalized electrical area classification drawings. The drawings shall demonstrate that the elevation of buildings located at the marine transfer area will result in the building being unclassified.

63. **Prior to construction of final design**, SPLNG shall provide documentation justifying the use of API RP 500's Figure 96 as a representation of Detail 13 of the Electrical Area Classification drawing E3-00-00003 using hazard modeling of various release rates from equivalent hole sizes (see NFPA 497 release rate of 1lb/min) or modify the electrical area classification drawings in the marine transfer area to be consistent with the most applicable Figure of API RP 500.

64. **Prior to construction of final design**, SPLNG shall file drawings and details of how process seals or isolations installed at the interface between a flammable fluid system and an electrical conduit or wiring system meet the requirements of NFPA 59A.

65. **Prior to construction of final design**, SPLNG shall file details of 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, alarm the hazardous condition, and shut down the appropriate systems.

66. **Prior to construction of final design**, SPLNG shall file 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.

67. **Prior to construction of final design**, SPLNG shall file a technical review of facility design that:

    a. identifies all combustion/ventilation air intake equipment and the distances to any possible flammable gas release; and

    b. demonstrates that these areas are adequately covered by hazard detection devices and indicates how these devices will isolate or shutdown any combustion or heating ventilation and air conditioning equipment whose continued operation could add to or sustain an emergency.

68. **Prior to the construction of final design**, SPLNG shall provide documentation demonstrating that the placement of HVAC intakes are in a location such that they not ingest gas from design spills

69. **Prior to construction of final design**, SPLNG shall file a list of alarm and shutdown set points for all hazard detectors that account for the calibration gas of the hazard detectors

when determining the lower flammable limit set points for methane, propane, ethane/ethylene, pentane, and condensate.

70. **Prior to construction of final design**, SPLNG shall file an evaluation of the voting logic and voting degradation for hazard detectors.

71. **Prior to construction of final design**, SPLNG shall file a design that includes hazard detection suitable to detect high temperatures and smoldering combustion products in electrical buildings and control room buildings.

72. **Prior to construction of final design**, SPLNG shall file an analysis of the off gassing of hydrogen in battery rooms and ventilation calculations that limit concentrations below the lower flammability limits (e.g., 25 percent LFL) and shall also provide hydrogen detectors that alarm (e.g., 20 to 25 percent LFL) and initiate mitigative actions (e.g., 40 to 50 percent LFL).

73. **Prior to construction of final design**, SPLNG shall file a drawing showing the location of the emergency shutdown buttons. Emergency shutdown buttons shall be easily accessible, conspicuously labeled, and located in an area which will be accessible during an emergency.

74. **Prior to construction of final design**, SPLNG shall file facility plan drawings and a list of the fixed and wheeled dry-chemical, hand-held fire extinguishers, and other hazard control equipment. Plan drawings shall clearly show the location and elevation by tag number of all fixed dry chemical systems in accordance with NFPA 17, and wheeled and hand-held extinguishers location travel distances are along normal paths of access and egress and in compliance with NFPA 10. The list shall include the equipment tag number, manufacturer and model, elevations, agent type, agent capacity, discharge rate, automatic and manual remote signals initiating discharge of the units, and equipment covered.

75. **Prior to construction of final design**, SPLNG shall specify the use of potassium bicarbonate extinguishers in areas where LNG is handled and the use of ABC extinguishers in areas where ordinary combustibles are stored and handled.

76. **Prior to construction of final design**, SPLNG shall file a design that includes clean agent systems in the instrumentation and electrical buildings.

77. **Prior to construction of final design**, SPLNG shall file drawings and specifications for the structural passive protection systems to protect equipment and supports from cryogenic releases.

78. **Prior to construction of final design**, SPLNG shall file calculations or test results for the structural passive protection systems to protect equipment and supports from cryogenic releases.

79. **Prior to construction of final design**, SPLNG shall file drawings and specifications for the structural passive protection systems to protect equipment and supports from pool and

jet fires. The information shall demonstrate that the passive fire protection design for the marine areas is consistent with the requirements of NFPA 307 and federal regulations.

80. **Prior to construction of final design**, SPLNG shall file a detailed quantitative analysis to demonstrate that adequate mitigation will be provided for each significant component within the 4,000 Btu/ft2-hr zone from pool or jet fires that could cause failure of the component. A combination of passive and active protection for pool fires and passive and/or active for jet fires shall be provided and demonstrate the effectiveness and reliability. Effectiveness of passive mitigation shall be supported by calculations or test results for the thickness limiting temperature rise and effectiveness of active mitigation shall be justified with calculations or test results demonstrating flow rates and durations of any cooling water will mitigate the heat absorbed by the component.

81. **Prior to construction of final design**, SPLNG shall demonstrate that the marine buildings housing electrical, instrument, and control systems that activate emergency systems will be designed to withstand a 20-minute fire exposure per UL 1709.

82. **Prior to construction of final design**, SPLNG shall file facility plan drawings showing the proposed location of the firewater system. Plan drawings shall clearly show the location of firewater piping, post indicator valves, and the location and area covered by, each monitor, hydrant, hose, water curtain, deluge system, water-mist system, and sprinkler. The drawings shall demonstrate that each process area, fire zone, or other sections of firewater piping can be isolated with post indicator valves such that no more than several users (e.g., NFPA 24 indicates max of six users) will be affected by a single isolation. The drawings shall also provide hydrants or monitors covering all areas that contain flammable or combustible fluids, including along the entire length of the marine transfer piping. The coverage circles shall take into account obstructions to the firewater coverage and shall reflect the number of firewater needed to reach and cool exposed surfaces potentially subjected to damaging radiant heats from a fire. Drawings shall also include piping and instrumentation diagrams of the firewater systems.

83. **Prior to construction of final design**, SPLNG shall file drawings and documentation showing the location of all internal road vehicle protections, such as guard rails, barriers, and bollards to protect transfer piping, etc. to ensure that they are located away from roadway or protected from inadvertent damage from vehicles.

