Federal Energy Regulatory Commission

Office of Energy Projects

September 2020

Trans-Foreland Pipeline Company, LLC

Docket No. CP19-118-000

Kenai LNG Cool Down 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 1
Trans-Foreland Pipeline
Company, LLC
Docket No. CP19-118-000

TO THE INTERESTED PARTIES:

The staff of the Federal Energy Regulatory Commission (FERC or Commission) has prepared an environmental assessment (EA) for the Kenai LNG Cool Down Project (Project) proposed by Trans-Foreland Pipeline Company, LLC (Trans-Foreland) in the above referenced docket. Trans-Foreland requests authorization to construct, install, own, and operate facilities at its existing liquified natural gas (LNG) export plant in Kenai, Alaska. Trans-Foreland states that the proposed Project would permit it to cool down the existing LNG storage tanks and associated LNG facilities by importing LNG for delivery to the storage tanks, and subsequently deliver boil-off gas (BOG) generated under normal operations from the Kenai LNG Plant to the Kenai Refinery.

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. Department of Energy, U.S. Department of Transportation's Pipeline and Hazardous Materials Safety Administration, and U.S. Coast Guard 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 Kenai LNG Cool Down Project would consist of the following facilities in Kenai, Alaska:

- a trim vaporizer unit assembly, containing 10 skid mounted units;
- a new trim vaporizer feed pump;
- a new LNG tank circulation pump;
- a 1,000 horsepower electric driven BOG booster compressor and associated building; and
- two electrical buildings.

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 parties 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-data/natural-gas/environment/environmental-documents). In addition, the EA may be accessed by using the eLibrary link on the FERC's website. Click on the eLibrary link (https://elibrary.ferc.gov/eLibrary/search), click on General Search, and enter the docket number in the "Docket Number" field, excluding the last three digits (i.e. CP19-118). 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.

The EA is not a decision document. It presents Commission staff's independent analysis of the environmental issues for the Commission to consider when addressing the merits of issues raised in this proceeding. 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 will be. To ensure that the Commission has the opportunity to consider your comments prior to making its decision on this Project, it is important that we receive your comments in Washington, DC on or before 5:00pm Eastern Time on **October 5, 2020.**

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 FERC Online. 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 FERC Online. 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 Commission. Be sure to reference the project docket number (CP19-118-000) on your letter. Submissions sent via the U.S. Postal Service must be addressed to: Kimberly D. Bose, Secretary, Federal Energy Regulatory Commission, 888 First Street NE, Room 1A, Washington, DC 20426. Submissions sent via any other carrier must be addressed to: Kimberly D. Bose, Secretary, Federal Energy Regulatory Commission, 12225 Wilkins Avenue, Rockville, Maryland 20852.

Filing environmental comments will not give you intervenor status, but you do not need intervenor status to have your comments considered. Only intervenors have the right to seek rehearing or judicial review of the Commission's decision. At this point in this proceeding, the timeframe for filing timely intervention requests has expired. Any person seeking to become a party to the proceeding must file a motion to intervene out-of-time pursuant to Rule 214(b)(3) and (d) of the Commission's Rules of Practice and Procedures (18 CFR 385.214(b)(3) and (d)) and show good cause why the time limitation should be waived. Motions to intervene are more fully described at https://www.ferc.gov/ferc-online/ferc-online/how-guides**.**

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 all 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 https://www.ferc.gov/ferc-online/overview to register for eSubscription.

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Technical Abbreviations and Acronyms

ADEC	Alaska Department of Environmental Conservation
ADF&G	Alaska Department of Fish and Game
AIChE	American Institute of Chemical Engineers
APE	area of potential effects
API	American Petroleum Standard
API RP	API Recommended
AQCR	Air Quality Control Regions
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
BIA	Biologically Important Area
BLEVE	boiling liquid expanding vapor explosion
BOG	boil-off gas
BPVC	Boiler and Pressure Vessel Code
Btu/ft^2-hr	British thermal units per square foot per hour
CAA	*Clean Air Act*
CCPS	Center for Chemical Process Safety
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CH_4	methane
CIRI	Cook Inlet Region, Incorporated
Coast Guard	U.S Coast Guard
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalents
Commission	Federal Energy Regulatory Commission
dBA	A-weighted decibels
DOD	U.S. Department of Defense
DOE	U.S. Department of Energy
DOE/FE	DOE's Office of Fossil Energy
DPS	distinct population segment
EA	environmental assessment
EI	Environmental Inspector
EIS	environmental impact statement
EFH	Essential Fish Habitat
EPA	U.S. Environmental Protection Agency
ESA	*Endangered Species Act*

ESD	emergency shut down
ESU	Evolutionary Significant Unit
°F	degrees Fahrenheit
FAA	Federal Aviation Administration
FEED	front-end-engineering-design
FERC	Federal Energy Regulatory Commission
FHWA	Federal Highway Administration
FR	Final Rule
GHG	greenhouse gases
GMD	geomagnetic disturbance
GOA	Gulf of Alaska
gpm	gallons per minute
GWP	global warming potential
HAP	hazardous air pollutant
HAZOP	hazard and operability review
HMB	heat and material balance
IBC	International Building Code
IMO	International Marine Organization
ISA	International Society for Automation
kW	kilowatts
kW/m^2	kilowatts per square meter
L_{dn}	day-night equivalent sound level
L_{eq}	equivalent continuous sound level
LNG	liquefied natural gas
LNGC	liquefied natural gas carriers
LOD	Letter of Determination
LOR	Letter of Recommendation
LPG	liquefied petroleum gas
m^3	cubic meters
mg/kg	milligrams per kilogram
MMBtu/d	million British thermal units per day
MMPA	Marine Mammal Protection Act
MMscfd	million standard cubic feet per day
MOU	memorandum of understanding
mph	miles per hour
MSA	*Magnuson-Stevens Fisheries Conservation and Management Act*
MTSA	*Maritime Transportation Security Act*

NAAQS	National Ambient Air Quality Standards
NAVD	North American Vertical Datum
NESHAP	National Emission Standards for Hazardous Air Pollutants
NEPA	*National Environmental Policy Act*
NFPA	National Fire Protection Association
NGA	*Natural Gas Act*
NHPA	*National Historic Preservation Act*
NHTSA	National Highway Traffic Safety Administration
NMFS	National Marine Fisheries Service
NNSR	Nonattainment New Source Review
NO_2	nitrogen dioxide
NO_x	nitrogen oxides
NOAA	National Oceanic and Atmospheric Administration
NOI	*Notice of Intent to Prepare an Environmental Assessment for the Proposed Kenai LNG Cool Down Project and Request for Comments on Environmental Issues*
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NSA	noise sensitive areas
NSR	New Source Review
NUREG	Nuclear Regulatory Commission publication
NVIC	Navigation and Vessel Inspection Circular
OEP	Office of Energy Projects
P&ID	piping and instrumentation diagram
PFD	process flow diagram
PHMSA	Pipeline and Hazardous Materials Safety Administration
Plan	*Upland Erosion Control, Revegetation, and Maintenance Plan*
Procedures	*Wetland and Waterbody Construction and Mitigation Procedures*
Project	Kenai LNG Cool Down Project
PSD	Prevention of Significant Deterioration
psig	pounds per square inch gauge
$PM_{2.5}$	particulate matter less than or equal to 2.5 microns in aerodynamic diameter
PM_{10}	particulate matter less than or equal to 10 microns in aerodynamic diameter
RMP	risk management plan
SEI	Structural Engineering Institute

SHPO	State Historic Preservation Officer
SO_2	sulfur dioxide
SPCC Plan	Spill Prevention Control and Countermeasures Plan
tpy	tons per year
Trans-Foreland	Trans-Foreland Pipeline Company, LLC
ug/L	micrograms per liter
USC	United States Code
USDOT	U.S. Department of Transportation
USGS	U.S. Geological Survey
VOC	volatile organic compound
WSA	Waterway Suitability Assessment

SECTION A – PROPOSED ACTION

1.0 INTRODUCTION

On March 29, 2019, Trans-Foreland Pipeline Company, LLC (Trans-Foreland) filed an application with the Federal Energy Regulatory Commission (FERC or Commission) in Docket No. CP19-118-000 for authorization under section 3(a) of the Natural Gas Act (NGA) and parts 153 and 380 of the Commission's regulations to construct and operate certain natural gas facilities at its existing Kenai Liquefied Natural Gas (LNG) Plant near Nikiski in the Kenai Peninsula Borough, Alaska. Trans-Foreland proposes to bring parts of the Kenai LNG Plant out of its current warm idle status, allow for the import of LNG, and provide 7 million standard cubic feet per day (MMscf/d) of natural gas for use at Trans-Foreland's affiliated, but non-FERC jurisdictional, Kenai Refinery adjacent to the Kenai LNG Plant. The proposed project is known as the Kenai LNG Cool Down Project (Project).

We[1] prepared this environmental assessment (EA) in compliance with the requirements of the National Environmental Policy Act of 1969 (NEPA), the Council on Environmental Quality's regulations for implementing NEPA (Title 40 of the Code of Federal Regulations [CFR], Parts 1500-1508 [40 CFR 1500-1508]), and the Commission's regulations for implementing NEPA (18 CFR 380). The assessment of environmental impacts is an important and integral part of the Commission's decision-making process. As such, we prepared this EA to assess the environmental impacts that would likely occur as a result of the proposed Project and to facilitate public involvement in the environmental review process. We have developed and incorporated measures into this EA that we believe would appropriately and reasonably avoid, minimize, or mitigate environmental impacts associated with the Project activities. We recommend that these measures (included in this EA as recommendations) be attached as conditions to any authorization issued by the Commission for the Project.

FERC is the lead federal agency for authorizing interstate natural gas transmission facilities under the NGA, and the lead federal agency for preparation of this EA, in accordance with NEPA (40 CFR 1501) and the Energy Policy Act of 2005. The U.S. Department of Energy (DOE), U.S. Department of Transportation's Pipeline and Hazardous Materials Safety Administration (USDOT PHMSA), and U.S. Coast Guard (Coast Guard) participated as cooperating agencies in the preparation of this EA. Cooperating agencies have jurisdiction by law or special expertise with respect to the environmental impacts associated with Trans-Foreland's proposal.

[1] "We," "us," and "our" refer to the environmental and engineering staff of the Office of Energy Projects.

2.0 PURPOSE AND NEED

The existing Kenai LNG Plant is currently operating in a warm idle state. Trans-Foreland states that the proposed Project would permit it to cool down the existing LNG storage tanks and associated LNG facilities by importing LNG for delivery to the storage tanks, and subsequently deliver boil-off gas (BOG) generated under normal operations from the Kenai LNG Plant to the non-jurisdictional Kenai Refinery, which the refinery would use as a fuel source.

The Commission is an independent regulatory agency and conducts a complete independent review of project proposals, including an environmental review of the proposed facilities. Under Section 3 of the NGA, FERC considers, as part of its decision to authorize natural gas facilities, all circumstances bearing on the public interest. Specifically, regarding whether to authorize natural gas facilities used for import or export, FERC shall authorize the proposal unless it finds that the proposed facilities would not be consistent with the public interest. The Commission bases its decisions on both economic issues, including need, and environmental impacts.

3.0 SCOPE OF THIS ENVIRONMENTAL ASSESSMENT

The topics addressed in this EA include geology, soils, groundwater, surface waters, fisheries, aquatic wildlife, land use, visual impacts, cultural resources, socioeconomics, air quality, noise, reliability and safety, cumulative impacts, and alternatives. This EA describes the affected environment as it currently exists and the environmental consequences of the Project, and compares the Project's potential impact with that of various alternatives. This EA also presents our recommended mitigation measures.

As the lead federal agency for the Project, FERC is required to comply with section 7 of the Endangered Species Act (ESA), as amended and section 106 of the National Historic Preservation Act (NHPA). These statutes have been considered in the preparation of this EA.

4.0 COOPERATING AGENCIES

The DOE, USDOT PHMSA, and Coast Guard 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 DOE, USDOT PHMSA, and Coast Guard in the Project review process are described below. The EA provides a basis for coordinated federal decision making in a single document, avoiding duplication 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.

4.1 U.S. DEPARTMENT OF ENERGY

Under Section 3 of the NGA, the DOE's Office of Fossil Energy (DOE/FE) is responsible for authorizing imports of natural gas, including LNG. By law, under Section 3(c) of the NGA, applications to import natural gas are deemed to be consistent with the public interest and the Secretary of the DOE/FE must grant authorization without modification or delay.

4.2 U.S. DEPARTMENT OF TRANSPORTATION

The USDOT PHMSA has established the minimum federal safety standards for LNG facilities in compliance with Title 49 of the U.S. Code, Section 60101, et seq (49 USC 60101). Those standards are codified in 49 CFR 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 edition and portions of 2006 edition)*, is incorporated into these requirements by reference, with regulatory preemption in the event of conflict.

On February 11, 2004, the USDOT Research and Special Programs Administration (superseded by PHMSA), Coast Guard, and FERC entered into an Interagency Agreement to ensure greater coordination among these three agencies in addressing the full range of safety and security issues at LNG terminals, including terminal facilities and tanker operations, and maximizing the exchange of information related to the safety and security aspects of the LNG facilities and related marine operations.[2] Under the Interagency Agreement, FERC is the lead federal agency responsible for the preparation of the analysis required under NEPA for impacts associated with terminal construction and operation. USDOT PHMSA and Coast Guard participate as cooperating agencies but remain responsible for enforcing their regulations covering LNG facility design, construction, and operation.

On August 31, 2018, FERC and USDOT PHMSA signed a memorandum of understanding (MOU) to improve agency coordination on LNG project reviews and eliminate duplicative efforts.[3] In the 2018 MOU, USDOT PHMSA agreed to issue a

[2] Interagency Agreement among the FERC, USCG, and USDOT RPSA (now PHMSA) for the Safety and Security Review of Waterfront Import/Export LNG Facilities, February 11, 2004, https://www.ferc.gov/sites/default/files/2020-07/2004-interagency.pdf

[3] Memorandum of Understanding between the USDOT and the FERC regarding LNG Transportation Facilities, August 31, 2018, https://www.ferc.gov/sites/default/files/2020-05/FERC-PHMSA-MOU_0.pdf

Letter of Determination (LOD) stating whether LNG facilities would be capable of complying with location criteria and design standards contained in 49 CFR 193 Subpart B.

On March 25, 2020, the USDOT PHMSA provided a LOD to FERC on the 49 CFR 193, Subpart B, regulatory requirements. The USDOT PHMSA's conclusion on the siting and hazard analysis required by Part 193 is 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 of LNG facilities, as defined in 49 CFR 193. Upon inquiry from FERC staff, Trans-Foreland notified USDOT PHMSA of its Project and sought input on whether the location and design of the proposed vaporizers would meet USDOT PHMSA regulations by safety equivalency. On May 7, 2020, the USDOT PHMSA provided a letter to Trans-Foreland indicating that they had no objection to Trans-Foreland's demonstration of safety equivalency provided that certain information is provided to USDOT PHMSA prior to installation of the vaporizers and that it reserves to reconsider its decision if there are changes in the design, conditions, configuration, safety features, circumstances, or information. If the Project is approved, constructed, and operated, the LNG facilities as defined in 49 CFR 193would be subject to USDOT's inspection and enforcement programs to ensure compliance with the requirements of 49 CFR 193.

4.3 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. It 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 LNG terminal facilities in compliance with 33 CFR 127.

The Coast Guard is also responsible for issuing a Letter of Recommendation (LOR) as to the suitability of the waterway for LNG marine traffic. However, the Trans-Foreland facility pre-dates the Water Suitability Assessment (WSA) and LOR regulations, and in accordance with 33 CFR 127.007 and 74 Federal Register 19160, a WSA is not required to reactivate an inactive existing LNG facility unless the owner or operator sought modification or expansion of marine transfer operations. As described in

this EA, the Project would not change the shipping route, maximum size, or maximum number of LNGCs historically received by the existing facility. Based on this information, the Coast Guard will not require a WSA. In addition, in a letter dated January 23, 2019, the Coast Guard stated that a new or revised LOR would not be required for the Project.

5.0 PUBLIC REVIEW AND COMMENT

On May 13, 2019, the Commission issued a *Notice of Intent to Prepare an Environmental Assessment for the Proposed Kenai LNG Cool Down Project and Request for Comments on Environmental Issues* (NOI). The NOI was published in the Federal Register on May 17, 2019 and sent to about 207 interested parties, including federal, state, and local government agencies; elected officials; Native American tribes; and other interested parties. This list also includes all affected landowners (as defined in the Commission's regulations) whose property is within certain distances of proposed aboveground facilities and anyone who submits comments on the Project. Comments were requested from the public on specific concerns about the Project or environmental issues that should be considered during the preparation of the EA.

The Commission received three letters in response to the NOI. Comments were received from the Alaska State Historic Preservation Office (SHPO), the U.S. Environmental Protection Agency (EPA), and the Alaska Department of Environmental Conservation (ADEC). The letters included comments on water quality, aquatic resources, permafrost and vegetation, solid waste, hazardous materials and wastewater management, endangered species, seismic risks, cumulative effects, air quality, climate adaption, cultural resources, tribal consultation, environmental justice, permits and authorizations, and monitoring management topics. All substantive comments received in response to the NOI are addressed within this EA. In addition, correspondence with the U.S. Department of Defense (DOD) in accordance with Energy Policy Act of 2005 is discussed in section B.9.1.