84. **Prior to commissioning**, SPLNG shall file 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. SPLNG 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.

85. **Prior to commissioning**, SPLNG shall file detailed plans and procedures for: testing the integrity of onsite mechanical installation; functional tests; introduction of hazardous fluids; operational tests; and placing the equipment into service.

86. **Prior to commissioning**, SPLNG shall file the operation and maintenance procedures and manuals, as well as safety procedures, hot work procedures and permits, abnormal operating conditions reporting procedures, simultaneous operations procedures, and management of change procedures and forms.

87. **Prior to commissioning**, SPLNG shall file 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, and shall provide justification if not using an inert or non-flammable gas for clean-out, dry-out, purging, and tightness testing.

88. **Prior to commissioning**, SPLNG shall tag all equipment, instrumentation, and valves in the field, including drain valves, vent valves, main valves, and car-sealed or locked valves.

89. **Prior to commissioning**, SPLNG shall file a plan to maintain a detailed training log to demonstrate that operating, maintenance, and emergency response staff has completed the required training.

90. **Prior to commissioning**, SPLNG shall file the procedures for pressure/leak tests which address the requirements of ASME B31.3. In addition, SPLNG shall file a line list with pneumatic and hydrostatic test pressures.

91. **Prior to introduction of hazardous fluids**, SPLNG shall complete and document a pre-startup safety review to ensure that installed equipment meets the design and operating intent of the facility. The pre-startup safety review shall include any changes since the last hazard review, operating procedures, and operator training. A copy of the review with a list of recommendations, and actions taken on each recommendation, shall be filed.

92. **Prior to introduction of hazardous fluids**, SPLNG shall complete and document all pertinent tests (Factory Acceptance Tests, Site Acceptance Tests, Site Integration Tests) associated with the DCS and SIS that demonstrates full functionality and operability of the system.

93. **Prior to introduction of hazardous fluids**, SPLNG shall update and implement an alarm management program to reduce alarm complacency and maximize the effectiveness of operator response to alarms.

94. **Prior to introduction of hazardous fluids**, SPLNG shall complete and document a firewater monitor and hydrant coverage test. The actual coverage area from each monitor and hydrant shall demonstrate it meets or exceeds the final design coverage area.

95. SPLNG shall file a request for written authorization from the Director of OEP **prior to unloading or loading the first LNG cargo**. SPLNG shall file weekly reports on the commissioning of the proposed systems that detail the progress toward demonstrating the facilities can safely and reliably operate at or near the design flow rates. The reports shall include a summary of activities, problems encountered, and remedial actions taken. The weekly reports shall also include a status and list of all planned and completed safety and

reliability tests, work authorizations, and punch list items. Problems of significant magnitude shall be reported to the FERC **within 24 hours**.

96. **Prior to commencement of service**, SPLNG shall file a request for written authorization from the Director of OEP. Such authorization would only be granted following a determination by the Coast Guard, under its authorities under the Ports and Waterways Safety Act, the Magnuson Act, the MTSA of 2002, and the Security and Accountability For Every Port Act, that appropriate measures to ensure the safety and security of the facility and the waterway have been put into place by SPLNG or other appropriate parties.

97. **Prior to commencement of service**, SPLNG shall notify the FERC staff of any proposed revisions to the security plan and physical security of the plant.

98. **Prior to commencement of service**, SPLNG shall label piping with fluid service and direction of flow in the field, in addition to the pipe labeling requirements of NFPA 59A.

99. **Prior to commencement of service**, SPLNG shall file plans for any preventative and predictive maintenance program that performs periodic or continuous equipment condition monitoring.

100. P**rior to commencement of service**, SPLNG shall develop procedures for handling offsite contractors including responsibilities, restrictions, and limitations and for supervision of these contractors by SPLNG staff.

In addition, conditions 101 through 103 shall apply **throughout the life of the SPLNG Third Berth facilities**.

101. 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, SPLNG 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.

102. **Semi-annual** operational reports shall be filed with the Secretary to identify changes in facility design and operating conditions; abnormal operating experiences; activities (e.g., LNG marine vessel arrivals, quantity and composition of imported and exported LNG, liquefied and vaporized quantities, boil off/flash gas); and plant modifications, including future plans and progress thereof. Abnormalities shall include, but not be limited to, unloading/loading/shipping problems, potential hazardous conditions from offsite 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)" shall be included in the semi-annual operational reports. Such information would provide the FERC staff with early notice of anticipated future construction/maintenance at the LNG facilities.

103. 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 the FERC staff. In the event that 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 the 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 5 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 maximum allowable operating pressure (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 from hazardous fluids transportation 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, the 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 E – REFERENCES

Abbott, R. & Bing-Sawyer E. 2002. Assessment of pile driving impacts on the Sacramento blackfish (*Orthodon microlepidotus*). Draft report prepared for Caltrans District 4. San Francisco, CA: Caltrans.

American Hospital Directory. 2018. Texas. Available online at: www.ahd.com/freesearch.php3.

Bartlett, J. 2015. Louisiana Coastal Wetlands. Available online at: http://www.uvm.edu/~jbartlet/nr260/.

Bartlett, R.D. and P.P. Bartlett. 1999. A field guide to Texas reptiles and amphibians. Gulf Publishing Company, Houston, Texas. 331 pp.

Bent, A. C. 1929. Life Histories of North American Shorebirds. Available online at: https://babel.hathitrust.org/cgi/pt?id=pst.000011385745;view=1up;seq=7.

Blackburn, J.C., Johnson, C., and Berryhill, M. 2001. The value of the Texas bays and adjacent wetlands. CLE International Wetlands Conference. Austin.

Blanchard, Troy C. 2007. Population Projections of Louisiana Parishes through 2030. Available online at: http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.527.6807&rep=rep1&type=pdf .