6.0 PROPOSED FACILITIES

Trans-Foreland proposes to cool down the existing LNG storage tanks and associated LNG facilities and facilitate the import of LNG. Trans-Foreland estimates that approximately four LNG carriers (LNGC) would deliver LNG to the Kenai LNG Plant annually. Trans-Foreland also anticipates that most LNGCs would have capacities between 65,000 and 95,000 cubic meters with a maximum possible capacity of 138,000 cubic meters. Trans-Foreland proposes to make minor modifications to its marine transfer piping and valving to import LNG from LNGCs. Pumps on the LNGCs would offload LNG into the existing marine transfer arms and piping and into the existing LNG storage tanks. The BOG generated from storing the imported LNG would then be captured through the existing BOG system and the installation of a new 1,000 horsepower electric-driven BOG booster compressor. Any excess BOG would be vented

through the existing vent stack. In addition, during periods of lower BOG generation, LNG would be supplied by a new trim vaporizer feed pump to a new electric-powered trim vaporizer module to supplement BOG generation. In addition, the Project would add a new LNG tank circulation pump. There would also be two electrical buildings and other ancillary facilities and equipment. The installation of the BOG Management System and cool down of the existing LNG facilities and LNG storage tanks would allow the Kenai LNG Plant to provide up to 7.0 MMscf/d of natural gas to Trans-Foreland's affiliated, but non-FERC jurisdictional, Kenai Refinery adjacent to the Kenai LNG Plant.

The general Project area is shown in figure 1.

Trim LNG Vaporization Module

The Project would include an electric-powered trim LNG vaporizer module on an equipment skid near the existing LNG storage tanks. Trans-Foreland would connect the existing LNG storage tanks withdrawal header to the trim vaporizer feed pump. The discharge of the vaporizer feed pump would feed into the LNG vaporizer module (consisting of ten trim LNG vaporizer units) and the LNG vaporizer module vapor discharge would flow to the vapor space of an LNG storage tank via an existing piping connection.

Trim Vaporizer Feed Pump

Trans-Foreland would replace one of the existing LNG transfer pumps in the south pump pit with a smaller trim vaporizer feed pump. This pump would backup a similarly sized existing pump. Each of these pumps would individually feed the trim LNG vaporizer module and the existing auxiliary fuel gas compressor temperature quench line.

Boil-off Gas Booster Compressor

The Project would include one new nominal 1,000-horsepower electric-powered BOG booster compressor that would provide the BOG system with the capacity to deliver up to 7.0 MMscf/d of natural gas to the Kenai Refinery. The BOG booster compressor would deliver pressurized gas up to 800 psig to the existing gas supply metering and regulating facilities. The new BOG booster compressor would be in a new 1,000- to 2,500-square-foot building near the existing raw water storage tank and firewater pumps in the south-central portion of the Kenai LNG Plant site. The BOG booster compressor facility would connect to the existing BOG system discharge downstream of the existing aerial coolers after the auxiliary fuel gas compressor, and connect to the existing 6-inch-diameter natural gas supply lateral. Trans-Foreland would also install a new in-line flow meter on the fuel gas system to measure the BOG discharge quantity leaving the Kenai LNG Plant.

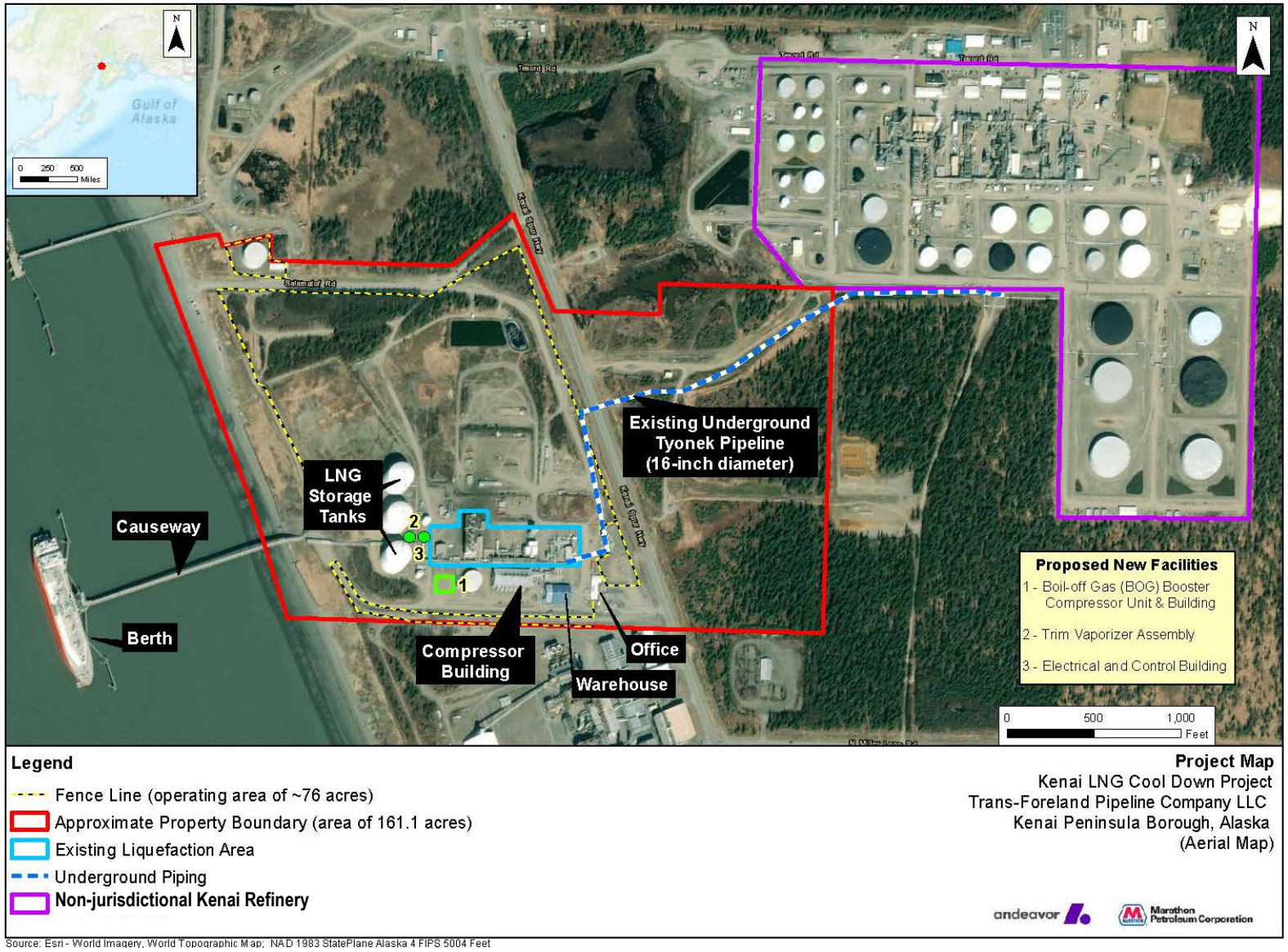

Figure 1 Kenai LNG Cool Down Project General Location Map

LNG Transfer System Enhancements

The Project would include new valves on existing storage tank nozzles and piping as well as minor piping rearrangements for the existing LNG storage tanks and LNG transfer system piping. Trans-Foreland would install new or upgraded valves on existing LNG storage tank nozzles. In addition to the valve work on the existing storage tanks, Trans-Foreland would install a new piping tee and associated valve assemblies on the existing LNG transfer system header that runs between the existing LNG storage tanks. A new small diameter piping segment with associated valves would be installed on the LNG marine transfer line for initial cool down of the currently warm process piping and LNG storage tanks.

LNG Circulation Pump

Trans-Foreland would replace one of the existing LNG transfer pumps in the north pump pit with a new LNG Circulation pump to allow circulation of LNG from the common header between the three LNG storage tanks to the top of any one tank.

Electric Power and Control System

The existing on-site power system would require new connections and controls for the Project. The new trim vaporizer module and new BOG booster compressor would be electric powered. Two new approximately 750-square-foot buildings that house electrical and control panels would be necessary for these facilities.

7.0 NON-JURISDICTIONAL FACILITIES

FERC is required to consider, as part of its decision to authorize jurisdictional facilities, all factors bearing on the public convenience and necessity. Occasionally, proposed projects have associated facilities that do not come under the jurisdiction of the Commission. These "non-jurisdictional" facilities may be integral to the need for the proposed facilities (e.g., a power plant at the end of a FERC-jurisdictional pipeline), or they may be merely associated as minor, non-integral components of the jurisdictional facilities that would be constructed and operated as a result of certification of the proposed facilities.

Trans-Foreland's affiliate Refinery would own and operate the existing Tyonek 16-inch-diameter natural gas pipeline connecting the Kenai LNG Plant's facilities to the Refinery. The Refinery would construct, own, and operate a new tie-in and natural gas supply lateral from the terminus of the existing 16-inch-diameter Tyonek Pipeline to the existing Refinery's natural gas supply manifold to deliver natural gas from the Kenai LNG Plant to the Refinery. The new Tyonek Pipeline tie-in and natural gas supply lateral consists of approximately 375 feet of 10-inch-diameter aboveground piping tying into an existing 6-inch flange and tee on the Refinery's existing 6-inch-diameter natural gas

supply manifold. Based on the information provided, no additional federal permits are anticipated for the service connection.

8.0 CONSTRUCTION, OPERATION, AND MAINTENANCE PROCEDURES

Trans-Foreland anticipates it would start construction of the proposed Project as soon as possible after the receipt of all required authorizations and necessary permits. Construction of the Project is estimated to take about five months. Trans-Foreland states that construction would be paused during winter months, if necessary, and anticipates placing the facilities into service after construction is complete.

Construction of the Project would occur fully within the existing boundary of the Kenai LNG Plant site. The existing plant is developed and has a mostly level grade. Different areas throughout the site are finished with varying materials, such as asphalt, gravel, or vegetation, based on the intended use of each operating area. Certain areas are separated by impoundment walls to allow for the collection of LNG in the event of a spill where the LNG would then be diverted to the LNG spill containment sump.

The Project would utilize existing electrical, water, and sewer services to feed associated equipment and construction activities, so no modifications or additional electrical, water, or sewer services are anticipated as a result of the Project.

Trans-Foreland states it would design, construct, test, operate, and maintain the proposed facilities to conform with or exceed federal, state, and local requirements, including the USDOT PHMSA's Minimum Safety Standards in 49 CFR 193, *Liquefied Natural Gas Facilities: Federal Safety Standards*, 18 CFR 380.15, *Siting and Maintenance Requirements*, the NFPA 59A: *Standards for the Production, Storage and Handling of LNG*, and applicable sections of the Coast Guard's regulations for Waterfront Facilities Handling LNG (33 CFR 127 and Executive Order 10173), and other recommended and generally-accepted good engineering practices.

During construction and restoration of the Project, Trans-Foreland would implement the measures contained in the following plans, in addition to other federal, state, and local permit requirements:

- FERC's Upland Erosion Control, Revegetation, and Maintenance Plan (Plan);[4]
- FERC's Wetland and Waterbody Construction and Mitigation Procedures (Procedures);[5]
- Trans-Foreland's Spill Prevention Control and Countermeasures Plan (SPCC Plan);
- Trans-Foreland's Unanticipated Discovery of Contamination Plan;
- Trans-Foreland's Emergency Action Plan; and
- Trans-Foreland's Unanticipated Discovery Plan.

FERC's Plan and Procedures are baseline construction and mitigation measures developed to minimize the potential environmental impacts of construction on upland areas, wetlands, and waterbodies. Trans-Foreland does not propose any modifications to FERC's Plan and Procedures.

The construction sequence for Project facilities prior to commissioning and cool down operations is anticipated to be mobilization of contractors, construction equipment, and contractor facilities; civil site work; foundation and building construction without the use of piles; installation of horizontal piping and electrical service support racks and associated utility racks; installation of trim vaporizer unit skid and BOG booster compressor; mechanical, electrical, and control system completion; pre-commissioning activities, such as hydrostatic testing, pneumatic testing, electrical continuity testing, and testing of control systems; building completion activities, such as painting and insulation; final site grading, landscaping, and cleanup; and demobilization of contractor's equipment and temporary construction facilities.

During the Project construction period, Trans-Foreland estimates needing 35 workers at the peak and about 20 workers on average for the Project, which would include Trans-Foreland Project staff, contractor personnel, and inspectors. Trans-Foreland's current operations personnel would assist the Trans-Foreland Project team and the Environmental Inspector (EI) with construction and environmental monitoring as the

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4 The FERC Plan can be viewed on the FERC website https://www.ferc.gov/sites/default/files/2020-04/upland-erosion-control-revegetation-maintenance-plan.pdf.

5 The FERC Procedures can be viewed on the FERC website https://www.ferc.gov/sites/default/files/2020-04/wetland-waterbody-construction-mitigation-procedures.pdf.

facility is being constructed. After Project completion, current Kenai LNG Plant operating personnel would be responsible for cool down operations and commissioning of the process piping, existing LNG storage tanks, new BOG Management System, and other related startup activities and no new permanent personnel would be required.

The EPA provided comments regarding monitoring of construction activities. In addition to Trans-Foreland's environmental compliance activities (which include monthly updates of construction compliance), FERC staff would conduct periodic inspections during all phases of construction. Following the construction inspections, FERC staff would prepare inspection reports and file them to the Commission's public record. After construction is complete, FERC staff would continue to monitor affected areas during operation to verify successful restoration. Additionally, FERC staff would conduct operations inspections of the LNG terminal throughout the life of the facility. Other federal and state agencies may also conduct inspections and require the implementation of additional and/or corrective environmental measures.

Maintenance of the Kenai LNG Plant would continue to be conducted in accordance with 49 CFR 193, Subpart G. Trans-Foreland's full-time maintenance staff would conduct routine maintenance and minor overhauls. Major overhauls and other major maintenance would be conducted by authorized factory service representatives and the services of trained contract personnel. Scheduled maintenance would be performed on safety and environmental equipment, instrumentation, and other equipment that require maintenance on a routine basis.

Access to the Kenai LNG Plant currently consists of one existing access road off of the Kenai Spur Highway (S-490) that crosses the center of the Kenai LNG Plant property. Due to the small scope of the construction activities and limited number of workers for the Project, Trans-Foreland does not propose any modifications to the plant site access.

9.0 LAND REQUIREMENTS

Construction of the Project would disturb about 18.3 acres of land, all of which consists of existing gravel cover within the existing property boundary of the Kenai LNG Plant site. Following construction, Trans-Foreland would maintain less than about 0.1 acre for permanent operation of the Project; it would restore the remaining acreage to former uses. The proposed facilities would be aboveground.

The Kenai LNG Plant encompasses approximately 161.1 acres of land, within which the site comprises about 76 acres of fenced area for operations. The Kenai LNG Plant's property also includes about 2,885 feet of water frontage on Cook Inlet, which is used for a single berth marine LNG loading facility.

The current land use within the plant site is developed industrial land. Land requirements are summarized in table 1 below.

Table 1
Kenai LNG Cool Down Project Summary of Land Requirements

Facilities	Ground Disturbance (acres)	Construction Workspace [a] (acres)	Permanent Workspace (acres)
Permanent Laydown Area P1 [b]	0.0	2.7	0.0
Permanent Laydown Area P2 [b]	0.0	2.4	0.0
Trim Vaporizer Module	<0.01	0.0	<0.01
BOG Compressor and Building	<0.06	0.0	<0.06
Motor Control Center and Building	<0.01	0.0	<0.01
Temporary Construction Workspace C1	0.0	10.7	0.0
Temporary Construction Workspace C2	0.0	1.1	0.0
Temporary Laydown Area	0.0	0.9	0.0
Kenai LNG Plant Existing Warehouse	0.0	0.3	0.0
Existing Plant Site Access Road	0.0	0.2	0.0
TOTAL	**<0.1**	**18.3**	**<0.1**

[a] Construction workspaces would not require excavation or grading.
[b] Permanent laydown areas would not require excavation or grading, and would not contain concrete or other foundations.

10.0 PERMITS, APPROVALS, AND REGULATORY CONSULTATIONS

Table 2 provides a list of known federal, state, and local permits for the Project, as well as any responses that have been received to date. Trans-Foreland would be responsible for obtaining all permits and approvals required for the Project, regardless of their listing in table 2.

Table 2
Anticipated Environmental Permits, Reviews, and Consultations for the Project

Agency	Permit/Approval/Consultations	Status
FEDERAL		
Federal Energy Regulatory Commission	Authorization under Section 3 of the Natural Gas Act	Application filed March 29, 2019.
U.S. Department of Energy, Office of Fossil Energy	Authorization to Import	Request for authorization not yet initiated. Anticipated Third Quarter 2020.
U.S. Environmental Protection Agency	Coordination with Alaska Department of Environmental Conservation for National Pollution Discharge Elimination System permitting	Project introduction letter sent January 15, 2019. Consultation complete January 2019.
U.S. Army Corps of Engineers	Clean Water Act Section 404 / Rivers and Harbors Act Section 10 33 United States Code (USC) Section 408	Project introduction letter sent January 15, 2019. Response received January 22, 2019. Call held and determination of no further consultation January 24, 2019.
U.S. Fish and Wildlife Service	Section 7 Consultation under Endangered Species Act Migratory Bird Treaty Act, Bald and Golden Eagle Protection Act Coordination	Consultation Complete.
U.S. Coast Guard	Administer national regulatory program to ensure safe transportation of LNG subject to 46 CFR 154, 33 CFR 127, and 33 CFR 105, and review of WSA and issue LOR per 33 CFR 127.007 and 74 Federal Register 19160	Letter that a new or revised LOR would not be required for the Project issued on January 23, 2019.