Cameron Parish Police Jury. 1997. Code of Ordinances, Chapter 15, Article III. Available online at: http://cameronparish-la.elaws.us/code/coor_apxid23094_ch15_artiii_sec15-28.

Cameron Parish Tourist Commission. 2018. Campgrounds and RV Parks. Available online at: http://cameronparishtouristcommission.org.

Caterpillar. 2012. VM 32 C Project Guide: Generator Set. Caterpillar Motorem Gmblt & Co. KG. Available online at: https://s7d2.scene7.com/is/content/Caterpillar/C10752920.

Central Dredging Association. 2011. CEDA Position Paper: Underwater Sound in Relation to Dredging. Terra et Aqua. Number 125. December 2011.

Cornell Lab of Ornithology. 2018. All About Birds. Brown pelican identification. R Available online at: https://www.allaboutbirds.org/guide/Brown_Pelican/id.

Council on Environmental Quality. 1997. Environmental Justice, Guidance under the National Environmental Policy Act. Executive Office of the President, Washington, D.C.

Council on Environmental Quality. 2005. Guidance on the Consideration of Past Actions in Cumulative Effects Analysis. Available online at: https://www.energy.gov/sites/prod/files/nepapub/nepa_documents/RedDont/G-CEQ-PastActsCumulEffects.pdf.

Cowardin, L. M., V. Carter, F. C. Golet, and E. T. LaRoe. 1979. Classification of Wetlands and Deepwater Habitats of the United States. Available online at: https://www.fws.gov/wetlands/Documents/Classification-of-Wetlands-and-Deepwater-Habitats-of-the-United-States.pdf.

Davis, L.W. 2011. The Effect of Power Plants on Local Housing Values and Rents. The Review of Economics and Statistics. 2011 93:4, 1391-1402.

Ewing, T. E., 1986, Structural styles of the Wilcox and Frio Growth-Fault Trends in Texas: Constraints on Geopressured Reservoirs: Bureau of Economic Geology Report of Investigations No. 154, University of Texas, Austin, 86p.

Fire Department Directory. 2018. Fire Department Information. Available online at: http://firedepartmentdirectory.com.

Florida Fish and Wildlife Conservation Commission. 2019. Leatherback Nesting in Florida. Available online at: https://myfwc.com/research/wildlife/sea-turtles/nesting/leatherback/.

Georgia Aquarium. 2018. Kemp's Ridley Sea Turtle (*Lepidochelys kempii*). Available online at: https://www.georgiaaquarium.org/animal-guide/marineland/home/animals/kemp%27s-ridley-sea-turtle.

Green, L.M., G. Lewis, and R.P. Campbell. 2002. Trends in fin-fish landings of sport-boat anglers in Texas marine waters, May 1974-May 1998. Management Data Series No. 204, Texas Parks and Wildlife Department, Coastal Fisheries Division, Austin, Texas.

Gulf of Mexico Fishery Management Council. 1998. Generic amendment for addressing Essential Fish Habitat Requirements in the following Fishery Management Plans of the Gulf of Mexico: Shrimp Fishery, Red Drum Fishery, Reef Fish Fishery, Coastal Migratory Pelagic Resources (Mackerels), Stone Crab Fishery, Spiny Lobster, and Coral and Coral Reefs. Prepared by the GMFMC, October 1998.

Higginbotham, Van K. 1972. Tectonic Map of Gulf Coast Region U.S.A. Published for Gulf Coast Association of Geological Societies.

Hotelmotels.info. 2018. Number of Hotels/Motels. Available online at: http://www.hotelmotels.info/.

ICF Jones and Stokes. 2012. Technical Guidance for Assessment and Mitigation of the Hydroacoustic Effects of Pile Driving on Fish. Updated October 2012. Available online at: http://www.dot.ca.gov/hq/env/bio/files/Guidance_Manual_2_09.pdf.

International Maritime Organization. 2017. International Maritime Organization. Available online at: http://www.imo.org/en/Pages/Default.aspx.

Lanier & Associates. 2018. Ship Traffic Study for the Sabine-Neches Waterway. Prepared for Cheniere Energy, Inc. Sabine Pass LNG Terminal Third Berth Expansion Cameron Parish, Louisiana. Prepared by Lanier & Associates Consulting Engineers, 4101 Magazine Street, New Orleans, LA 70115. Revised May 24, 2018.

Long, E.R. 1999. Survey of Sediment Quality in Sabine Lake, Texas and Vicinity. NOAA Technical Memorandum NOS ORCA 137.

Louisiana Department of Culture, Recreation, and Tourism. 2018. Louisiana State Parks. Available online at: https://www.crt.state.la.us/louisiana-state-parks/.

Louisiana Department of Environmental Quality. 2018. Solid Waste Landfill Report. Available online at: https://deq.louisiana.gov/page/solid-waste.

Louisiana Department of Environmental Quality. 2017. Leaking Underground Storage Tank Facility List. Available online at: http://deq.louisiana.gov/page/underground-storage-tank.

Louisiana Department of Environmental Quality. 2016. FINAL 2016 Louisiana Water Quality Inventory: Integrated Report (305(b)/303(d)), Appendix A. Available online at: http://deq.louisiana.gov/page/water-quality-integrated-report-305b303d.

Louisiana Department of Environmental Quality. 2015. Superfund Sites. Available online at: http://www1.deq.louisiana.gov/portal/DIVISIONS/UndergroundStorageTankandRemediationDivision/RemediationServices/SuperfundSitesinLouisiana.aspx.

Louisiana Department of Environmental Quality. 2001. Source Water Assessment Program. Available online at: https://deq.louisiana.gov/assets/docs/Water/SWAPdocument.pdf.

Louisiana Department of Natural Resources. 2018a. Strategic Online Natural Resources Information System (SONRIS). Available online at: http://www.sonris.com.