Table 2
Anticipated Environmental Permits, Reviews, and Consultations for the Project

Agency	Permit/Approval/Consultations	Status
USDOT PHMSA	Administer national regulatory program to ensure the safe transportation of natural gas subject to 49 CFR 193 and review Project's compliance with the siting requirements in 49 CFR 193 Subpart B and issue LOD per 2018 MOU. Assists as a cooperating agency to review the safety and security of waterfront import/export LNG facilities per 2004 Interagency Agreement.	LOD submitted to FERC on March 25, 2020. Letter of no objection on equivalency of vaporizer meeting spacing requirements under 49 CFR 193 sent on May 7, 2020.
U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service	Endangered Species Act Section 7 Consultation (16 USC 1856 et seq.) Magnuson-Stevens Fishery Conservation and Management Act Consultation Essential Fish Habitat Consultation (50 CFR Part 600)	Project introduction letter sent February 27, 2019 Response received December 9, 2019 recommending mitigation measures be implemented to reduce impacts on T&E species. Consultation Ongoing.
State		
Alaska Department of Environmental Conservation, Water Division	Construction General Permit for Storm Water Discharges for Large and Small Construction Activities (2016 CGP, AKR100000) Hydrostatic General Permit (AKG003000), if required	Project introduction letter sent January 15, 2019. Anticipated submittal approximately 2 months prior to construction.
Alaska Department of Environmental Conservation, Division of Air Quality	Title V permit modification	To be submitted prior to commencing operations.
Alaska Department of Fish and Game	Threatened and Endangered Species Consultation State Species of Concern	Project introduction letter sent January 15, 2019. Consultation only.

Table 2 Anticipated Environmental Permits, Reviews, and Consultations for the Project		
Agency	**Permit/Approval/Consultations**	**Status**
Alaska Department of Natural Resources, Office of History and Archaeology (SHPO)	National Historic Preservation Act Section 106 Consultation	Section 106 consultation initiated on October 26, 2018. SHPO concurrence received on April 1, 2020.
Borough		
Kenai Peninsula Borough Government	Zoning Changes; Letter of No Objection; Building and Construction Permit	Application not yet submitted. Anticipated submittal third quarter 2020.

SECTION B – ENVIRONMENTAL ANALYSIS

The following sections discuss the Project's potential direct and indirect impacts on environmental resources. 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 are defined as 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. Our analysis also addresses direct and indirect effects collectively by resource.

The analysis contained in this EA is based upon Trans-Foreland's application and supplemental filings and our experience with the construction and operation of natural gas infrastructure. However, if the Project is authorized and proceeds to the construction phase, it is not uncommon for a project proponent to require modifications (e.g., minor changes in workspace configurations). These changes are often identified by a company once on-the-ground implementation work is initiated. Any Project modifications would be subject to review and approval from FERC's Director of the Office of Energy Projects (OEP), or the Director's designee, and any other permitting/authorizing agencies with jurisdiction.

Based on our review of the Project, we have determined that constructing and operating the proposed LNG facilities would not impact mineral resources; wetlands; vegetation and terrestrial wildlife; national or state wild or scenic rivers, recreation or scenic places, state parks, nature preserves, national trails, wilderness areas; registered landmarks, landfills, quarries, hazardous waste sites, or wastewater outfalls; planned developments; and coastal zone management areas. Therefore, these resources are not addressed further in this analysis. Furthermore, the LNG facilities would not impact water resources, fisheries (including Essential Fish Habitat [EFH]) and marine mammals, and threatened and endangered species; however, these resources would be affected by an estimated four LNGCs traversing Cook Inlet annually to call on the newly modified Kenai LNG Plant; therefore, these effects are described below.

1.0 GEOLOGY

The Project is within the Kenai Lowland, part of the Cook Inlet Lowland physiographic sub-province. The Kenai Lowland is gently sloping, with plains influenced and shaped heavily by alluvial and glacial activity. During the Pleistocene era, the Kenai Peninsula was buried by ice and flooded by proglacial lakes several times

(Karlstrom, 1964). The current surfaces of the Kenai Lowland are hummocky and consist of Quaternary era deposits of glacial and alluvial sediment derived from the erosion of the Alaska Range, Kenai Mountains, and Chugach Mountains during these glaciations (Kirschner and Lyon, 1973). The Project area is at an elevation of approximately 100 feet above mean sea level. Due to current industrial use, the Project area has been graded and the topography is generally flat to gently sloping.

Geologic hazards are natural, physical conditions that can result in damage to land and structures or injury to people. Such hazards typically include seismicity (e.g., earthquakes, surface faults, and soil liquefaction), landslides, flash flooding, and ground subsidence. Volcanism also occurs in the Project vicinity. As pertinent to construction, safety, and reliability of LNG facility operations, natural geologic hazards are discussed in detail in section B.9.5.2.

2.0 SOILS

Soil characteristics at the Kenai LNG Plant were identified and assessed using the Natural Resources Conservation Service's (NRCS) Soil Survey Geographic database (NRCS, 2019). Project area soils have been altered by incorporating non-native structural fill and are classified as urban land.[6] Urban land soils are not prime farmland and are not rated for other major soil limitations, such as wind erosion, water erosion, revegetation potential, or susceptibility to compaction (NRCS, 2019).

The Kenai LNG Plant is on the northwestern shore of the Kenai Peninsula in the Cook Inlet Lowlands major land resources area (MLRA). Soils in this MLRA are generally deep and range in permeability from well-drained to poorly-drained (NRCS, 2004). The major soil resource management considerations within this MLRA are erosion and water quality (NRCS, 2004).

Trans-Foreland would install erosion and sedimentation controls in accordance with the FERC Plan. FERC's Plan requires Trans-Foreland to install erosion controls immediately after initial soil disturbance to minimize erosion during construction, and to successfully revegetate/stabilize disturbed areas, which would minimize long-term soil loss. If necessary, Trans-Foreland would additionally utilize dust control measures (such as routine wetting of the construction area) during construction activities. FERC's Plan also requires that Trans-Foreland inspect temporary erosion controls on a regular basis and after each rainfall event of 0.5 inch or greater to ensure proper functioning, and that these devices are maintained until workspaces are successfully revegetated or stabilized with other surface cover.

[6] Soils classified by the NRCS as urban land have generally been minimally to significantly altered by anthropogenic development and may have impervious surfaces, such as buildings and pavement.

Coastal erosion is a well-documented issue along the eastern side of the Cook Inlet in the Kenai Peninsula Borough. The estimated rate of bluff face erosion near the Kenai LNG Plant is 1 to 3 feet per year, with a maximum erosion rate of 5 feet per year (Kenai Peninsula Borough, 2014), but strong storms have been documented to cause up to 50 feet of bluff face retreat in one event (U.S. Army Corps of Engineers, 2011). Proposed facilities would be entirely within the boundaries of the existing plant, would be sited approximately 330 feet from the bluff, and would not alter the existing plant's exposure to coastal bluff erosion. See section B.9.5.2 for additional information on bluff erosion impacts, mitigation measures, and facility design factors.

Existing Soil Contamination and Inadvertent Spills

In 2011, the Kenai LNG Plant's former owner conducted a site soil characterization which identified six separate areas of the Kenai LNG Plant with concentrations of arsenic in soils exceeding the ADEC-approved, site-specific soil cleanup level of 16 milligrams per kilogram (mg/kg). In January 2016, ADEC determined that all exposure pathways were either controlled, de-minimis in nature, or incomplete, and there was no unacceptable risk to human health or the environment. Therefore, ADEC issued the site a Cleanup Complete with Institutional Controls determination.

This determination mandates that land use remain commercial/industrial and requires signage around the perimeter of each area of soil where concentrations of arsenic exceed 16 mg/kg to provide notification of the health risks posed to workers. Additionally, the excavation, transport, movement, treatment, or disposal of soil from any of these six areas requires prior ADEC notification and approval. None of the arsenic-impacted areas are within proposed construction workspaces; therefore, no excavation, transport, movement, treatment, or disposal of soil from any of the six arsenic-impacted areas would be required for the Project. However, two such areas are immediately adjacent to permanent laydown area P1. To comply with ADEC's other institutional controls, Trans-Foreland maintains signage in the arsenic-impacted areas.

Trans-Foreland has developed an Unanticipated Discovery of Contamination Plan, which it would implement in the event of discovery of contaminated soil or groundwater during construction. Specifically, Trans-Foreland would cease activities in that area, initiate measures to avoid the spread of contamination, initiate measures to characterize and manage the contamination, and notify any appropriate agencies.

Soil contamination from inadvertent spills or leaks of fuels, lubricants, and coolant from construction equipment would be minimized by implementation of Trans-Foreland's SPCC Plan, which specifies preventive measures to reduce the likelihood of a spill, as well as cleanup procedures in the event of spills or leaks of these materials.

Should a spill occur, Trans-Foreland would follow its SPCC Plan to contain the material and to ensure spills would be cleaned up and disposed of in an appropriate manner.

Based on the limited scope and anticipated depth of disturbance, Trans-Foreland's implementation of its SPCC Plan and Unanticipated Discovery of Contamination Plan and the FERC Plan, and because there would be no ground disturbance within the known areas of arsenic-contaminated soils, we conclude that the Project would not significantly impact soil resources.

3.0 WATER RESOURCES

3.1 GROUNDWATER RESOURCES

The Kenai LNG Plant is within the South-Central Hydrologic Region of Alaska. The regional aquifer is characterized by unconsolidated glacially-derived, alluvial or colluvial clay, silt, sand, gravel, and boulder deposits in low-lying valleys. Due to the variability in grain size and discontinuity of interbedded lenses, the hydraulic characteristics of the regional aquifer are highly variable (Miller et al., 1999). Although locally high concentrations of naturally-occurring iron, manganese, and arsenic have been encountered in area groundwater, most water quality parameters, including nutrients, pesticides, and volatile organic compounds (VOC) (from industrial and agricultural activities in the Cook Inlet area), do not exceed EPA drinking water recommendations (Glass, 2001). Locally, in areas near the coast, these aquifers contain moderately saline to very saline water where hydraulically connected to seawater (Miller et al., 1999).

The EPA oversees the Sole Source Aquifer Protection Program to protect high production aquifers that supply 50 percent or more of the region's water supply and for which there are no reasonably available alternative drinking water sources, should the aquifer become contaminated. The Project does not overlie EPA-designated sole source aquifers (EPA, 2019). The Project also does not overlie any state-designated drinking water protection areas (ADEC, 2019). Further, Trans-Foreland has not identified water supply wells or springs within 150 feet of the Project workspace (Alaska Department of Natural Resources, 2019).

Groundwater Contamination

The Kenai LNG Plant has undergone remediation for arsenic in soil; however, groundwater samples collected from monitoring wells at the site in 2002 were found to contain 1.44 to 3.17 micrograms per liter (ug/L) of arsenic, which is below the ADEC action level of 10 ug/L. Therefore, ADEC determined that arsenic is not a contaminant of concern in groundwater at the Kenai LNG Plant.

Numerous groundwater monitoring wells, injection wells, and recovery wells were installed as part of an EPA-approved groundwater correction action plan for the adjacent

Kenai Refinery. There are approximately 20 groundwater monitoring wells and recovery wells associated with this effort within the Project workspace. Trans-Foreland states that existing monitoring wells close to any planned improvements would be protected with steel bollards or concrete barriers. If needed, wells can be reconfigured to 'flush mount' style so surface disturbance/traffic deemed hazardous to well integrity would be minimized.

The non-jurisdictional Kenai Refinery began operation at the site in 1969 and covers an area of approximately 350 acres; primary products of the refinery include gasoline and diesel fuels, jet fuels, residual heating oil, sulfur, asphalt, and liquefied petroleum gas (ADEC, 2017). In September 1988, an estimated 6,700 gallons of jet fuel were released at the refinery. The operator excavated approximately 1,500 cubic yards of soil from the spill area but was not able to completely remove all contaminated soil without jeopardizing the structural integrity of the associated tank and piping. A second large spill occurred in May 1990, involving the release of recovered oils. This spill spread over approximately 1,040 square feet. The operator recovered approximately 135 barrels of the spilled oil and excavated 100 cubic yards of soil but was not able to completely remove all of the contaminated soil (ADEC, 2017). Subsequent site characterization efforts identified contaminants of concern at this site in soil and groundwater, including benzene, toluene, ethylbenzene, xylenes, naphthalene, trichloroethene, vinyl chloride, and diesel- and gasoline-range organics. The known horizontal extent of groundwater contamination (benzene and trichloroethene) extends into the northern portion of the Kenai LNG Plant, inclusive of proposed permanent laydown areas P1 and P2 (ADEC, 2017).

Groundwater was encountered during Trans-Foreland's geotechnical investigation for the Project at depths as shallow as 6.6 feet below the ground surface. Trans-Foreland states that ground disturbing activities would be approximately 500 feet from the nearest known extent of the groundwater plume. If groundwater is encountered during excavation, water extracted from dewatering activities would be containerized and labeled as non-hazardous waste, sampled to verify waste profile, and shipped off-site for disposal. Trans-Foreland would also implement applicable procedures as outlined in its Unanticipated Discovery of Contamination Plan.

Groundwater Impacts and Mitigation

Surface drainage and groundwater recharge patterns can be temporarily affected by construction activities which may cause minor fluctuations in groundwater levels and/or increased turbidity; however, we expect water levels to quickly re-establish and turbidity levels to rapidly subside.

The Project may require up to 16,800 gallons of water for fugitive dust control during construction, obtained from the Kenai LNG Plant's firewater system. The

firewater system is sourced from three groundwater supply wells located across the Spur Highway, more than 150 feet from the Project area. Two of the firewater supply wells are within the horizontal extent of groundwater contamination from the Kenai Refinery; however, these wells are screened in the upper confined aquifer, which is hydrologically separate from the unconfined aquifer where groundwater contamination occurs. The Project would not impact operational groundwater use of the existing Kenai LNG Plant.

Should spills of fuels, lubricants, or other hazardous materials occur, Trans-Foreland would follow its SPCC Plan to contain the material and to ensure spills would be cleaned up and disposed of in an appropriate manner.

Based on the limited proposed Project scope and depth of disturbance, as well as Trans-Foreland's implementation of its various construction plans, and an absence of existing nearby sole-source aquifers, drinking water source protection areas, and both public and private potable water supply wells, we conclude that the Project would not significantly impact groundwater resources.

3.2 SURFACE WATER

The Project activities at the Kenai LNG Plant would have no direct impacts on surface waters. However, LNGCs calling on the terminal would affect Cook Inlet. Cook Inlet is a tidal estuary about 230 miles in length, generally extending south from the Anchorage area into the Gulf of Alaska (GOA). At high tide, Cook Inlet's 270.5 trillion gallons of water cover a surface area of approximately 7,900 square miles. Except for naturally high turbidity levels, water quality in Cook Inlet is generally considered good due to the inflow of melting snow and glaciers. According to the National Oceanic and Atmospheric Administration, water temperatures within Cook Inlet range between 32 degrees Fahrenheit (°F) and 58 °F.[7] Tidal currents range from 4 to 9 knots.

Operating an LNGC's engines and systems while at berth to offload cargo would require the intake and discharge of engine cooling water and the intake of water for ballast. According to Trans-Foreland and depending on the specific ship's size, an LNGC engine's operations while at berth would require between 8.2 and 13.2 million gallons of water per ship to be withdrawn and discharged from and into Cook Inlet. Trans-Foreland estimates that approximately four LNGCs would deliver LNG to the Kenai LNG Plant annually. Additionally, an LNGC berthed at the site could require up to 9.1 million gallons of water to be uploaded from Cook Inlet for ship ballast. LNGCs at berth also increase the potential for an inadvertent release of equipment-related fluids.

[7] Water Temperature Table of the Alaska Coast. https://www.nodc.noaa.gov/dsdt/cwtg/alaska.html. March 2020.

Due to the size of Cook Inlet and the dynamic nature of the tidal and freshwater inflows into the system, and the frequency and amounts of water that would be required for LNGC operations (engine and other systems) and ballast, uploaded water would be quickly replaced and water quality would not be significantly affected. The primary impacts of uploading water for LNGC operations and ballast would be experienced by aquatic organisms which are addressed in the Fisheries and other Aquatic Organisms section below.

While traversing Cook Inlet and while berthed at the Kenai LNG Plant, LNGC operations would result in discharges temporarily affecting water quality in Cook Inlet. According to Trans-Foreland, the temperature of cooling water that would be discharged from an LNGC is generally 20 to 25 degrees (Fahrenheit) higher than the ambient water temperature in Cook Inlet. Subsequently, the higher temperature discharge(s) would increase the temperature of the receiving water, thereby temporarily decreasing water quality. However, this impact would be highly localized, and its magnitude would decrease quickly over distance and time (dilution) due to swift currents and tidal changes. Other water quality components in Cook Inlet including oxygen content, pH, and salinity could also be temporarily affected by LNGC discharges, but these impacts, similar to temperature impacts, would be highly localized and lessened with distance and time by dilution. Additionally, it is unlikely that an LNGC calling on the site would discharge substantial amounts of ballast water; however, should the discharge of ballast water be required, LNGCs would, in accordance with Coast Guard regulations (33 CFR 151, subpart D and 46 CFR 162.060 on Standards for Living Organisms in Ships' Ballast Water Discharged in U.S. Waters; Final Rule [77 FR 17254 {Mar. 23, 2012}] and Navigation and Vessel Inspection Circular 01-18), operate a ballast water management system that meets applicable ballast water discharge standards.