Louisiana Department of Natural Resources. 2018b. Coastal Zone Boundary. Available online at: http://dnr.louisiana.gov/index.cfm?md=pagebuilder&tmp=home&pid=928.

Louisiana Department of Transportation and Development. 2018. Average Daily Traffic Counts. Available online at: http://www.dotd.la.gov/highways/tatv/default.asp.

Louisiana Department of Wildlife and Fisheries. 2019. Rare Animals of Louisiana: Leatherback Sea Turtle. Available online at: http://www.wlf.louisiana.gov/sites/default/files/pdf/fact_sheet_animal/32232-Dermochelys%20coriacea/dermochelys_coriacea.pdf.

Louisiana Department of Wildlife and Fisheries. 2018a. Species by Parish List. Available online at: http://www.wlf.louisiana.gov/wildlife/species-parish-list?tid=218&type_1=All.

Louisiana Department of Wildlife and Fisheries. 2018b. Rare Animals of Louisiana. Kemp's Ridley sea turtle. Available online at: http://www.wlf.louisiana.gov/sites/default/files/pdf/fact_sheet_animal/32231-Lepidochelys%20kempii/lepidochelys_kempii.pdf.

Louisiana Department of Wildlife and Fisheries. 2018c. LDWF Cautions Boaters in South Louisiana to be Aware of West Indian Manatees. Available online at: http://www.wlf.louisiana.gov/news/42247.

Louisiana Department of Wildlife and Fisheries. 2018d. Louisiana Natural and Scenic Rivers Descriptions and Map. Available online at: http://www.wlf.louisiana.gov/louisiana-natural-and-scenic-rivers-descriptions-and-map.

Louisiana Department of Wildlife and Fisheries. 2018e. Wildlife Management Areas Overview. Available online at: http://www.wlf.louisiana.gov/wma?tid=209.

Louisiana Department of Wildlife and Fisheries. 2018f. Natural Areas Registry Program. Available online at: http://www.wlf.louisiana.gov/wildlife/natural-areas-registry-program.

Louisiana Department of Wildlife and Fisheries. 2004. Hawksbill Sea Turtle. Available online at: http://www.wlf.louisiana.gov/sites/default/files/pdf/fact_sheet_animal/32230-Eretmochelys%20imbricata/eretmochelys_imbricate.pdf.

Louisiana Geological Survey. 2002. 46-Million-Year-Old Marine Fossils from the Cane River Site, North Central Louisiana. Available online at: https://www.lsu.edu/lgs/publications/products/Free_publications/CaneRiver-fossils.pdf.

Louisiana Groundwater Resources Commission. 2012. Managing Louisiana's Groundwater Resources. Available online at: https://biotech.law.lsu.edu/blog/la_ground_water_resources_commission_report_march_2012.pdf.

Louisiana Hospital Inform. 2018. Search by Parish. Available online at: http://www.lahospitalinform.org/searchparish.html.

McCauley, R.D., Fewtrell, J., Duncan, A.J., Jenner, C., Jenner, M.N., Penrose, J.D., Prince, R.I.T., Adihyta, A., Murdoch, J., and McCabe, K. 2000. Marine seismic surveys: analysis and propagation of air gun signals; and effects of exposure on humpback whales, sea turtles, fishes and squid. Prepared for the Australian Petroleum Exploration and Production Association from the Centre for Marine Science and Technology, Curtin University. CMST R99-15, 185, unpublished.

Moffatt & Nichol. 2018. Metocean Study Report, Sabine Pass LNG Terminal, Cameron Parish, Louisiana.

Molieri, Melinda. 2018. Louisiana Department of Environmental Quality. Email Communication with Melinda Molieri (Access Sciences Public Records Technician).

Musick, J. 1979. The marine turtles of Virginia with notes on identification and natural history. Educational Series No. 24. Sea Grant Program, Virginia Institute of Marine Science, Gloucester Point, Virginia. 18 pp.

National Audubon Society. 2018a. Guide to North American Birds. Red Knot. Available online at: http://www.audubon.org/field-guide/bird/red-knot.

National Audubon Society. 2018b. Guide to North American Birds. Brown pelican. Available online at: https://www.allaboutbirds.org/guide/Brown_Pelican/id.

National Marine Fisheries Service. 2019a. Louisiana Threatened and Endangered Species and Critical Habitats Under NOAA Fisheries Jurisdiction. Available online at: https://www.fisheries.noaa.gov/southeast/consultations/louisiana.

National Marine Fisheries Service. 2019b. Giant Manta Ray. Available online at: https://www.fisheries.noaa.gov/species/giant-manta-ray.

National Marine Fisheries Service. 2019c. Oceanic Whitetip Shark. Available online at: https://www.fisheries.noaa.gov/species/oceanic-whitetip-shark.

National Marine Fisheries Service. 2018. Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (Version 2.0), Underwater Thresholds for Onset of Permanent and Temporary Threshold Shifts. Available online at: https://www.fisheries.noaa.gov/resource/document/technical-guidance-assessing-effects-anthropogenic-sound-marine-mammal.

National Marine Fisheries Service. 2012. An Overview of Protected Species in the Gulf of Mexico. Available online at: https://sero.nmfs.noaa.gov/protected_resources/outreach_and_education/documents/protected_species_gom.pdf.

National Marine Fisheries Service. 2011. Final Recovery Plan for the Sei Whale (*Balaenoptera borealis*). Available online at: https://repository.library.noaa.gov/view/noaa/15977.

National Marine Fisheries Service. 2010a. Sperm Whale. Available online at: https://www.fisheries.noaa.gov/species/sperm-whale.

National Marine Fisheries Service. 2010b. Final Recovery Plan for the Fin Whale (*Balaenoptera physalus*). Available online at: https://repository.library.noaa.gov/view/noaa/4952.

National Marine Fisheries Service. 2008. Vessel Strike Avoidance Measures and Reporting for Mariners. Available online at: https://sero.nmfs.noaa.gov/protected_resources/section_7/guidance_docs/documents/copy_of_vessel_strike_avoidance_february_2008.pdf.

National Marine Fisheries Service. 2004. Sea Turtles. Available online at: https://www.fisheries.noaa.gov/sea-turtles.

National Marine Fisheries Service and U.S. Fish and Wildlife Service. 1991a. Recovery plan for U.S. population of loggerhead turtle. National Marine Fisheries Service, Washington, D.C. 64 pp.

National Marine Fisheries Service and U.S. Fish and Wildlife Service. 1991b. Recovery plan for U.S. population of Atlantic green turtle. National Marine Fisheries Service, Washington, D.C. 52 pp.

National Park Service. 2018a. List of National Parks. Louisiana. Available online at: http://www.nps.gov/state/la/index.htm?program=parks.

National Park Service. 2018b. National Natural Landmarks by state. Available online at: https://www.nps.gov/subjects/nnlandmarks/state.htm?State=LA.

National Park Service. 2018c. National Trail System. Available online at: https://www.nps.gov/subjects/nationaltrailssystem/index.htm.

National Park Service. 2018d. Nationwide Rivers Inventory. Available online at: http://www.nps.gov/ncrc/programs/rtca/nri/states/la.html.

National Park Service. 2015. Sea Turtle Nesting Season 2014. Available online at: http://www.nps.gov/pais/learn/nature/nesting2014.htm.

National Recreation Trails Program. 2013. NRT Database by American Trails. Available online at: http://www.americantrails.org/NRTDatabase/.

National Wild and Scenic Rivers System. 2018. National Wild and Scenic Rivers System: Louisiana. Available online at: https://www.rivers.gov/louisiana.php.

Oregon LNG. 2008. Screening Level Thermal Plume Evaluation of LNG Vessels Cooling Water System Discharges to the Columbia River. Prepared by CH2M HILL. September 10, 2008.

Owen, D.E. 2008. Geology of the Chenier Plain of Cameron Parish, Southwestern Louisiana. Geological Society of America Field Guide 14.

Patillo, M. E., T. E. Czapl, D. M. Nelson and M. E. Monaco. 1997. Distribution and abundance of fishes and invertebrates in Gulf of Mexico estuaries. Volume II: Species life history summaries. ELMR Report No. 11. NOAA/NOS Strategic Environmental Assessments Division, Silver Spring, MD. 377 pp.

Papua New Guinea LNG Project. 2009. Environmental Noise Impact Assessment. 2009. Heggies Pty Ltd., Table 15, Page 28, January 15, 2009. Available online at: https://pnglng.com/media/PNG-LNG-Media/Files/Environment/EIS/eis_appendix10.pdf.

Popper Arthur N., Carlson Thomas J., Hawkins, Anthony D., Southall, Brandon L., and Gentry, Roger L. 2006. Interim criteria for injury of fish exposed to pile driving operations: a white paper. May 13, 2006. Available online at: http://www.dot.ca.gov/hq/env/bio/files/piledrivinginterimcriteria_13may06.pdf.

Potter, Lloyd B., and Hoque, Nazrul. 2014. Texas Population Projections, 2010 to 2050. Available online at: https://demographics.texas.gov/Resources/Publications/2014/2014-11_ProjectionBrief.pdf.

Pritchard, P.C.H, and R. Marquez. 1973. Kemp's ridley or Atlantic ridley, *Lepidochelys kempii*. IUCN Monograph No. 2. (Marine Turtle Ser.).

Protection of the Marine Environment of the North-East Atlantic. 2009. Overview of the impacts of anthropogenic underwater sound in the marine environment, Vol. OSPAR Convention for the Protection of the Marine Environment of the North-East Atlantic. Available online at: www.ospar.org.

Public School Review. 2018. Profiles of USA Public Schools. Available online at: http://www.publicschoolreview.com.

Railroad Commission of Texas. 2018. Public GIS Viewer. Available online at: http://www.rrc.state.tx.us/about-us/resource-center/research/gis-viewers/.

Ramsdell, J. and Rishel, J. 2007. Tornado Climatology of the Contiguous United States. U.S. Nuclear Regulatory Commission. Available online at: https://www.nrc.gov/docs/ML0708/ML070810400.pdf.

Rebel, T. P. 1974. Sea turtles and the turtle industry of the West Indies, Florida, and the Gulf of Mexico. University Miami Press. Coral Gables, Florida. 250 pages.

Renken, R. 1998. Arkansas, Louisiana, Mississippi, in Groundwater Atlas of the United States, U.S. Geological Survey HA 730-F. Available online at: http://capp.water.usgs.gov/gwa/ch_f/index.html.

Ropicki, A., Hanselka, D., Dudensing, R., and T. Looney. 2016. The Economic Impacts of Recreational Fishing in the Sabine Lake Estuary. December 12, 2016. Available online at: http://texasseagrant.org/assets/uploads/resources/16-518_The_Economic_Impacts_of_Recreational_Fishing_in_the_Sabine_Lake_Estuary.pdf.

Ross, J.P. 1982. Historical decline of loggerhead, ridley, and leatherback sea turtles. In: K. Bjorndal (editor), Biology and Conservation of Sea Turtles. Pp. 189-195. Smithsonian Institution Press, Washington, D.C. 583 pp.

Roverpass. 2018. Find RV Parks and Campgrounds Near Me (Jefferson County, TX). Available online at: https://www.roverpass.com/.

Ruple, D.L. 1993. Shoreline Erosion Losses. Proceedings of the 59th Meeting of the Coastal Engineering research Board, 16-18 November 1993 Point Clear, Alabama. Available online at: http://bigfoot.wes.army.mil/5914.html.

Sabine-Neches Navigation District. 2018. Waterway Commerce. Available online at: https://www.navigationdistrict.org/.