LNGC operations could result in the inadvertent release of equipment-related fluids into Cook Inlet, which would decrease affected water quality. However, depending on the amount of fluid released, impacts on water quality would be temporary, localized, and quickly diluted. To reduce the potential for an inadvertent release of equipment-related fluids and to address a release should one occur, all vessels with 400 gross tonnage and above, such as LNGCs, are required by guidelines outlined by the International Maritime Organization under the Marine Environmental Protection Committee to develop and implement a Coast Guard approved Shipboard Oil Pollution Emergency Plan.

Based on the characteristics of Cook Inlet, impacts on this waterbody resulting from LNGCs calling on the Kenai LNG Plant, and required mitigation measures (including implementation of a Shipboard Oil Pollution Emergency Plan) we conclude that constructing and operating the Project would not significantly affect water resources.

4.0 FISHERIES AND OTHER AQUATIC ORGANISMS

The Project activities at the Kenai LNG Plant would result in no direct impacts on fisheries and aquatic organisms. However, LNGCs calling on the terminal would affect Cook Inlet. A wide variety of fish in all their life stages and other aquatic organisms including aquatic insects, zooplankton, and other plankton are present throughout Cook Inlet. Cook Inlet fisheries have been generally characterized as consisting largely of migratory fish, eulachon, and salmon that return to spawn in rivers and outmigrate as smolts. Benthic communities in Cook Inlet would not be affected by LNGCs calling on the Kenai LNG Plant. As described in the recently issued final environmental impact statement (EIS) for the Alaska LNG Project,[8] information on phytoplankton present in Cook Inlet is limited. Phytoplankton blooms are known to peak in spring corresponding with water column stratification and increased light levels and in the late summer with warmer water and air temperatures. As also described in the Alaska LNG Project final EIS, the phytoplankton assemblage in Cook Inlet is dominated by diatoms and microflagellates. Additionally, ichthyoplankton and surface insects peak in early July and decrease thereafter. Lastly, small copepods largely comprise the zooplankton studied, with large copepods, euphausiids (krill), chaetognaths (arrow worms), and cirripedes (larval barnacles) present in lower numbers.

LNGCs traversing Cook Inlet and berthed at the Kenai LNG Plant (through the uptake and discharge of marine waters or the inadvertent release of equipment-related fluids) would affect fisheries and other aquatic organisms in proximity to the LNGC. Changes to water quality, ship generated noise, and the physical disturbance of the water column would affect species present, causing fish to avoid the LNGCs, and increasing the rates of stress, injury, and mortality experienced by fish and other aquatic organisms. Additionally, LNGC water intakes could result in small fish, fish eggs and larvae, phytoplankton, and other aquatic organisms becoming entrained or impinged during cooling water withdrawals. Entrainment and/or impingement would further increase the rates of stress, injury, and mortality experienced by fish and other aquatic organisms.

Impacts on fisheries and other aquatic organisms resulting from berthed LNGCs would be reduced due to screened (0.2-inch-wide bars spaced every 0.8 to 1 inch) water intakes which, according to Trans-Foreland, are generally located about 15 to 30 feet below the water surface. Therefore, based on the size of Cook Inlet, the fisheries and other aquatic resources present, and the frequency and volumes of water that would be required for LNGC operations and ballast; impacts on fisheries and other aquatic organisms would be highly localized, temporary, and not significant.

[8] FERC Docket No. CP17-178-000 (accession # 20200306-3098)

4.1 ESSENTIAL FISH HABITAT

The Magnuson-Stevens Fisheries Conservation and Management Act (MSA) was established, along with other goals, to promote the protection of 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 National Marine Fisheries Service (NMFS).

EFH is present (and would be traversed by LNGCs) within Cook Inlet for numerous fish species including salmon, rockfish, cod, perch, sole, and other fishes. Based on our review of the Project and the effects of LNGCs calling on the Kenai LNG Plant, it is our view that these vessels may (through the uptake and discharge of marine waters) affect EFH in Cook Inlet. Effects on EFH would include changes to water quality and the physical disturbance of the water column. Subsequently, fish dependent on affected EFH may experience increased rates of stress, injury, and mortality. However, as described previously, and based on the size of Cook Inlet and the frequency and volumes of water that would be required for LNGC operations and ballast, these affects would be highly localized, temporary, minor, and not significant. Therefore, we conclude that Project effects on EFH would not be adverse. Because these effects are not adverse, an EFH assessment and further consultation with NMFS are not required.

4.2 MARINE MAMMALS

The Marine Mammal Protection Act (MMPA) prohibits the "take" of marine mammals in U.S. waters without appropriate authorization. "Take" under the MMPA means "to hunt, harass, capture, or kill" any marine mammal or attempt to do so (16 United States Code [USC] 1362 [13]). "Harass," as used in the definition of "take," is "any act of pursuit, torment, or annoyance that has the potential to injure a marine mammal or marine mammal stock in the wild;" or "the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering" (16 USC 1362 [18][a]).

Cook Inlet is home to several pinnipeds (seals) and cetaceans (whales, porpoises, and dolphins). Specifically, Cook Inlet provides habitat for Harbor seal (Phoca vitulina), Baird's beaked whale (Berardius bairdii), Cuvier's beaked whale (Ziphius cavirostris), Stejneger's beaked whale (Mesoplodon stejnegeri), Beluga whale (Delphinapterus leucas), Gray whale (Eschrichtius robustus), Humpback whale (Megaptera novaeangliae), Killer whale (Orcinus orca), Minke whale (Balaenoptera acutorostrata), Dall's porpoise (Phocoenoides dalli), Harbor porpoise (Phocoena phocoena), and Pacific white-sided dolphin (Lagenorhynchus obliquidens). Marine Mammals that are also federally-listed threatened and endangered species are addressed in the following section.

LNGCs traversing Cook Inlet and berthed at the Kenai LNG Plant could affect marine mammals. LNGC transits to and from the Kenai LNG Plant would disturb the water column and could affect water quality in the immediate vicinity of the ship. Also, these transits could result in a marine mammal being struck. Ship generated noise could affect marine mammals use of sound to communicate, navigate, avoid predators, mate, and locate food. Marine mammal species have differing hearing capabilities in terms of sensitivity and frequency and these variations can lead to differences in susceptibility to injury or disturbance. Habitat disturbance, ship strikes, and the potential disruption of normal behaviors would result in avoidance and displacement, possibly increase predation, and could increase the rates of stress, injury, and mortality experienced by marine mammals.

To reduce the potential for impacts on marine mammals due to ship strikes, Trans-Foreland would provide the "Vessel Strike Avoidance Measures and Reporting for Mariners" guidance to vessels contracted to deliver LNG to the Kenai LNG Plant. All vessels entering U.S. waters are obligated to comply with the MMPA and other applicable federal and state requirements.

Marine mammals are accustomed to ship traffic within Cook Inlet and to some extent have become habituated to this traffic. Additionally, marine mammal presence within Cook Inlet is often transitory and, for some species, seasonal. Furthermore, as reported in the Alaska LNG final EIS, Cook Inlet has a naturally noisy acoustic environment (noise sources include vessels, oil platform activities, and aircraft overflights). Therefore, based on the relatively small number of LNGCs that would be traversing Cook Inlet (4 carriers per year), use of licensed ship pilots, and compliance with the "Vessel Strike Avoidance Measures and Reporting for Mariners" and other applicable requirements, we conclude that impacts on marine mammals would not be significant. We also note that the operation of LNGCs is outside of the FERC's jurisdiction.

4.3 FEDERALLY-LISTED THREATENED AND ENDANGERED SPECIES AND OTHER PROTECTED SPECIES

Based on our review of the Project; we have determined that constructing and operating the Kenai LNG Cool Down Project would result in *no effect* on federally-listed threatened and endangered species managed by the U.S. Fish and Wildlife Service; therefore, no additional consultation with this agency is required, and the ESA section 7 consultation process pertaining to this agency is complete. In a letter to Commission staff dated December 9, 2019, the NMFS concluded that "…the main impacts of the project to marine mammals listed under the ESA will be from vessel (LNG carriers) operations to and from the facility." In this letter, the NMFS also provided numerous recommendations to reduce impacts on federally-listed threatened and endangered species resulting from LNGC operations. As described previously, LNGCs calling on the

Kenai LNG Plant are non-jurisdictional facilities. As such, the Commission has no authority to regulate these vessels and cannot require them to adhere to any impact avoidance, minimization, or mitigation measures. Therefore, consistent with the Commission's regulatory authority and its NEPA responsibilities, we are merely disclosing the impacts of these facilities in this analysis. Furthermore, as described below, we have determined that LNGCs associated with the Project are *not likely to adversely affect* federally-listed threatened and endangered species under the jurisdiction of the NMFS. Therefore, we request NMFS to consider the analysis below as our biological assessment for the Project. We also request NMFS' concurrence with our determination that the Project is *not likely to adversely* affect federally-listed threatened and endangered species. To ensure compliance with section 7 of the ESA, **we recommend that**:

- **Trans-Foreland should <u>not begin</u> construction activities <u>until</u>:**

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

    b. **FERC staff completes ESA consultation with the NMFS; and**

    c. **Trans-Foreland has received written notification from the Director of OEP, or the Director's designee, that construction or use of mitigation may begin.**

Lastly, we conclude that constructing and operating the Project facilities would not impact any other federal or state protected species.

Federally-listed threatened and endangered species that could occur or are known to occur in Cook Inlet include Cook Inlet beluga whale (Delphinapterus leucas); Gray whale, Western North Pacific distinct population segment (DPS) (Eschrichtius robustus); Humpback whale, Western North Pacific DPS (Megaptera novaeangliae); Sei whale (Balaenoptera borealis); Steller sea lion, Western DPS (Eumetopias jubatus); Chinook salmon (Onchorhynchus tshawytscha); and Steelhead Trout (Oncorhynchus mykiss).

<u>Cook Inlet Beluga Whale</u>

The Cook Inlet beluga whale was listed as endangered in 2008. A Biologically Important Area for the small and resident population of the species occurs in the Upper Cook Inlet and along the western coast of Cook Inlet. In 2011, NMFS designated critical habitat for Cook Inlet beluga whales (76 FR 20180) in the two areas of Cook Inlet. Mating of Cook Inlet beluga whales is believed to occur between late winter and early spring. Most calves are born between May and August, but calving season can extend into October. In Cook Inlet, beluga whales feed extensively on spawning eulachon in

spring, shifting to salmon as eulachon runs diminish and salmon runs begin in the summer months. Winter prey is not well known; however, it is presumed that Cook Inlet beluga whales forage more on benthic fish and invertebrates at that time of year. Although beluga whales may be found throughout Cook Inlet at any time of year, they generally spend the ice-free months in the Upper Cook Inlet and expand their distribution south and into more offshore waters of the Upper Cook Inlet in winter. Shallow water habitats in Upper Cook Inlet may be important for calving because they provide warmer water for newborn calves and refuge from killer whale predation. While specific calving areas in Cook Inlet have not been identified, newborn calves have been observed in Upper Cook Inlet (Susitna River Delta, Knik Arm, Chickaloon Bay/Southeast Fire Island, Turnagain Arm), as well as the lower Kenai River delta.

Noise is believed to be a key factor in beluga health and distribution patterns. It has been suggested that the decline of beluga populations is due in part to shipping traffic.

Gray Whale

Gray whales, Western North Pacific DPS, were listed as endangered in 1970. Critical habitat has not been designated for the species. According to the Alaska Department of Fish and Game (ADF&G), Gray whales often travel in groups of two to three in coastal shallow waters over the continental shelf. Gray whales are baleen whales, feeding primarily by dredging through the mud and filtering out bottom-dwelling crustaceans (e.g., amphipods). A gray whale Biologically Important Area for migration occurs at the mouth of Cook Inlet in the GOA which would be traversed by LNGCs. This area is used by gray whales traveling south from November through January and traveling north from March through May.

Humpback Whale

Humpback whales, Western North Pacific DPS, were listed as endangered in 1970. Critical habitat has not been designated for the species. According to the ADF&G, humpback whales are usually found alone or in temporary small groups. During migration, they are found at the ocean surface; while feeding and calving, they are typically found in shallow waters. Humpback whales spend summers in temperate and subpolar waters, similar to that of Cook Inlet. Breeding and calving take place in tropical and subtropical waters during the winter months. Humpback whales are baleen whales, feeding primarily on euphausiids (e.g., krill) and small schooling fish. they rarely feed during winter and while migrating.

Sei Whale

The sei whale was listed as endangered in 1970. Critical habitat has not been designated for this species. Sei whales are typically found in small groups near the continental shelf edge and over deeper waters. Sei whales are baleen whales that primarily feed on plankton, small schooling fish, and squid. Sei whales are found in the GOA and south of the Aleutian Islands in the summer where they feed. They migrate south out of Alaska waters to lower latitudes for winters where they give birth.

Steller Sea Lion

The Steller sea lion, Western DPS, was listed as endangered in 1997. Critical habitat for the Steller sea lion is defined by NMFS as "a 20 nautical mile buffer around all major haulouts and rookeries, as well as associated terrestrial, air, and aquatic zones, and three large offshore foraging areas." In addition, NMFS also "designated no-entry zones around rookeries [and] a complex suite of fishery management measures designed to minimize competition between fishing and the endangered population of Steller sea lions in critical habitat areas." Steller sea lions feed primarily on fish and cephalopods. Steller sea lion haulouts and rookeries are found on beaches, ledges, and reefs for resting and breeding.

Chinook Salmon

Six Chinook salmon Evolutionary Significant Units (ESU) spawn on the West Coast of Alaska, but also occur within Cook Inlet: Lower Columbia River Spring, Upper Columbia River, Puget Sound, Snake River Fall, Snake River Spring/Fall, and Upper Willamette River. These ESUs are listed as either threatened or endangered. Critical habitat for Chinook salmon does not occur in Alaska. Chinook salmon are anadromous fish (migrating from a marine environment to freshwater streams and rivers to spawn); once they spawn in freshwater, they die. While in marine environments, they feed on other fish.

Steelhead Trout

Six steelhead trout DPS spawn on the West Coast of Alaska, but also occur within Cook Inlet. They also occur within the Lower Columbia River, Middle Columbia River, Upper Columbia River, Puget Sound, Snake River Basin, and Upper Willamette River. These DPSs are listed as either threatened or endangered. Critical habitat for steelhead trout does not occur in Alaska. Steelhead trout are anadromous fish; however, unlike Chinook salmon, steelhead trout can mate more than once. Steelhead trout can mature in the ocean or in freshwater rivers. Young fish feed on zooplankton, and adults feed on aquatic and terrestrial invertebrates, mollusks, crustaceans, fish eggs, and other fish. Steelhead trout runs occur in either winter or summer, depending on the DPS.

Impacts and Mitigation

LNGC effects on federally-listed threatened and endangered species would be similar to those described above for fisheries and marine mammals. Changes to water quality, ship generated noise, and the physical disturbance of the water column would affect species present, causing them to avoid the LNGCs, and increasing the rates of stress, injury, and mortality experienced by these species. Additionally, LNGC water intakes could result in small fish, fish eggs, and fish larvae becoming entrained or impinged. Entrainment and/or impingement would further increase the rates of stress, injury, and mortality experienced by salmon and steelhead. In the summer, salmonids migrate to Cook Inlet from freshwater streams upon emerging from the gravel at their hatching sites and could be both impinged and entrained when in close proximity to LNGCs docked in Cook Inlet.

As described previously, LNGC transits to and from the Kenai LNG Plant would disturb the water column in the immediate vicinity of the ship. Also, these transits could result in an ESA federally-listed marine mammal being struck. Additionally, ship generated noise could affect federally-listed threatened and endangered species use of sound to communicate, navigate, avoid predators, mate, and locate food. Habitat disturbance, ship strikes, and the potential disruption of normal behaviors would result in avoidance and displacement, possibly increased predation, and could increase the rates of stress, injury, and mortality experienced by these species.

Similar to non-listed marine mammals and fish, federally-listed threatened and endangered species occurring in Cook Inlet are accustomed to ship traffic and to some extent have become habituated to this traffic and its effects. Additionally, their presence within Cook Inlet is often transitory and for most species seasonal. Therefore, based on the relatively small number of LNGCs that would be traversing Cook Inlet (4 carriers per year), use of licensed ship pilots, and compliance with the "Vessel Strike Avoidance Measures and Reporting for Mariners" and other applicable requirements (e.g., Shipboard Oil Pollution Emergency Plan), we have determined that LNGCs associated with the Project are *not likely to adversely affect* federally-listed threatened and endangered species.

5.0 CULTURAL RESOURCES

In addition to accounting for impacts on cultural resources under NEPA, Section 106 of the NHPA, as amended, requires FERC to consider the effects of its undertakings on historic properties listed, or eligible for listing on the National Register of Historic

Places (NRHP),[9] and to afford the Advisory Council on Historic Preservation an opportunity to comment. Trans-Foreland, as a non-federal party, is assisting FERC in meeting our obligations under Section 106 and its implementing regulations at 36 CFR 800.

5.1 AREAS OF POTENTIAL EFFECTS

The Project area of potential effects (APE) is the "geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist" (36 CFR 800.16[d]). Trans-Foreland defined the Project APE for direct effects as approximately 18.3 acres which includes all areas of construction, operations, and maintenance for the proposed Project. Though no indirect effects are anticipated for the proposed Project, Trans-Foreland defined the indirect effects APE as the 76-acre fenced Kenai LNG Plant operating area, which surrounds the direct effects APE.