Savannah River Ecology Laboratory University of Georgia. 2018. Loggerhead sea turtle (*Caretta caretta*). Available online at: https://srelherp.uga.edu/turtles/carcar.htm.

Science Daily. 2018. Seawater. Available online at: https://www.sciencedaily.com/terms/seawater.htm.

Sciencing.com. 2018. What is the pH of Salt Water? Available online at: https://sciencing.com/ph-salt-water-5098328.html.

Shinkle, K. and Dokka, R.K. (2004) Rates of Vertical Displacement at Benchmarks in the Lower Mississippi Valley and the Northern Gulf Coast. NOAA Technical Report, No. 50, 135 p.

Stadlar, J.H. and D.P. Woodbury. 2009. Assessing the effects to fishes from pile driving: application of new hydroacoustic criteria. Inter-noise 2009. August 23-26, 2009, Ottawa, Canada.

Ten Brink, U., D.C. Twichell, P. Lynett, E.L. Geist, J.D. Chaytor, H.J. Lee, B.J. Buczkowski, and C.H. Flores. 2009. Regional assessment of tsunami potential in the Gulf of Mexico. USGS Administrative report to the National Tsunami Hazard Mitigation Program.

Texas Commission on Environmental Quality. 2014. 2014 Texas Integrated Report of Surface Retrieved from: Available online at: Water Quality for the Clean Water Act Sections 305(b) and 303(d). https://www.tceq.texas.gov/waterquality/assessment/14twqi.

Texas Demographic Center. 2019. Texas Population Projections Program. Available online at: https://demographics.texas.gov/Data/TPEPP/Projections/.

Texas Department of State Health Services. 2018. Shellfish Harvesting Areas and Maps - Seafood and Aquatic Life. Available online at: https://www.dshs.texas.gov/seafood/shellfish-harvest-maps.aspx.

Texas Parks and Wildlife Department. 2018. Rare, Threatened and Endangered Species of Texas. Available online at: https://tpwd.texas.gov/gis/rtest/.

Texas Parks and Wildlife Department. 2019. Leatherback Sea Turtle (*Dermochelys coriacea*). https://tpwd.texas.gov/huntwild/wild/species/lethback/.

The Nature Conservancy. 2018. Louisiana: Places We Protect. Available online at: https://www.nature.org/en-us/about-us/where-we-work/united-states/louisiana/.

Tolunay-Wong Engineers, Inc. 2018. Geotechnical Report Sabine Pass LNG Third Berth Expansion Project, Cameron Parish, Louisiana. TWEI Project No. 17.14.057.

University of Montana. 2018. Wilderness Areas of the United States. Available online at: http://www.wilderness.net/map.cfm.

USACops. 2018. Law Enforcement Agencies. Available online at: http://www.usacops.com/.

U.S. Army Corps of Engineers. 2013. Brazos Island Harbor, Texas Channel Improvement Project. Draft Integrated Feasibility Report-Environmental Assessment. Available online at: http://www.swg.usace.army.mil/Portals/26/docs/Cheryl%20Jaynes/2-BIH%20DIFREA%202013.pdf.

U.S. Army Corps of Engineers. 2012. Sabine-Neches Waterway Channel Improvement Project Final Environmental Impact Statement. The Assistant Secretary of the Army, Civil Works, The Department of Defense. February 2012.

U.S. Army Corps of Engineers. 2011a. Final Feasibility Report for Sabine-Neches Waterway Channel Improvement Project Southeast Texas and Southwest Louisiana. Prepared by U.S. Army Corps of Engineers, Galveston District. March 2011.

U.S. Army Corps of Engineers. 2011b. Methods to Minimize Dredging Impacts on Sea Turtles. Available online at: https://dots.el.erdc.dren.mil/workshops/2011-05-24-dmams/20_19_Sea-Turtles-Dredging_Dickerson.pdf.

U.S. Army Corps of Engineers. 2006. North Texas Sediment Budget Sabine Pass to San Luis Pass. Final Report. ERDC/CHL TR-06-17. Coastal and Hydraulics Laboratory U.S. Army Engineer Research and Development Center 3909 Halls Ferry Road Vicksburg, MS 39180-6199.

U.S. Army Corps of Engineers. 2003. Biological Assessment for Impacts to Endangered and Threatened Species Relative to the Corpus Christi Ship Channel Improvement Project in Nueces and San Patricio Counties, Texas - Volume II, Appendix C of: Corpus Christi Ship Channel, Channel Improvements Project Corpus Christi and Nueces Bays, Nueces and San Patricio Counties, Texas, Final Environmental Impact Statement - Galveston.

U.S. Army Corps of Engineers. 1987. Wetlands Delineation Manual. Available online at: http://www.cpe.rutgers.edu/wetlands/1987-army-corps-wetlands-delineation-manual.pdf.

U.S. Census Bureau. 2018. American Fact Finder. Available online at: http://factfinder2.census.gov.

U.S. Department of Agriculture, Natural Resources Conservation Service. 2018a. Hydric Soils – Introduction. Available online at: https://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/use/hydric/?cid=nrcs142p2_053961.

U.S. Department of Agriculture. 2018b. Ecoregions of the U.S. Available online at: https://www.fs.fed.us/land/pubs/ecoregions/ch20.html#231F.

U.S. Department of Agriculture, Natural Resources Conservation Service. 2017. Web Soil Survey. Available online at: http://websoilsurvey.nrcs.usda.gov/.

U.S. Department of Agriculture, Natural Resources Conservation Service. 2013. Geospatial Data Gateway. Soil Survey Geographic Database for Cameron Parish. Available online at: https://datagateway.nrcs.usda.gov/.

U.S. Department of Transportation - Federal Highway Administration. 2008. FHWA Roadway Construction Noise Model Version 1.1. Available online at: https://www.fhwa.dot.gov/environment/noise/construction_noise/rcnm/.

U.S. Department of Transportation Federal Highway Administration. 2018. Creole Nature Trail: All-American Road. Available online at: https://www.fhwa.dot.gov/byways/byways/2454.

U.S. Environmental Protection Agency. 2019. NEPAssist. Available online at: https://nepassisttool.epa.gov/nepassist/nepamap.aspx.

U.S. Environmental Protection Agency. 2019b. Learn About Environmental Justice. Available online at: https://www.epa.gov/environmentaljustice/learn-about-environmental-justice.

U.S. Environmental Protection Agency. 2018a. Cleanups in My Community Map. Available online at: https://ofmpub.epa.gov/apex/cimc/f?p=cimc:MAP::::71:P71_WELSEARCH:Louisiana|State|Louisiana|||true|true|true|true|true|true||-1|sites|N|basic.

U.S. Environmental Protection Agency. 2018b. Hazardous Waste. Available online at: https://www.epa.gov/hw.

U.S. Environmental Protection Agency. 2018c. EJSCREEN: Environmental Justice Screening and Mapping Tool. Available online at: https://www.epa.gov/ejscreen.

U.S. Environmental Protection Agency. 2016. ArcGIS Online: USA Hazardous Waste Sites. Available online at: https://www.arcgis.com/home/item.html?id=f45656afebea4d1288e03f960b883847.

U.S. Environmental Protection Agency. 2006. Amendments to the Storm Water Regulations for Discharges Associated with Oil and Gas Construction Activities. Available online at: https://www.epa.gov/sites/production/files/2015-10/documents/final_oil_gas_factsheet.pdf.

U.S. Environmental Protection Agency. 2001. Region 6 Sole Source Aquifers. Available online at: http://www.epa.gov/region6/water/swp/ssa/ssa.htm.

U.S. Environmental Protection Agency. 1974. Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety. Available online at: https://nepis.epa.gov/Exe/ZyNET.exe/2000L3LN.TXT?ZyActionD=ZyDocument&Client=EPA&Index=Prior+to+1976&Docs=&Query=&Time=&EndTime=&SearchMethod=1&TocRestrict=n&Toc=&TocEntry=&QField=&QFieldYear=&QFieldMonth=&QFieldDay=&IntQFieldOp=0&ExtQFieldOp=0&XmlQuery=&File=D%3A%5Czyfiles%5CIndex%20Data%5C70thru75%5CTxt%5C00000001%5C2000L3LN.txt&User=ANONYMOUS&Password=anonymous&SortMethod=h%7C-

&MaximumDocuments=1&FuzzyDegree=0&ImageQuality=r75g8/r75g8/x150y150g16/i425&Display=hpfr&DefSeekPage=x&SearchBack=ZyActionL&Back=ZyActionS&BackDesc=Results%20page&MaximumPages=1&ZyEntry=1&SeekPage=x&ZyPURL.

U.S. Fish and Wildlife Service. 2019. Flyways. Available online at: https://www.fws.gov/birds/management/flyways.php.

U.S. Fish and Wildlife Service. 2018a. Information for Planning and Conservation (IPaC). Available online at: https://ecos.fws.gov/ipac/location/GPNTHFFREZELNHJAS5SPUJTWEE/resources.

U.S. Fish and Wildlife Service. 2018b. Service proposes to list eastern black rail as threatened under the Endangered Species Act. Available online at: https://www.fws.gov/southeast/news/2018/10/service-proposes-to-list-the-eastern-black-rail-as-threatened-under-the-endangered-species-act/.

U.S. Fish and Wildlife Service. 2018c. Kemp's Ridley Sea Turtle (*Lepidochelys kempii*). Available online at: https://www.fws.gov/northflorida/seaturtles/turtle%20factsheets/kemps-ridley-sea-turtle.htm.

U.S. Fish and Wildlife Service. 2018d. West Indian Manatee (*Trichechus manatus*). Available online at: https://www.fws.gov/southeast/wildlife/mammals/manatee.

U.S. Fish and Wildlife Service. 2016. Sabine Pass to Galveston Coastal Storm Risk Management and Ecosystem Restoration Study in Orange, Jefferson, Chambers, Galveston, Harris, and Brazoria Counties, Texas. Final Fish and Wildlife Coordination Act Report submitted to U.S. Army Corps of Engineers, Galveston District, August 18, 2016.

U.S. Fish and Wildlife Service. 2011. Standard Manatee Conditions for In-water Activities. Available online at: https://www.fws.gov/northflorida/Manatee/Manate_Key_Programmatic/20130425_gd_Appendix%20B_2011_Standard%20Manatee%20Construction%20Conditions.pdf.

U.S. Fish and Wildlife Service. 2002. Colonial-Nesting Waterbirds. Available online at: https://www.fws.gov/uploadedFiles/waterbird-fact-sheet.pdf.

U.S. Fish and Wildlife Service, and National Marine Fisheries Service. 1992. Recovery plan for the Kemp's ridley sea turtle (*Lepidochelys kempii*). National Marine Fisheries Service, St. Petersburg, Florida. 40 pp.

U.S. Forest Service. 2018. Kisatchie National Forest. Available online at: https://www.fs.usda.gov/kisatchie.

U.S. Geological Survey. 2019. The Mineral Industry of Louisiana. Available online at: https://www.usgs.gov/centers/nmic/mineral-industry-louisiana.

U.S. Geological Survey. 2014. The USGS Water Science School. Land Subsidence. Available online at: http://water.usgs.gov/edu/earthgwlandsubside.html.

U.S. Geological Survey. 2011. Mineral Resources Data System. Available online at: https://mrdata.usgs.gov/mrds/.

U.S. Geological Survey. 2002. Physiographic Divisions of the Conterminous U.S. Available online at: http://water.usgs.gov/GIS/metadata/usgswrd/XML/physio.xml#stdorder.