5.2 CULTURAL RESOURCES INVESTIGATIONS

In an effort to identify historic properties within the Project APE and to account for any direct or indirect effects to those properties by the proposed Project, Trans-Foreland conducted a cultural resources investigation background research and a physical inspection of the APE. The Project area has been disturbed due to construction and operation of the Kenai LNG Plant. No archaeological sites have been identified within the Project APE.

On October 26, 2018, Trans-Foreland submitted the results of the cultural resources assessment to the Alaska SHPO for review and concurrence. In an email response dated February 15, 2019, the SHPO stated that experience with past projects in the proposed Project vicinity indicates that the Project area has potential to contain prehistoric cultural resources that were not damaged when the Kenai LNG facility was constructed. Further, the SHPO stipulated that the LNG facility itself may also need to be considered as a potential historic property because it went into operation in 1969. The Alaska SHPO sent a letter dated April 17, 2019 to Trans-Foreland, again stating that the Kenai LNG facility is potentially eligible for listing in the NRHP due to the significance of the facility in the history of the oil and gas industry statewide, and for the potential significance of historic structures connected to the facility's historic operations. In September 2019, Trans-Foreland conducted a Phase I architectural survey of the Kenai

[9] In accordance with 36 CFR 800.16(l)(1), a historic property is any prehistoric or historic district, site, building, structure, object, or property of traditional religious and cultural importance to an Indian tribe or Native Hawaiian organization, included in, or eligible for inclusion in, the NRHP. This term includes artifacts, records, and remains that are related to and located within such properties. Cultural resources are those properties that have not been evaluated for NRHP eligibility.

LNG facility (KEN-00714) to record and evaluate facility components for NRHP eligibility (Wiginton et al. 2019).

On October 11, 2019, Trans-Foreland sent a Historic Architecture Management Summary to the Alaska SHPO describing the preliminary findings from the historic architectural survey. Subsequently, Trans-Foreland sent the Phase I architectural survey report to the SHPO on October 25, 2019. Based on the results of the survey, Trans-Foreland recommended that the Kenai LNG facility is eligible for inclusion in the NRHP under Criterion A for its association with the early development and growth of the oil and gas industry and its contribution to events important to the history of the Kenai Peninsula region and the state of Alaska. However, Trans-Foreland recommended that the Project would have no adverse effect on the Kenai LNG facility as the proposed modifications and additions to the facility would not compromise the character-defining features important to the facility's historical significance. As the facility has gone through numerous modifications since its inception, these successive phases of expansion showcase the evolution of the property and the development of the oil and gas industry in the area.

In a letter dated November 13, 2019, the Alaska SHPO indicated that they concur with Trans-Foreland's recommendation that the Kenai LNG facility is eligible for inclusion in the NRHP under Criterion A. Furthermore, the SHPO stated that they believes the facility is also significant under Criterion C because the Kenai LNG facility was the first plant in the nation to perfect the LNG cool down process and for the groundbreaking design of its machinery. However, the Alaska SHPO did not concur with Trans-Foreland's determination that the proposed Project would have no adverse effect to the facility as the Project would introduce new elements to the area of potential effects that change the function of the existing machinery.

Trans-Foreland responded to the SHPO on February 28, 2020 stating that they have consulted with Project engineers regarding the SHPO's concerns and that based on conversations with the engineers, they were confident that the proposed Project would have no adverse effect on the Kenai LNG facility. Trans-Foreland indicated that the addition of new components would not modify, change, or remove those elements which contribute to the property's eligibility under Criterion C. Based on this correspondence and the additional documentation Trans-Foreland provided to the Alaska SHPO regarding the proposed changes to the machinery and clarification that the most significant technological features of the facility would not be altered by the proposed Project, the SHPO concurred with a finding of no adverse effect on April 1, 2020. FERC concurs with the recommendations and finds that the proposed Project would have no adverse effect on historic properties.

5.3 TRIBAL CONSULTATIONS

On January 15, 2019, Trans-Foreland contacted the following tribes regarding the proposed Project: Chickaloon Native Village, Eklutna Native Village, Kenaitze Indian Tribe, Knik Tribe, Ninilchik Village, Village of Salamatof, Village of Seldovia, and Native Village of Tyonek. Trans-Foreland sent notification letters to the tribes to inform them about the Project and to request information on the identification of archaeological sites and Traditional Cultural Properties important to the tribes that may be affected by the proposed Project. Trans-Foreland received an email response from Ninilchik Village on February 5, 2019 in which the tribe inquired about accidental spills, cleanup, and pollution by the Project, along with questions about the NEPA process. Ninilchik Village sent a follow-up letter on February 19, 2019 to Trans-Foreland again requesting the information from their previous email. Trans-Foreland responded to Ninilchik Village's requests for information via letter on February 27, 2019.

In accordance with the NHPA, Alaska Native corporations are recognized as 'Indian tribes' and must be included in tribal consultation. As such, FERC requested that Trans-Foreland provide any previous consultation documents sent to tribes to Cook Inlet Region, Incorporated (CIRI) and the Native village corporations associated with CIRI. On July 19, 2019, Trans-Foreland sent the Project notification letters to the following Native corporations, villages, and tribal organizations: CIRI, Cook Inlet Tribal Association; Tyonek Native Corporation; Native Village of Nanwalek; Native Village of Port Graham; Knikatnu, Inc.; Montana Creek Native Association; Ninilchik Natives Association, Inc.; Point Possession Inc.; Salamatof Native Association, Inc.; and Seldovia Native Association, Inc. On July 30 and August 23, 2019, CIRI contacted Trans-Foreland requesting overview maps and access to Resource Report 4 of the Project Environmental Report. Trans-Foreland submitted the requested information to CIRI on July 31 and August 27, 2019, respectively.

On May 13, 2019, FERC sent the Project NOI to the tribes and Native village corporations associated with CIRI. FERC also contacted those same tribes and corporations by letter on June 19, 2019 regarding the Project. To date, FERC has not received any responses from the tribes or Alaska Native corporations.

5.4 UNANTICIPATED DISCOVERIES PLAN

Trans-Foreland developed a Project-specific Unanticipated Discovery Plan, which outlines the procedures to follow, in accordance with state and federal laws, if unanticipated cultural resources or human remains are discovered during construction of the Project. The plan was submitted to FERC and the SHPO for review. FERC requested minor changes to the plan. Trans-Foreland has provided copies of the revised plan with the requested revisions. We find the plan to be acceptable.

5.5 COMPLIANCE WITH THE NATIONAL HISTORIC PRESERVATION ACT

Section 106 compliance requirements with the NHPA for the proposed Project are complete.

6.0 LAND USE AND VISUAL RESOURCES

6.1 LAND USE

Land use types surrounding the Project area include undeveloped, forest land and industrial land, primarily represented by oil and gas facilities and utility rights-of-way. The Project area sits wholly within the existing Kenai LNG Plant, which is bounded by Cook Inlet to the west. Trans-Foreland would disturb a total of 18.3 acres of land for Project construction and operation. The Project area consists of Terminal facility structures; cement foundations; gravel pads; bare, compacted land; and some areas of sparse vegetation. The proposed facilities are similar to other existing industrial facilities in the vicinity of the Kenai LNG Plant, which has been historically used for oil and gas development purposes. As such, we find that land use impacts by the proposed Project would be consistent with the existing environment and would not be significant.

Residential Areas

The closest residence to the proposed Project is approximately 0.5 mile away. Trans-Foreland expects that construction would generate dust, but those impacts would be minimal and temporary, as construction is anticipated to last about five months. However, Trans-Foreland would use water, where feasible and necessary, to reduce excess dust emissions. Furthermore, construction would be scheduled during normal work hours (12 daytime hours). Noise impacts during construction and operation at the nearest residences are expected to be minimal, not significant, and are discussed further in section B.8.2.

6.2 VISUAL RESOURCES

The Project is in an area of low visual sensitivity. Temporary visual and/or aesthetic impacts would primarily occur during construction as a result of the presence of construction equipment, movement of construction vehicles on local roads, and grading of the construction workspace, that may be visible to residents and along the Kenai Spur Highway. No permanent impacts on visual resources are anticipated as the proposed facilities and equipment would be significantly shorter than the existing aboveground facilities at the Kenai LNG Plant and are in keeping with the surrounding visual landscape.

Because visual impacts from Project construction would be temporary (lasting about five months) and the permanent visual impacts from the proposed aboveground facilities would be consistent with the existing setting of oil and gas development and utility rights-of-way, visual impacts by the Project would not be significant.

7.0 SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE

Analysis of socioeconomic impacts is required for projects involving significant aboveground facilities, such as conditioning or new LNG facilities, or large new compressor stations, which are not part of this Project. Construction of the Project would only require an average of 20 workers, with a maximum of 35 workers needed during peak construction, most of whom are operations personnel at the existing Kenai LNG Plant and would maintain their current residences. Additionally, no new additional permanent staff would be required for operation of Project. Therefore, no significant impacts are anticipated on population, housing, transportation and traffic, public services, and economy. However, we received comments from the EPA stating that impacts to environmental justice communities should be assessed, which are addressed below.

Environmental Justice

Environmental justice considers disproportionately high and adverse impacts on minority or low-income populations in the surrounding community resulting from the programs, policies, or activities of federal agencies. Items considered in the evaluation of environmental justice include human health or environmental hazards, the natural physical environment, and associated social, economic, and cultural factors.

According to the Council on Environmental Quality (CEQ) environmental justice guidance under NEPA (CEQ 1997) and US EPA's *Promising Practices for EJ Methodologies in NEPA Reviews* (EPA 2016), minorities are those groups that include American Indian or Alaskan Native; Asian or Pacific Islander; Black, not of Hispanic origin; or Hispanic. Minority populations are defined where either; (a) the minority population of the affected area exceeds 50 percent or, (b) the minority population of the affected area is meaningfully greater (10 percent greater) than the minority population percentage in the general population or other appropriate unit of geographic analysis. The guidance also directs low-income populations to be identified based on the annual statistical poverty thresholds from the U.S. Census Bureau. In this EA, low-income populations are identified where the percent low income population of the affected block group is equal to or greater than that of the county or borough where the affected block group is located. Table 3 provides a summary of the minority or low-income percentage of county populations within the project areas.

Table 3
Project Area Demographics

Area	White Alone Not Hispanic (percent)	African American (percent)	Native American and Alaskan Native (percent)	Asian (percent)	Native Hawaiian and Pacific Islander (percent)	Other Race (percent)	Two or More Races (percent)	Hispanic or Latino Origin (percent)	Total Minority (percent)	Below Poverty Level (percent)
Alaska	**62%**	**3%**	**14%**	**6%**	**1%**	**0%**	**7%**	**7%**	**38%**	**10%**
Kenai Peninsula Borough	81%	1%	7%	1%	0%	0%	5%	4%	18%	11%
Census Tract 2 Block Group 1	70%	1%	17%	1%	0%	0%	8%	3%	30%	24%
Census Tract 2 Block Group 3	90%	0%	2%	0%	0%	0%	5%	3%	10%	6%

Source: U.S. Census Bureau 2020 (American Community Survey 2013-2017 5-Year Estimates)

As shown in table 3, only one block group within 2-miles of the Project in the Kenai Peninsula Borough (Census Tract 2, Block Group 1) has a minority population that is meaningfully greater, and a low-income population that is greater, than the Kenai Peninsula Borough (U.S. Census Bureau, 2020). The block group in which the Project is located (Census Tract 2, Block Group 3) is not identified as having a minority or low-income population.

As discussed throughout this EA, potentially adverse environmental effects associated with the Project would be minimized or mitigated, as applicable. Construction of the Project would disturb about 18.3 acres of land, all of which consists of existing gravel cover within the existing property boundary of the Kenai LNG Plant site. Following construction, Trans-Foreland would maintain less than about 0.1 acre for permanent operation of the Project and the remaining acreage would be restored to former uses.

Both construction and operation potential pollution emissions from the Project, when considered with background concentrations, would be below the National Ambient Air Quality Standards (NAAQS), which are designated to protect public health. Construction emissions would occur over the duration of construction activity and would be emitted at different times throughout the Project area. Construction emissions would be relatively minor and would result in short-term, localized impacts in the immediate vicinity of construction work areas. Operation of the Project would result in a minimal increase in criteria pollutant emissions from the current warm idle state that would not result in significant impacts on air quality in the Project area. Therefore, the Project would not have significant adverse air quality impacts on the minority or low-income populations in the Project area. Air quality impacts are discussed in more detail within section B.8.1.

Temporary construction impacts on residences and businesses in proximity to construction work areas could include noise. As discussed in section B.8.2, noise levels resulting from construction would vary over time and would depend upon the number and type of equipment operating, the level of operation, and the distance between sources and receptors. Operational noise associated with the Project would be persistent; however, Trans-Foreland would meet FERC's sound level requirements, which is discussed in detail in section B.8.2. With Trans-Foreland's proposed mitigation measures and our recommendation in section B.8.2 regarding operational noise, the Project would not result in significant noise impacts on local residents and the surrounding communities including the EJ and non-EJ population, as the closest residence to the project area is approximately 0.5-mile away the southeast and located in a non-EJ population.

As described in section B.6.2, the Project would have temporary visual impacts primarily occurring during construction as a result of the presence of construction equipment, movement of construction vehicles on local roads, and grading of the

construction workspace, that may be visible to residents and along the Kenai Spur Highway. However, no permanent impacts on visual resources are anticipated as the proposed facilities and equipment would be significantly shorter than the existing aboveground facilities at the Kenai LNG Plant and are consistent with the existing setting of oil and gas development and utility rights-of-way. Therefore, we conclude the project would not result in significant visual impacts on EJ populations in the study area.

Based on our analysis, we conclude that although low income and minority populations exist within the Project area, the Project would not result in disproportionately high and adverse impact on environmental justice populations within the study area.

8.0 AIR QUALITY AND NOISE

8.1 AIR QUALITY

Air quality in the Project area would be affected by construction and operation of the Project. The term air quality refers to relative concentrations of pollutants in the ambient air. The subsections below summarize federal and state air quality regulations that are applicable to the Project. This section also characterizes the existing air quality and describes potential impacts the facilities may have on air quality regionally and locally.

8.1.1 Existing Environment

The Project area is within the Kenai Peninsula Borough, Alaska. The climate in the Project area is cool and wet in the summer and cold with snowfall in the winter. The Project area receives an average of 19.1 inches of rain annually, with April being the driest month of the year and September the wettest. The Project area receives a mean of 61.2 inches of snow annually, typically between October and April. Temperatures range from a monthly average of 12.5 ºF in January to a monthly average of 54.7 ºF in July (Western Regional Climate Center, 2006).

Ambient air quality is protected by the Clean Air Act (CAA) of 1970, as amended in 1977 and 1990. The EPA oversees the implementation of the CAA and establishes National Ambient Air Quality Standards (NAAQS) to protect human health and welfare.[10] NAAQS have been developed for seven "criteria air pollutants," including nitrogen dioxide (NO_2), carbon monoxide (CO), ozone, sulfur dioxide (SO_2), particulate matter less than or equal to 2.5 microns in aerodynamic diameter ($PM_{2.5}$), particulate matter less than or equal to 10 microns in aerodynamic diameter (PM_{10}), and lead, and include levels for short-term (acute) and long-term (chronic) exposures. The NAAQS

[10] The current NAAQS are listed on EPA's website at https://www.epa.gov/criteria-air-pollutants/naaqs-table.

include two standards, primary and secondary. Primary standards establish limits that are considered to be protective of human health and welfare, including sensitive populations such as children, the elderly, and asthmatics. Secondary standards set limits to protect public welfare, including protection against reduced visibility and damage to crops, vegetation, animals, and buildings (EPA, 2018). Although ozone is a criteria air pollutant, it is not emitted into the atmosphere from an emissions source; rather, it develops as a result of a chemical reaction between nitrogen oxides (NO_x) and VOCs in the presence of sunlight. Therefore, NO_x and VOCs are referred to as ozone precursors and are regulated to control the potential for ozone formation. Additional pollutants, such as VOC and hazardous air pollutants (HAP), are emitted during fossil fuel combustion.

The EPA, and state and local agencies have established a network of ambient air quality monitoring stations to measure concentrations of criteria pollutants across the U.S. The data are then averaged over a specific time period and used by regulatory agencies to determine compliance with the NAAQS and to determine if an area is in attainment (criteria pollutant concentrations are below the NAAQS), nonattainment (criteria pollutant concentrations exceed the NAAQS) or maintenance (area was formerly nonattainment and is currently in attainment).

Air quality control regions (AQCR) are areas established by the EPA and local agencies for air quality planning purposes, in which State Implementation Plans describe how the NAAQS would be achieved and maintained. The AQCRs are intra- and interstate regions (such as large metropolitan areas) where improvement of the air quality in one portion of the AQCR requires emission reductions throughout the AQCR. The Project area is within the Cook Inlet Intrastate Air Quality Region. Kenai Peninsula Borough is considered unclassifiable, which is treated as in attainment for all NAAQS.

Greenhouse gases (GHG) occur in the atmosphere both naturally and as a result of human activities, such as the burning of fossil fuels. GHGs are non-toxic and non-hazardous at normal ambient concentrations, and there are no applicable ambient standards or emission limits for GHG under the CAA. The primary GHGs that would be emitted by the Project are carbon dioxide (CO_2), methane, and nitrous oxide. During construction and operation of the Project, these GHGs would be emitted from the majority of construction and operational equipment, as well as from fugitive methane leaks from the pipeline and aboveground facilities.