U.S. Global Change Research Program. 2017. Climate Science Special Report: Fourth National Climate Assessment, Volume I. (Wuebbles, D.J., D.W. Fahey, K.A. Hibbard, D.J. Dokken, B.C. Stewart, and T.K. Maycock (eds.)]. U.S. Global Change Research Program, Washington, DC, USA, 470 pp., doi: 10.7930/J0J964J6.

U.S. Global Change Research Program. 2018. Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II: Report-in-Brief. [Reidmiller, D.R., C.W. Avery, D.R. Easterling, K.E. Kunkel, K.L.M. Lewis, T.K. Maycock, and B.C. Stewart (eds.)]. U.S. Global Change Research Program, Washington, DC, USA, 186 pp.

Van Zandt. 2012. State of Community Report, Port Arthur, TX. Available online at: https://laup.arch.tamu.edu/research/students/mup/PortARthurSOC.pdf.

World Population Review. 2019. Port Arthur, Texas Population 2019. Available online at: http://worldpopulationreview.com/us-cities/port-arthur-tx-population/.

YellowPages. 2018. Campgrounds and RV Parks (Port Arthur, Texas). Available online at: http://www.yellowpages.com.

SECTION F – LIST OF PREPARERS

Federal Energy Regulatory Commission

Barakat, Kandilarya – Project Manager, Proposed Action, Socioeconomics, Land Use, Air Quality and Noise, Cumulative, Alternatives

M.E., Environmental Engineering/Project Management, 2006, University of Maryland, College Park
B.S., Chemical Engineering, 2003, University of Maryland, College Park

Jensen, Andrea – Geology, Mineral Resources, Groundwater Resources

B.S., Environmental Geology, 2012, College of William and Mary

Polit, Juan – Soils

M.S., Forest Ecology, 1992, University of Illinois
B.S., Forest Science, 1989, University of Illinois

John Peconom – Surface Water, Wetlands, Vegetation, Wildlife, Threatened and Endangered Species

B.S., Environmental Biology and Management, 2000, University of California, Davis

Brad Wazaney – Cultural Resources

Ph.D., Anthropology, 2006, Washington State University
M.A., American Studies, 2000, University of Wyoming
B.A., History, 1995, Old Dominion University

McDaniel, Nina – Air Quality and Noise

M.S., Engineering Management, 2012, University of New Orleans
B.S., Civil Engineering, 2010, University of New Orleans

Hoogendoorn, Wimberly – LNG Reliability and Safety

B.S.M.E., Mechanical Engineering, 2017, Baylor University

Charles, Dakoriye – LNG Reliability and Safety

B.S., Petroleum Engineering, 2014, Louisiana State University

Peng, Andrew – LNG Reliability and Safety

B.C.E., Civil Engineering, 2014, University of Delaware

McCullough, Erin – LNG Reliability and Safety

M.Eng., Mining Engineering, 2016, Virginia Tech

B.S., Mining Engineering, 2014, South Dakota School of Mines and Technology

Peng, Andrew – LNG Reliability and Safety

B.C.E., Civil Engineering, 2014, University of Delaware

Perennial Environmental Services, LLC

Butler, Amy – Project Manager, Project Description, Cumulative Impacts,
M.S., Natural Resource Sciences, 2011, University of Nebraska-Lincoln
B.S., Natural Resource Sciences, 2008, Washington State University

Cochran, Megan – Deputy Project Manager, Geology, Soils, Groundwater
B.S., Environmental Studies, 2013, Texas A&M University

Yoo, Leslie – NEPA Director, Soils, Land Use, Alternatives
M.S., Zoology, 2001, Oklahoma State University
B.A., Biology, 1995, Randolph-Macon Woman's College

Olson, Marshall – Surface Water, Wetlands, Socioeconomics
M.S., Marine Science, 2010, University of San Diego
B.S., Marine and Freshwater Biology, 2006, University of Texas

Gocke, Kelsey – Vegetation, Wildlife, Threatened and Endangered Species
B.S., Marine Science, 2006, Coastal Carolina University

Power Engineers, Inc.

Corio, Lou – Air Quality
M.S., Meteorology, 1983, Rutgers University – Cook College
B.S., Meteorology, 1980, University of Maryland

Guerrero, Priscilla A. – Air Quality
Ph.D., Civil and Environmental Engineering, 2013, University of Texas
M.S., Environmental and Water Resources Engineering, 2009, University of Texas
B.S., Metallurgical and Materials Engineering, 2007, University of Texas

Federal Energy Regulatory Commission Consultants

Bachman, Robert

M.S., Structural Engineering, University of California at Berkeley, 1968
B.S., Civil Engineering, University of California at Berkeley, 1967

Bhushan, Kul

Ph.D., Geotechnical Engineering, Duke University, 1970
M.S., Highway Engineering, Panjab University, India, 1963
B.S., Civil Engineering, Panjab University, India, 1962

CSTI Acoustics

Arno Bommer – Noise

B.S., Architectural Design, 1982, Massachusetts Institute of Technology

Robert Bruce – Noise

E.E., Electrical Engineering, 1966, Massachusetts Institute of Technology
S.M., Electrical Engineering, 1966, Massachusetts Institute of Technology
B.S., Electrical Engineering, 1963, Massachusetts Institute of Technology

Perennial Environmental Services, LLC, Power Engineers, Inc., and CSTI Acoustics are third-party contractors assisting the Commission staff in reviewing the environmental aspects of the project application and preparing the environmental documents required by NEPA. Third-party contractors are selected by Commission staff *and funded by project applicants. Per the procedures in 40 CFR 1506.5(c), third-party contractors execute a disclosure statement specifying that they have no financial or other conflicting interest in the outcome of the project. Third-party contractors are required to self-report any changes in financial situation and to refresh their disclosure statements annually. The Commission staff solely directs the scope, content, quality, and schedule of the contractor's work. The Commission staff independently evaluates the results of the third-party contractor's work and the Commission, through its staff, bears ultimate responsibility for full compliance with the requirements of NEPA.*