Emissions of GHGs are typically quantified and regulated in units of carbon dioxide equivalents (CO_2e). The CO_2e takes into account the global warming potential (GWP) of each GHG. The GWP is the measure of a particular GHG's ability to absorb solar radiation as well as its residence time within the atmosphere. The GWP allows comparison of global warming impacts between different gases; the higher the GWP, the

more that gas contributes to climate change in comparison to CO_2. Thus, CO_2 has a GWP of 1, methane has a GWP of 25, and nitrous oxide has a GWP of 298.[11]

8.1.2 Regulatory Requirements for Air Quality

The provisions of the CAA that may be applicable to the Project are discussed below. Federal air quality requirements are contained in 40 CFR Parts 50 through 99.

8.1.3 Prevention of Significant Deterioration and New Source Review

Proposed new or modified air pollutant emission sources must undergo a New Source Review (NSR) prior to construction or operation. Through the NSR permitting process, state and federal regulatory agencies review and approve project emissions increases or changes, emissions controls, and various other details to ensure air quality does not deteriorate as a result of new or modified existing emission sources. The three basic categories of NSR permitting are Prevention of Significant Deterioration (PSD), Nonattainment New Source Review (NNSR), and minor source NSR. PSD, NNSR, and minor source NSR are applicable to projects depending on the size of the proposed project, the projected emissions, and if the project is proposed in an attainment area or nonattainment/maintenance area.

PSD regulations define a major source as any source type belonging to a list of name source categories that have a potential to emit 100 tons per year (tpy) or more of any regulated pollutant or 250 tpy for sources not among the listed source categories. These are referred to as the PSD major source thresholds.

The addition of a usable interconnection between the Kenai LNG Plant and the Kenai Refinery would cause the Kenai LNG Plant to be considered a “support facility” to the Refinery under CAA permitting programs. This change in designation would cause the two facilities to be considered a single “stationary” source under NSR. It is not expected that the Project would trigger the need for a pre-construction permit from ADEC (minor NSR or PSD).

8.1.4 National Emission Standards for Hazardous Air Pollutants

The 1990 CAA amendments established a list of 189 HAPs, resulting in the promulgation of National Emission Standards for Hazardous Air Pollutants (NESHAP). The NESHAPs regulate HAP emissions from specific source types at major or area

[11] These GWPs are based on a 100-year time period. We have selected their use over other published GWPs for other timeframes because these are the GWPs the EPA has established for reporting of GHG emissions and air permitting requirements. This allows for a consistent comparison with these regulatory requirements.

sources of HAPs by setting emission limits, monitoring, testing, record keeping, and notification requirements.

The Kenai LNG Plant and Kenai Refinery are already considered the same single "major source" under Section 112 of the CAA for HAPs, but interconnections between them from the Project would cause certain monitoring and recordkeeping provisions at 40 CFR 63, Subpart CC to become applicable following completion of the Project. Trans-Foreland would comply with these recordkeeping requirements.

8.1.5 Title V Permitting

Title V is an operating air permit program run by each state for each facility that is considered a "major source." The major source threshold for an air emission source is 100 tpy for criteria pollutants, 10 tpy for any single HAP, and 25 tpy for total HAPs. As previously discussed, the interconnection between the Kenai LNG Plant and the Kenai Refinery would cause the Kenai LNG Plant to be considered a "support facility" to the Refinery under CAA permitting programs. This change in designation would cause the two facilities to be considered a single "major" source under Title V.

Trans-Foreland intends to incorporate the new applicable NESHAP requirements described above into the Kenai LNG Title V Air Permit by submitting a minor Title V permit modification application to ADEC. This type of application does not require pre-construction authorization, but would rather be submitted prior to commencing operations.

8.1.6 Construction Emissions Impacts and Mitigation

Project construction would result in temporary, localized emissions that would last the duration of construction activities (i.e., about five months). Heavy equipment, trucks, delivery vehicles, and construction workers commuting to and from work areas would generate exhaust emissions through the use of diesel or gasoline engines. Additionally, construction activities, such as land clearing and grading, ground excavation and soil disturbance, and driving on unpaved roads would also result in the temporary generation of fugitive dust. The amount of dust generated would be a function of construction activity, soil type, soil moisture content, wind speed, precipitation, vehicle traffic and types, and roadway characteristics. Emissions would be greater during dry periods and in areas of fine-textured soils subject to surface activity.

Trans-Foreland estimated construction emissions based on the fuel type and anticipated frequency, duration, capacity, and levels of use of various types of construction equipment. Construction emissions were estimated using EPA's MOVES model and AP-42. Table 4 below provides the total Project construction emissions, including exhaust emissions from on-road and off-road construction equipment and vehicles. There would be no shipping emissions related to construction.

Table 4 Construction Emissions for the Project (tons per construction duration)								
Activity	**NO_x**	**CO**	**PM_{10}**	**$PM_{2.5}$**	**SO_2**	**VOC**	**HAPS**	**CO_{2e}**
Total Emissions	0.49	5.58	0.04	0.04	0.01	0.08	0.05	869.02

Construction emissions are not expected to result in a degradation of ambient air quality standards or an exceedance of the NAAQS. To minimize construction emissions, Trans-Foreland would require its contractors to meet all federal, state, and local air quality regulations and emission standards applicable to the equipment. Trans-Foreland would minimize fugitive dust emissions by applying water, as needed, on disturbed areas during construction.

Construction emissions would occur over the duration of construction activity and would be emitted at different times throughout the Project area. Construction emissions would be relatively minor and would result in short-term, localized impacts in the immediate vicinity of construction work areas. We conclude air quality impacts from construction would be temporary and would not result in a significant impact on local or regional air quality.

8.1.7 Operation Emissions and Impacts and Mitigation

The Kenai LNG Plant was an LNG export terminal until February 2018, when their authorization to export LNG expired. Currently, the Kenai LNG Plant is in a warm idle state and is not generating emissions. The Project would result in the delivery of LNG up to four times a year to cool down the existing LNG storage tanks and deliver BOG to the Kenai Refinery. In export mode, excess BOG that was produced through the storage of LNG at the Kenai LNG Plant was either vented to the atmosphere or flared. The venting and flaring emissions for the existing Kenai LNG Plant during LNG export mode are shown below in table 5 and 6, respectively.

Table 5 Venting Emissions from the Kenai LNG Plant during Export Mode	
Pollutant	**Emissions[1] (tons per year)**
VOC	62
CH_4	37,989
CO_2e	949,725
[1] Emissions were calculated assuming 5,000 million British thermal units per day (MMBTU/d) BOG for a duration of 365 days per year	

Table 6 Flaring Emissions from the Kenai LNG Plant during Export Mode	
Pollutant	**Emissions[1] (tons per year)**
NO_x	62
CO	257
PM[2]	24
VOC	1.2
SO_2	0.5
CO_2e	123,786
[1] Emissions were calculated assuming 5,000 MMBTU/d BOG for a duration of 365 days per year [2] Inclusive of PM_{10} and $PM_{2.5}$	

The proposed Project would result in the capturing of excess BOG and routing it to the Kenai Refinery's fuel gas system to be used as useful thermal energy rather than flared or vented, as was done during LNG export operation. However, during ship unloading, which would occur up to four times per year, excess BOG would exceed the capacity of the BOG management system and would be vented to the atmosphere. Trans-Foreland estimates that up to 25 MMscf/event of gas would be vented to the atmosphere during each ship unloading event, for a total of 100 MMscf/year. In the event that the BOG management system fails or otherwise is inoperable, additional BOG would be vented directly to the atmosphere. This would increase emissions of methane (i.e., GHG); however, that has not been accounted for in this emissions analysis. Table 7 below quantifies the annual ship unloading venting emissions.

Table 7 Annual Venting Emissions from Ship Unloading	
Pollutant	**Emissions[1] (tons per year)**
VOC	3.4
CH_4	2,100
CO_2e	52,500
[1] Emissions were calculated assuming 100 MMscf/year, with 4 ship unloading events per year, each event lasting 2 days	

The proposed Project would utilize existing facilities and the following new equipment to reroute excess BOG:

- a 3 MMscf/d LNG trim vaporizer module;
- a 27 gallon per minute (gpm) trim vaporizer feed pump;
- a 500 gpm LNG tank circulation pump;
- a 7 MMscf/d electric powered BOG booster compressor;
- a tank density monitoring system;
- piping and valve modifications; and
- flanged connections with valves for connection to possible LNG vaporizers that are subject to future commercial development commitments.

Excess BOG would displace natural gas that is currently used as fuel in the Kenai Refinery. Because the composition and thermal energy value of the BOG is comparable to the natural gas used in the Kenai Refinery's fuel gas system, emissions at the Refinery would not be expected to change. After completion of the Project, the Kenai LNG Plant would have the capacity to deliver up to 7,000 million British Thermal Units per day (MMBtu/d) of BOG, with an average delivery of approximately 5,000 MMBtu/d to the Kenai Refinery to displace natural gas. The existing potential to emit at the Kenai Refinery are shown below in table 8.

Table 8
Kenai Refinery Potential to Emit

Pollutant	Emissions[1] (tons per year)
NO_x	697
CO	566
PM	73
PM_{10}	72
$PM_{2.5}$	54
VOC	1,093
SO_2	101
CO_2e	843,829

The Project would result in an increase in CO_2e emissions from the current warm idle state due to LNG import and venting emissions from LNG ship unloading events (see table 7). However, with the exception of backup generators and two diesel engine pumps, the majority of equipment required to maintain the terminal in a cool down state would be electric-powered, and would result in minimal operational emissions. Additionally, Project emissions would be less than those generated during previous

operation as an LNG export facility. Lastly, routing BOG gas to the Kenai Refinery would result in lower emissions than venting/flaring the gas during previous LNG export. Therefore, although the Project would result in an increase in CO_2e emissions from the warm idle state (see table 7) and emissions at the Kenai Refinery would remain the same, the Project would result in minimal criteria pollutant emissions (other than CO_2e) at the LNG Terminal during intermittent operation of backup generators and/or diesel engine pumps. Consequently, the proposed Project would not cause or significantly contribute to a degradation of ambient air quality or an exceedance of the NAAQS.

The Alaska DEC expressed concerns that the Project could result in impacts to the nearby Class 1 area, the Tuxedni National Wildlife Refuge, which is about 50 miles southwest of Kenai. Class 1 areas are federal lands which include national parks, national wilderness areas, or national monuments. These areas are provided special air quality and visibility protections under the CAA. The Project would result in an increase in CO_2e emissions from the current warm idle state and would result in minimal and intermittent combustion-related emissions due to the use of backup generators and diesel pumps at the LNG Terminal, but would not result in significant criteria pollutant emissions or produce smog-forming ground level ozone. Therefore, we conclude that the Project would not negatively affect nearby Class 1 areas. Although the Project would route BOG gas to the Kenai Refinery, the Refinery's emissions would remain unchanged as a result of the Project.

The ADEC also expressed concerns for fugitive dust emissions during construction. Section 8.1.6 reviews the potential construction emissions, as well as Trans-Foreland's proposed mitigation measures for fugitive dust, including watering of disturbed surfaces. The EPA also expressed concerns with potential impacts on air quality during construction and operation, the potential for impacts on human health, and proposed mitigation measures to reduce impacts. These concerns are addressed throughout section 8 above. Based on the mitigation proposed and the temporary duration of construction activities, air quality impacts due to construction would be minimized and would not be significant. Project operation would result in minimal combustion-related emissions and an increase in CO_2e emissions from the current warm idle state that would not result in significant impacts on air quality in the Project area.

8.2 NOISE

The noise environment can be affected both during construction and operation of pipeline and LNG terminal projects. The magnitude and frequency of environmental noise may vary considerably over the course of the day, throughout the week, and across seasons, in part due to changing weather conditions. This section identifies the potential sources of noise, the magnitude of noise, and the change in noise attributable to construction and operation of the Project.

Sound is a sequence of waves of pressure that propagates through compressible media such as air or water. When sound becomes excessive, annoying, or unwanted, it is referred to as noise. Construction and operation of the Project would affect overall noise levels in the Project vicinity. The ambient sound level of a region is defined by the total noise generated within the specific environment and usually comprises natural and man-made sounds.

Decibels are the units of measurement used to quantify the intensity of noise. Noise is typically measured on the A-weighted scale (dBA). The A-weighting scale was developed and has been shown to provide a good correlation with the human response to sound and is the most widely used descriptor for community noise assessments. The faintest sound that can be heard by a healthy ear is about 0 dBA, while an uncomfortably loud sound is about 120 dBA. A 3 dBA change of sound level is considered to be barely perceivable by the human ear, a 5 or 6 dBA change of sound level is considered noticeable, and a 10 dBA increase is perceived as if the sound intensity has doubled.

Two measures used by some federal agencies to relate the time-varying quality of environmental noise with its known effect on people are the equivalent continuous sound level (L_{eq}) and the day-night average sound level (L_{dn}). The preferred single value figure to describe sound levels that vary over time is L_{eq}, which is defined as the sound pressure level of noise fluctuating over a period of time, expressed as the amount of average energy. L_{dn} is defined as the 24-hour average of the equivalent sound levels during the daytime (L_d – from 7:00 a.m. to 10:00 p.m.) and nighttime (L_n – 10:00 p.m. to 7:00 a.m.) and includes a nighttime penalty. Specifically, in the calculation of the L_{dn}, late night and early morning (10:00 p.m. to 7:00 a.m.) noise exposures are increased by 10 dBA to account for people's greater sensitivity to sound during nighttime hours.

8.2.1 Applicable Noise Standards and Ordinances

FERC guidelines require that the sound attributable to new or modified compressor equipment, or LNG-related equipment not exceed an L_{dn} of 55 dBA at any nearby noise sensitive area (NSA), unless such NSAs are established after facility construction. An NSA is generally considered a residence, place or worship, hospital, place where people gather, etc. Additionally, a sound level of 55 dBA (L_{dn}) can be used as a benchmark sound criterion or guideline for assessing the noise impact of other sources of noise, such as certain construction noise. There are no Alaskan or local numerical noise standards applicable to the Project.

8.2.2 Existing Noise Conditions

The Project is proposed in a mixed industrial and rural area. The closest NSA about 0.5 mile from the proposed construction and laydown yard boundaries for the Project. The closet NSAs are residences located southeast and northeast of the Kenai LNG Plant.

Trans-Foreland did not provide an ambient noise survey at the Project location or at the NSAs and instead based its original analysis upon the existing noise measurements for an unrelated liquefaction plant proposed nearby on the Kenai Peninsula. Staff requested that Trans-Foreland provide a site-specific ambient noise survey. The survey was filed on September 20, 2019 and indicated that the NSAs were identified through the use of aerial photography and a site reconnaissance.

The survey confirmed that the closest NSA to the Project site boundary is approximately 2,770 feet to the southeast on Miler Loop Road. The ambient noise monitoring showed relatively high noise levels as indicated in table 9.

The survey indicated that contributing sources of noise at all locations consisted of vehicular traffic, including dirt bike activity, during the day and at night at NSA 1, natural sounds (wind and wildlife), and some industrial sounds. Elevated noise may have been caused by light southerly winds during the survey of 5 to 10 miles-per-hour.

Table 9
Existing Ambient Noise Measurements

NSA	Distance/Direction	Daytime Leq (dBA)	Nighttime Leq (dBA)	Day-Night Average Noise level (dBA)
1	2,870 ft Southeast	59.6	60.4	66.7
2	2,770 ft Southeast	53.5	46.9	55.1
3	3,230 ft Northeast	42.6	40.3	57.1

8.2.3 Construction Noise Impacts and Mitigation

Construction activities are anticipated to last approximately five months, although only two months would have the highest activity. Construction is also only anticipated to occur during daytime (7:00 a.m. to 7:00 p.m.) hours.

Construction activity and associated noise levels would vary depending on the phase of construction in progress at any time. The construction equipment that would be utilized would differ from phase to phase, but would include bulldozers, cranes, dump trucks, and loaders. Noise is generated during construction primarily from diesel engines, which power the equipment. Exhaust noise is usually the predominant source of diesel engine noise, which is the reason that maintaining functional mufflers on all equipment would be a requirement. The highest level of construction noise typically occurs during earth-moving work.

No impact pile driving, horizontal directional drilling, direct pipe installation, or dredging is proposed. Based upon the limited construction timeframe and daytime only

construction, we conclude that construction of the Project would not have a significant impact on the local noise environment and the nearby NSAs.

8.2.4 Operational Noise Impacts and Mitigation

Operation of the Project would produce noise on a continuous basis. Operational noise and impacts on nearby NSAs are discussed below. We note that the number of LNGCs would not increase over historic levels, and are thus not included in the noise impact analysis. However, LNG loading/unloading noise is considered part of the Project. The primary noise-generating sources during operation would include:

- a BOG booster compressor, located within a building;
- a BOG electrical control module within a building;
- three BOG compressor fin fan coolers;
- one trim vaporizer unit assembly, containing 10 skid mounted vaporizers;
- a trim vaporizer feed pump (within the existing south pump pit);
- an LNG circulation pump (within the existing north pump pit);
- one existing auxiliary fuel gas compressor (C-702) within a building;
- one existing compressor fin fan cooler;
- one existing TTI Blower and cooler; and
- one existing steam boiler (B-501) and forced draft fan within a building.

Trans-Foreland provided an acoustical analysis of the operational noise impacts from the Project. The noise sources included those listed above. Trans-Foreland also designed the Project with certain noise mitigation measures. For example, Trans-Foreland would:

- construct the BOG compressor and associated electrical control module within separate pre-engineered metal buildings;
- locate the tank level gauges/management systems on top of the existing LNG tanks;
- locate the trim vaporizer feed pumps and LNG recirculation pumps within the existing LNG pump pits; and

- use existing buildings for existing compressor C-702 and existing steam boiler B-501.

Table 10 below, shows the calculated sound level attributable to the Project at NSA 2 (the closest to the Project noise sources). The impacts at NSAs 1 and 3 although further would be approximately the same noise level. Thus, the noise impacts attributable to the Project are estimated to be below our 55 dBA L_{dn} criterion at the NSAs. In addition, Trans-Foreland has indicated that that no perceptible increase in either ground-borne vibration, or low-frequency noise induced vibration should occur from operation of the Project at any NSAs. We agree.

Table 10
Operational Noise Impacts

NSA	Distance to NSA from Center of Noise Sources	Existing Ambient Sound Level (dBA, Ldn)	Noise Attributable to the Project (dBA, Ldn)	Total Noise Level (dBA, Ldn)	Noise Increase (dBA)
2 (closest NSA)	3,000	55.1	41.7	55.3	0.2

Based on the noise analyses above, noise levels attributable to full-load cumulative operation of the Terminal would not be greater than 55 dBA L_{dn} at any of the NSAs. However, due to the high ambient background and potential variations in this background noise (human activity and weather) it may be audible to nearby NSAs. To ensure that the noise from the facility does not exceed an L_{dn} of 55 dBA at the nearest NSAs, **we recommend that**:

- **Trans-Foreland should file noise surveys with the Secretary of the Commission (Secretary) <u>no later than 60 days</u> after placing the Project into service. If full-load condition noise surveys are not possible, Trans-Foreland should provide an interim survey at the maximum possible load <u>within 60 days</u> of placing the Project into service and provide the full-load surveys <u>within 6 months</u>. If the noise attributable to operation of the equipment at the Terminal exceeds an L_{dn} of 55 dBA at the nearest NSAs under interim or full load conditions, Trans-Foreland should file a report on what changes are needed and should install the additional noise controls to meet the level <u>within 1 year</u> of the in-service date. Trans-Foreland should confirm compliance with the above requirement by filing an additional noise survey with the Secretary <u>no later than 60 days</u> after it installs the additional noise controls.**

Based on the noise analyses above and our recommendation, we conclude that operation of the Project, while audible during operation, would not have a significant impact on the noise environment near the Terminal.

9.0 RELIABILITY AND SAFETY

9.1 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 LNG facilities. Multiple federal agencies share regulatory authority over LNG facilities and the operator's approach to risk management. The safety, security, and reliability of the Kenai Cool Down Project would be regulated by USDOT PHMSA, Coast Guard, and FERC.

In February 2004, USDOT PHMSA, Coast Guard, and FERC entered into an Interagency Agreement to ensure greater coordination among these three agencies in addressing the full range of safety and security issues at LNG terminals and LNGC operations, and to maximize the exchange of information related to the safety and security aspects of LNG facilities and related marine operations. Under the Interagency Agreement, 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, personnel qualifications and training, fire protection, 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 natural gas by pipeline that are subject to federal pipeline safety laws (49 USC 60101 et seq.), and 49 CFR 192.

On August 31, 2018, USDOT PHMSA and FERC signed a MOU regarding methods to improve coordination throughout the LNG permit application process for FERC jurisdictional LNG facilities. In the MOU, USDOT PHMSA agreed to issue a Letter of Determination (LOD) stating whether a proposed LNG facility would be capable of complying with location criteria and design standards contained in Subpart B of Part 193. FERC committed to rely upon the USDOT PHMSA's determination in conducting

its review of whether the facilities would be consistent in 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 is 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 as defined in 49 CFR 193. If the Project is authorized, constructed, and operated, LNG facilities as defined in 49 CFR 193, would be subject to the USDOT PHMSA's inspection and enforcement programs to ensure compliance with the requirements of 49 CFR 193.

The Coast Guard has authority over the safety of an LNG terminal's marine transfer area and LNGC traffic, as well as over security plans for the waterfront facilities handling LNG and LNGC 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 LNGC traffic and whether the waterfront facilities handling LNG would be operated in accordance with 33 CFR 105 and 33 CFR 127. If the proposed additions are constructed and become operational, the facility would continue to be subject to the Coast Guard inspection program to ensure compliance with the requirements of 33 CFR 105 and 33 CFR 127.

The FERC authorizes the siting and construction of LNG terminals under the NGA and delegated authority from the DOE. 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), which require 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 suggest additional mitigation measures for FERC to consider for incorporation as conditions in the order. If the facilities are approved and the suggested mitigation measures are incorporated into the order as conditions, FERC staff would review material filed to satisfy the conditions of the order and conduct periodic inspections throughout construction and operation.

Finally, the Energy Policy Act of 2005 requires FERC to coordinate and consult with the DOD on the siting, construction, expansion, and operation of LNG terminals that would affect the military. On November 21, 2007, FERC and the DOD entered into a MOU formalizing this process.[12] On September 18, 2019 the DOD contacted FERC with a letter from the DOD Siting Clearinghouse stating that the Project may impact military operations conducted in the area.[13] Specifically, the DOD's letter stated that structures at or above 150 feet would impact radar scanning operations. FERC provided additional details on the heights of the proposed equipment as well as the anticipated BOG venting operations in response to DOD's inquiries. After reviewing this information, DOD provided an updated response letter on April 13, 2020 stating that the Project would have minimal impact on military operations conducted in the area.

9.2 USDOT PHMSA SITING REQUIREMENTS AND 49 CFR 193, SUBPART B DETERMINATION

USDOT PHMSA has siting obligations under 49 CFR 193 Subpart B for LNG facilities, as defined in 49 CFR 193, to ensure the proposed site selection and location does not pose an unacceptable level of risk to public safety. FERC's regulations under 18 CFR 380.12(o)(14) require Trans-Foreland to identify how the proposed design complies with the siting requirements in USDOT PHMSA's regulations under 49 CFR 193 Subpart B. The scope of USDOT PHMSA's siting authority under 49 CFR 193 applies to LNG facilities used in the transportation of gas by pipeline that is subject to the federal pipeline safety laws and 49 CFR 192.[14]

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 or flammable vapors may 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

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12 Memorandum of Understanding between the Federal Energy Regulatory Commission and United States Department of Defense to Ensure Consultation and Coordination on the Effect of Liquefied Natural Gas Terminals on Active Military Installations, https://www.ferc.gov/sites/default/files/2020-04/MOUwiththeSecretaryofDefensetoensurecoordinationofLNGfacilitiesthatmayaffectanactivemilitaryinstallation.pdf, November 21, 2007, updated August 29, 2014.

13 September 18, 2019 letter from Steven J. Sample to Kimberly Bose. Filed in Docket Number CP19-118-000 on September 18, 2019. FERC eLibrary accession number 20190918-4003.

14 49 CFR 193.2001(b)(3), Scope of part, excludes any matter other than siting provisions pertaining to marine cargo transfer systems between the LNGC and the last manifold (or in the absence of a manifold, the last valve) located immediately before a storage tank.

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). In the event of a conflict with NFPA 59A (2001), the regulatory requirements in Part 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 that shop fabricated containers of LNG or other hazardous fluids less than 70,000 gallons must be designed to withstand wind forces based on the applicable wind load data in American Society of Civil Engineers (ASCE) 7 (2005). All other LNG facilities must be designed for a sustained wind velocity of not less than 150 miles per hour (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, which includes but is 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 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.[15]

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, other hazards that may affect the public or plant personnel must be evaluated as prescribed in NFPA 59A (2001), section 2.1.1(d).

Additionally, 49 CFR 193 Subpart B, and NFPA 59A (2001) specify radiant heat flux levels which must be considered for as long as the facility is in operation. For LNG spills from process and transfer areas, the 1,600 Btu/ft^2-hr flux level cannot extend beyond the plant property line onto a property that can be built upon.[16] In addition, section 2.1.1 of NFPA 59A (2001) requires that factors applicable to the specific site with a bearing on the safety of plant personnel and the surrounding public must be considered, including an evaluation of potential incidents and safety measures incorporated into the design or operation of the facility. USDOT PHMSA has indicated that potential incidents, such as vapor cloud explosions, should be considered to comply with Part 193, Subpart B.[17]

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15 USDOT PHMSA has approved two additional models for the determination of vapor dispersion exclusion zones in accordance with 49 CFR 193.2059: FLACS 9.1 Release 2 (Oct. 7, 2011) and PHAST-UDM Version 6.6 and 6.7 (Oct. 7, 2011).

16 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 to 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.

17 The USDOT PHMSA's "LNG Plant Requirements: Frequently Asked Questions" item H1, https://www.phmsa.dot.gov/pipeline/liquified-natural-gas/lng-plant-requirements-frequently-asked-questions, accessed Aug. 2018.

In accordance with the August 31, 2018 MOU, USDOT PHSMA issued a LOD to FERC on the 49 CFR 193 Subpart B regulatory requirements.[18] The LOD provides USDOT PHMSA's analysis and conclusions regarding 49 CFR 193 Subpart B regulatory requirements for FERC to consider in its decision to authorize, with or without modification or conditions, or deny an application.

9.3 COAST GUARD SAFETY AND LNGC REGULATORY REQUIREMENTS

Since 1969, the Kenai LNG Plant exported LNG shipments but discontinued this practice due to market conditions in 2015. For this Project, LNG shipments would be imported and Trans-Foreland indicated there would not be any changes to the previous route, maximum vessel size, or maximum number of LNGC transits. To assess the waterway for LNG marine traffic, the Coast Guard has published a Navigation and Vessel Inspection Circular (NVIC) – *Guidance on Assessing the Suitability of a Waterway for Liquefied Natural Gas (LNG) Marine Traffic* (NVIC 01-11). NVIC 01-11 directs the use of three concentric Zones of Concern, based on LNGCs with a cargo carrying capacity up to 265,000 cubic meters (m^3). These Zones of Concern are listed below.

- Zone 1: Impacts on structures and organisms are expected to be significant within 1,640 feet (500 meters). The outer perimeter of Zone 1 is about the distance to thermal hazards of 12,000 Btu/ft^2-hr (37.5 kilowatts per square meter [kW/m^2]) from a pool fire.
- Zone 2: Impacts would be significant but reduced, and damage from radiant heat levels are expected to transition from severe to minimal between 1,640 and 5,250 feet (500 and 1,600 meters). The outer perimeter of Zone 2 is approximately the distance to thermal hazards of 1,600 Btu/ft^2-hr (5 kW/m^2) from a pool fire.
- Zone 3: Impacts on people and property from a pool fire or an un-ignited LNG spill are expected to be minimal between 5,250 feet (1,600 meters) and a conservative maximum distance of 11,500 feet (3,500 meters) or 2.2 miles. The outer perimeter of Zone 3 should be considered the vapor cloud dispersion distance to the lower flammability limit from a worst case un-ignited release. Impacts on people and property could be significant if the vapor cloud reaches an ignition source and burns back to the source.

[18] March 25, 2020 letter "Re: Kenai LNG Cool Down Project, Docket No. CP19-118-000, 49 CFR Part 193, Subpart B, Siting – Letter of Determination" from Massoud Tahamtani to Rich McGuire. Filed in Docket Number CP19-118-000 on March 26, 2020. FERC eLibrary accession number 20200326-3014.

NVIC 01-11 references the Zones of Concern for assisting in a risk assessment of the waterway. LNGC traffic associated with this Project would proceed along the previously established transit route. During transit, the Zones of Concern would not overlap hospitals, city centers, or military installations. Zone 1 would not extend over any public areas along the entire ship transit route as it enters from the Gulf of Alaska to the existing Kenai facility. Zone 2 would encompass a larger area that would include a portion of the existing Kenai facility and adjacent areas such as multiple residential buildings, commercial buildings, industrial facilities, and a portion of the Kenai Spur Highway. Zone 3 would span larger portions of the Kenai facility and surrounding areas that include multiple residential buildings, commercial buildings, industrial facilities, churches, a fire department, a private airport, portions of the Kenai Spur Highway, and a portion of the East Foreland Lighthouse Reserve. At the pilot station, Zone 3 would also encompass multiple commercial buildings, residential buildings, campgrounds, and a boat harbor. Commercial, recreational, and fishing vessels may also fall within the zones, depending on their course. Transit of such vessels through a Zone of Concern can be avoided by timing and course changes, if conditions permit.

The areas affected by the three hazards zones are illustrated for potential accidental and intentional events in figures 2 and 3, respectively.

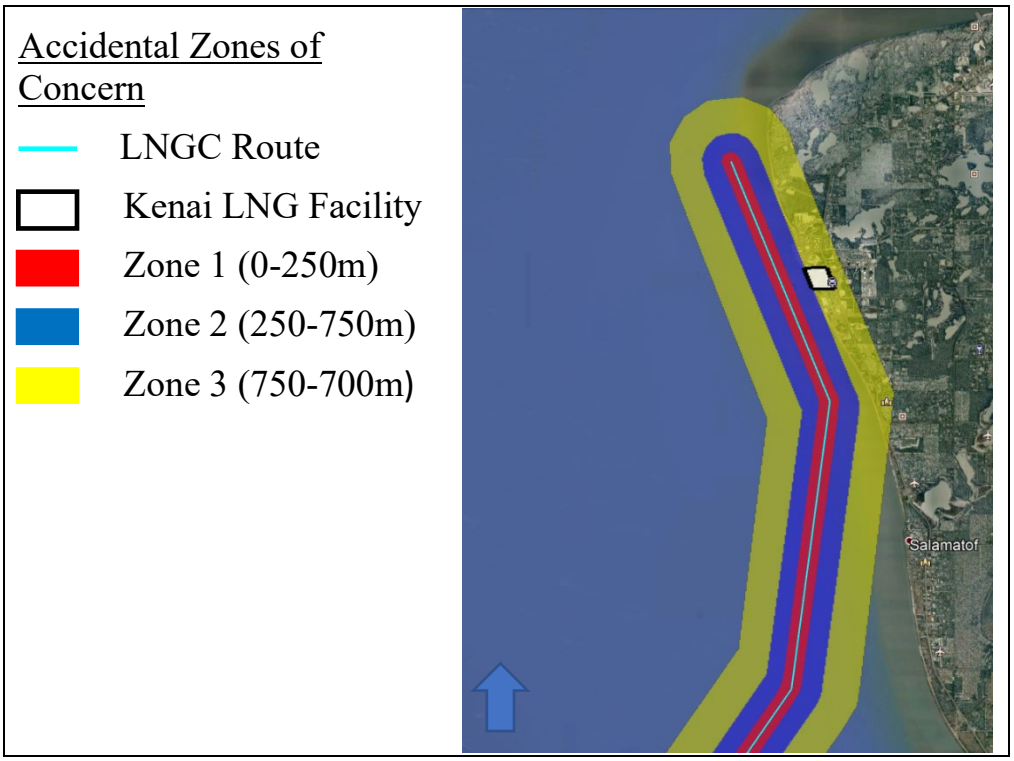

Figure 2 Accidental Zones of Concern

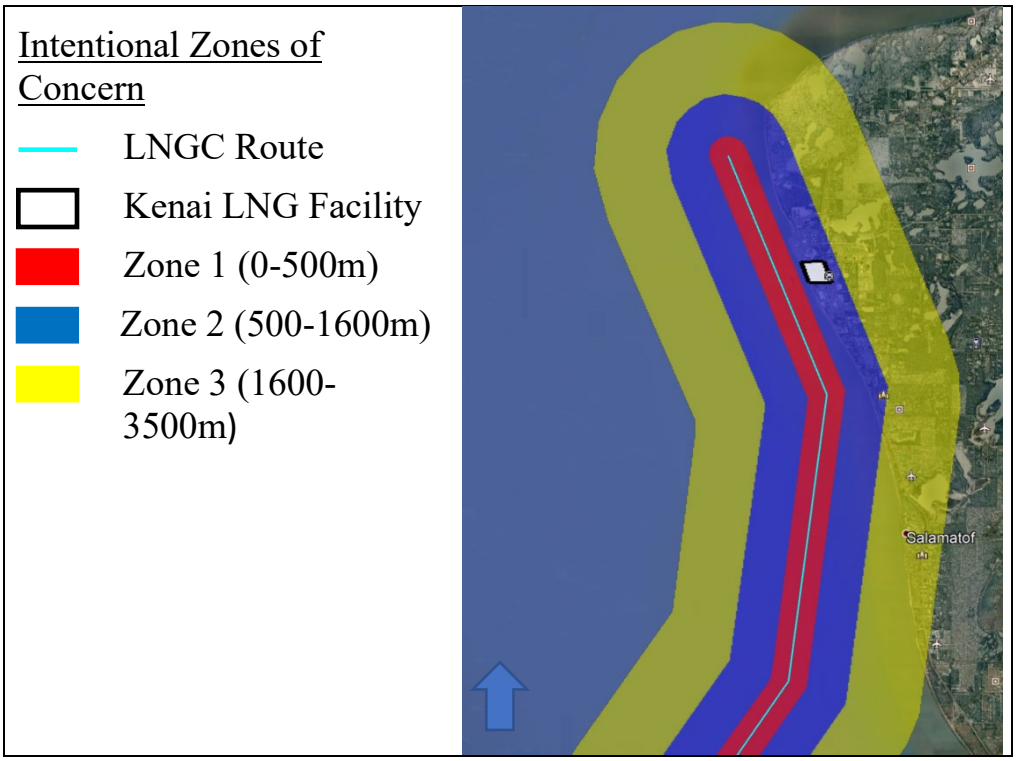

Figure 3 Intentional Zones of Concern

Filings under Docket No. CP09-34-000 indicate that the existing marine facilities can receive LNGCs with capacities of 87,500 m^3 with no modifications and LNGCs with capacities of 125,000 m^3 with some modifications. Since the CP09-34-000 application, the Kenai LNG Plant has not disclosed actions related to modifications to the marine facilities in the required semi-annual reports. In addition, Trans-Foreland submitted 2011 structural inspection reports for the marine facilities that indicate degradation relative to the original design. The current geotechnical conditions for the marine facilities must also be re-evaluated to account for changes that potentially affect the reliability of the original design. The 2011 structural inspection reports of the dock caissons indicate that the mudline at certain structural elements of the dock were lower than assumed in the design calculations and it is possible that the mudline elevation has receded further due to continuous erosion. This results in less embedment of structural elements into the soil, leading to higher bending moments because of the longer cantilever length above the mudline. Both the lower mudline and higher potential for bending moments could result in significant reduction of structural capacity to resist berthing and mooring loads.

However, Trans-Foreland also reported it loaded a 127,000 m^3 LNGC three times in 2012 with more than 100,000 m^3 (and up to approximately 125,000 m^3) of LNG, and between 2014 and 2015, loaded a 140,000 m^3 LNGC eleven times with approximately 130,000 to 135,000 m^3 of LNG. FERC is addressing these technical aspects of the existing marine facilities through its inspection program under Docket No. CP09-34-000 in coordination with Coast Guard. Characterization and mitigation of any identified

structural, geotechnical, and environmental operating condition issues must be resolved prior to receiving any ships and reactivation of any areas. This cooperative review by FERC and the Coast Guard will continue as described in the February 2004 Interagency Agreement.

Under the Ports and Waterways Safety Act, the Magnuson Act, the MTSA, and the Security and Accountability For Every Port Act, the Coast Guard Captain of the Port has the authority to prohibit LNG transfer or LNGC 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. Therefore, we recommend in section B.9.6 that Trans-Foreland file a request for written authorization from the Director of OEP prior to receiving the first LNG cargo, including any commissioning cargos, after the Coast Guard determines 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. If the Project is authorized, constructed, and operated, compliance with the requirements of 33 CFR 127 would be subject to the Coast Guard inspection and enforcement program.

9.4 LNG FACILITY SECURITY REGULATORY REQUIREMENTS

The security requirements for the Project are governed by 33 CFR 105, 33 CFR 127, and 49 CFR 193 Subpart J - Security. 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 the Project facilities. The existing facility has provided a Facility Security Plan to the Coast Guard, as required by 33 CFR 105. In addition, 33 CFR 127 has requirements for access controls, lighting, security systems, security personnel, protective enclosures, communications, and emergency power. 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 Coast Guard inspection and enforcement programs.

Title 49 CFR 193 Subpart J also specifies security requirements for the onshore components of LNG facilities, as defined in 49 CFR 193, including requirements for conducting security inspections and patrols, liaison with local law enforcement officials, design and construction of protective enclosures, lighting, monitoring, alternative power sources, and warning signs. The existing LNG facilities, as defined in 49 CFR 193, are already subject to these requirements. Trans-Foreland would augment its security program to take into account the Project facilities subject to 49 CFR 193. If the Project is authorized, constructed, and operated, compliance with the security requirements of 49 CFR 193 Subpart J would be subject to the USDOT PHMSA inspection and enforcement programs.

Trans-Foreland filed information on its existing and proposed security features. We recommend in section B.9.6 that Trans-Foreland provide, for review and approval, final design lighting coverage drawings that illustrate photometric analyses demonstrating the lux levels at the interior of the terminal are in accordance with Project specifications, including American Petroleum Standard (API) 540, and other federal regulations for lighting. We also recommend in section B.9.6 that Trans-Foreland provide, for review and approval, final design camera coverage drawings that illustrate coverage areas of each camera such that the Project facilities are covered, including cameras that cover the vaporizer, compressor buildings, marine transfer area, and building. Furthermore, in accordance with the February 2004 Interagency Agreement among FERC, USDOT PHMSA, and Coast Guard, FERC staff would collaborate with the Coast Guard and USDOT PHMSA on the Project's security features.

9.5 FERC ENGINEERING AND TECHNICAL REVIEW OF THE PRELIMINARY ENGINEERING DESIGNS

9.5.1 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.[19] 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 address this potential hazard for the Project, we evaluate the preliminary engineering and final specifications for suitable 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 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 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. To ensure that this potential hazard would be addressed for proposed facilities that have electrical seal interfaces, we evaluated the preliminary designs and recommend in section B.9.6 that

[19] 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.

Trans-Foreland provide, for review and approval, the final design details of the electrical seal design 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. To ensure that this potential hazard would be addressed for proposed facilities, we evaluated the preliminary design for mitigation of flammable vapor dispersion and ignition in buildings and combustion equipment to ensure they would be adequately covered by hazard detection equipment that could isolate and deactivate any combustion equipment whose continued operation could add to or sustain an emergency. We also recommend in section B.9.6 that Trans-Foreland provide, 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.[20] 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 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 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. To ensure that this potential hazard would be

[20] 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

addressed for proposed facilities, we recommend in section B.9.6 that Trans-Foreland provide a plan for purging, for review and approval, which addresses the requirements of the American Gas Association, *Purging Principles and Practice*, and to 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.9.6 that Trans-Foreland provide, for review and approval, operating and maintenance plans, including safety procedures, prior to commissioning. In evaluating such plans, we would assess whether they cover all standard operations, including purging activities associated with startup and shutdown. Also, the proposed facilities do not include any pressure vessels that could be sources of projectiles.

9.5.2 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 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. Furthermore, the potential hazards are dictated by the site location and engineering details. In general, FERC staff considers an acceptable design to include various layers of protection and 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.

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. Our review of the engineering design for these layers of protection is initiated in the application process and carried through to the next phase of the Project in final design if authorization is granted by FERC.

The reliability of these layers of protection is informed by occurrence and likelihood of causes and the potential severity of consequences based on past incidents and validated hazard modeling. As a result of the ongoing engineering review, we recommend mitigation measures and continuous oversight to FERC for consideration to include as conditions in the order. If the Project 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.9.6 that Trans-Foreland file final design PFDs, HMBs, and P&IDs for review and approval. We also recommend in section B.9.6 that Trans-Foreland request modifications to engineering information 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.

The Project would utilize the existing LNG storage tanks, marine transfer piping, and vapor handling systems, but would install a new trim vaporizer module, LNG pumps, a BOG booster compressor, and related ancillary facilities. It would also modify existing piping and valves to cooldown the currently warm and idle facility, receive LNG imports, and deliver BOG to fuel the Kenai Refinery. The existing pretreatment, liquefaction, and refrigerant storage equipment previously utilized for export operations would remain idle.

After conversion to an import facility, Trans-Foreland would receive up to four LNGCs per year. During LNGC unloading operations, the LNGC's pumps send LNG to fill the three existing LNG storage tanks via the marine transfer piping. The LNG entering each LNG storage tank would generate BOG that would exceed the capacity of the vapor handling system. Some BOG would return to the LNGC to displace the LNG transferred to the LNG storage tanks. The BOG handling system would convert some BOG to fuel gas that would be routed to the adjacent refinery. Any excess BOG would be released into the atmosphere via an existing ventilation stack within the LNG storage tank diked area. The estimated BOG venting rate during LNGC unloading operations would be approximately 13.3 MMscfd. Dispersion modeling from the existing vent stack shows that BOG vapors would disperse well above grade and would not reach ignition sources or onsite personnel. However, in the event the BOG compression system is not available due to unscheduled maintenance or unforeseen equipment failure, excess BOG flows would exceed the original design basis of the existing vent stack. Therefore, we recommend in section B.9.6 that Trans-Foreland file vent stack design information showing that it could handle the maximum vapor loads during ship unloading operations when the BOG compression system is not available and would not result in flammable vapors reaching ignition sources and areas that would cause cascading damage or alternatively, file procedures to cease LNGC unloading operations when the BOG compression system is not available.

Once the LNG storage tanks are full, the LNGC would disconnect from the marine dock. The Project would install new level, temperature, and density transmitters and associated process controls on the existing LNG storage tanks to monitor the contents for consistency and detect early indication of stratification. In addition, a new LNG circulation pump would facilitate inter-tank and intra-tank recirculation of LNG into the top or bottom of each LNG storage tank, which promotes compositional consistency.

During holding mode (i.e., LNG storage tanks filled with LNG), either an existing repurposed LNG pump or a new trim vaporizer feed pump would supply LNG from the existing LNG storage tanks to the trim vaporizer module. The trim vaporizer module would create cold vapors to supplement BOG normally generated through heat leak into the process. The trim vaporizer module would heat the LNG flowing through a coil via electrical induction. The BOG is routed back to an LNG storage tank and would flow into the existing BOG handling system. The BOG handling system would pressurize the BOG using existing compressors and the new BOG booster compressor to supply fuel gas to the adjacent refinery.

The Project would use existing utilities and associated auxiliary equipment such as the on-site power system, control system, nitrogen generation equipment, plant and utility air system, and plant and utility water system. These existing systems would provide sufficient power, control, and utility capacity for the equipment proposed in this Project, including emergency power generation and uninterruptable power supplies that would power safety and security related equipment. The existing firewater system would also cover the proposed equipment, as discussed more in the Hazard Mitigation Design section below.

A failure of process equipment could pose potential harm if not properly safeguarded with appropriate engineering controls and operation. Trans-Foreland would install process control valves and instrumentation to safely operate and monitor the facilities. Alarms would have visual and audible notification in the control room to warn operators that process conditions may be approaching design limits. Trans-Foreland would design and maintain their control systems and human machine interfaces to the International Society for Automation (ISA) Standards 5.1, 5.2, 5.3, 5.5, 18.2, 20, 55.1, 55.3, 84, and 99; International Electrotechnical Commission Standards 61131, 61508, 62381, 62382, 62443; and other standards and recommended practices. We also recommend in section B.9.6 that Trans-Foreland develop and implement an alarm management program, for review and approval, prior to introduction of hazardous fluids. We would verify that the alarm management program would be in accordance with recommended and generally accepted good engineering practices, such as ISA 18.2.

Operators would have the ability to mitigate a process upset or emergency condition from the existing control room, including activating remotely actuated shut-off valves to enable rapid isolation of inventories. Trans-Foreland would develop facility operation procedures after completion of the final design; this timing is consistent with accepted industry practice. We recommend in section B.9.6 that Trans-Foreland provide more information, for review and approval, on the operating and maintenance procedures, including safety procedures, hot work procedures and permits, abnormal operating conditions procedures, management of change procedures and forms, and personnel training prior to commissioning. We would evaluate these procedures to ensure that onsite personnel can operate and maintain all systems safely, based on benchmarking

against other operating and maintenance plans and comparing against recommended and generally accepted good engineering practices, such as American Institute of Chemical Engineers (AIChE) Center for Chemical Process Safety (CCPS), *Guidelines for Writing Effective Operating and Maintenance Procedures*, AIChE CCPS, *Guidelines for Management of Change for Process Safety*, AIChE CCPS, *Guidelines for Effective Pre-Startup Safety Reviews, AGA, Purging Principles and Practices*, and NFPA 51B, *Standards for Fire Prevention During Welding, Cutting, and Other Hot Work*. In addition, we recommend in section B.9.6 that Trans-Foreland 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. We also recommend in section B.9.6 that Trans-Foreland maintain a detailed training log that demonstrates the operating staff has completed all required training prior to commissioning.

Instrumentation would be installed to monitor equipment and piping and would trigger automatic shutdowns to isolate equipment and piping during process upsets or emergency conditions. The Project would incorporate the proposed equipment into its existing plant-wide emergency shutdown system that would initiate closure of valves and shutdown of the process during emergency situations as well as the ability to shutdown specific areas to address local emergency conditions. Safety-instrumented systems would comply with ISA Standard 84.00.01 and other recommended and generally accepted good engineering practices. We also recommend in section B.9.6 that Trans-Foreland 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.

A Hazard and Operability (HAZOP) analysis identifies the major process hazards that may occur during the operation of the facilities. In developing the FEED, Trans-Foreland conducted a HAZOP analysis on the Project's design based on the proposed PFDs and the P&IDs. The HAZOP analysis identified potential hazards in the early stage of the Project's design that could produce undesirable consequences through the occurrence of an incident by evaluating the materials, systems, process, and plant design.

The HAZOP analysis addressed hazards of the process, engineering, and administrative controls and provided a qualitative evaluation of a range of possible safety, health, and environmental consequences that may result from the process hazard, and identify whether there are adequate safeguards (e.g., engineering and administrative controls) to prevent or mitigate the risk from such events. Where insufficient engineering or administrative controls were identified, recommendations to prevent or minimize these hazards were generated from the results of the HAZOP review. Once the design has been subjected to a HAZOP review, the design development team would track, manage, and keep records of changes in the facility design, construction, operations, documentation,

and personnel. Trans-Foreland would evaluate these changes to ensure that the safety, health, and environmental risks arising from these changes are addressed and controlled based on its management of change procedures. We also recommend in section B.9.6 that Trans-Foreland file all changes to their FEED for review and approval by FERC staff. However, major modifications could require an amendment or new proceeding.

If the Project is authorized and constructed, Trans-Foreland would install equipment in accordance with its design. We recommend in section B.9.6 that the facility be subject to construction inspections and that Trans-Foreland 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.9.6 that Trans-Foreland provide semi-annual reports that include abnormal operating conditions and planned facility modifications. Furthermore, we recommend in section B.9.6 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 the basis of design conditions, such as process conditions, do not exceed the original basis of design.

Mechanical Design

Each mechanical component's design prevents hazardous events by using adequate design margins to ensure operating limits are not reached, using suitable materials of construction, and undergoing examination and testing to verify mechanical integrity prior to in-service. FERC regulations under 18 CFR 380.12(o)(8) and (12) requires applicants to provide engineering information on major process components, and design considerations and safety provisions applied to these components. In addition, 18 CFR 380.12(o)(7) requires applicants to provide engineering studies on the design approach and 18 CFR 380.12(o)(14) requires applicants to demonstrate how they comply with 49 CFR 193 and NFPA 59A.

As required by 49 CFR 193 Subparts C and D, and by incorporation, Chapters 3 and 6 of NFPA 59A (2001), process equipment and piping systems must be designed to the requirements of standards such as American Society of Mechanical Engineers (ASME) B31.3, ASME Boiler Pressure Vessel Code (BPVC), etc. If authorized, constructed, and operated, LNG facilities, as defined in 49 CFR 193, must comply with the requirements of 49 CFR 193 Subpart C and D and would be subject to USDOT PHMSA's inspection and enforcement programs. In addition, the marine facilities must comply with similar requirements of NFPA 59A (1994), which are incorporated by reference into the Coast Guard's regulations in 33 CFR 127. If the Project is authorized, constructed, and operated, compliance with the requirements of 33 CFR 127 would be subject to the Coast Guard inspection and enforcement program. However, all components are not covered in NFPA 59A (2001). Therefore, FERC staff evaluated these aspects against recognized and generally accepted good engineering practices,

newer editions of NFPA 59A, and other federal regulations (e.g., U.S. Occupational Health and Safety Administration Process Safety Management standard).

Trans-Foreland provided codes and standards for the design, fabrication, construction, and installation of piping and equipment and specifications for the facility. The design specified materials of construction and ratings suited to the pressure and temperature conditions of the process design. Piping would be designed, fabricated, assembled, erected, inspected, examined, and tested in accordance with the ASME Standards B31.3, B36.10, B36.19. Valves and fittings would be designed to standards and recommended practices such as API Standards 594, 598, 600, 602, 603, 607, 608, 609, and 623; ASME Standards B16.5, B16.9, B16.10, B16.11, B16.20, B16.21, B16.25, B16.34, B16.36, and B16.48; ISA 75.01, 75.03, 75.08, and 75.17; and other recommended and generally-accepted good engineering practices. Portions of the facility regulated under 33 CFR 127 for the marine transfer system, including piping, hoses, and loading arms should also be tested in accordance with 33 CFR 127.407. The heat exchangers (i.e., trim vaporizer module) would be designed to ASME BPVC Section VIII standards. Rotating equipment would be designed to standards and recommended practices, such as API 610, 613, 614, 618, 670, 671, and 672; and ASME B73.1 and B73.2. The Project would utilize the existing LNG storage tanks, which predated the Federal Power Commission (predecessor to FERC) evaluation of the siting, design, and construction of those facilities and predated USDOT PHMSA regulatory requirements. However, after FERC clarified jurisdiction in 2008 under Docket CP09-34-000, FERC staff has evaluated design and construction information on the LNG export terminal, including the LNG storage tanks. The information available on the LNG storage tank design indicates they were designed to meet similar codes and standards in existing regulations, but the time at which the facilities were designed and constructed had different and lesser requirements than current regulations, codes, and standards that could present a higher risk of failure from certain structural loads, such as from natural hazards. In addition, during the latest inspection, FERC staff identified some corrosion on the outer tank and adjoining piping.

FERC is addressing these technical aspects of the existing LNG storage tank and dike facilities through its inspection program under Docket No. CP09-34-000 in coordination with USDOT PHMSA. Evaluation of enclosing the dike and benefit it may serve in mitigating risks associated with failures of an LNG storage tank, including natural hazards, must be resolved prior to areas being reactivated with hazardous fluids. Trans-Foreland has also committed to inspecting the LNG storage tanks and resolving any deficiencies. The review by FERC and coordination with USDOT PHMSA will continue as described in the February 2004 Interagency Agreement.

Pressure safety relief valves would be installed to protect the storage containers, pressure vessels, process equipment, and piping from an unexpected or uncontrolled pressure excursion. In addition, the facility could utilize the existing vent to address

unexpected or uncontrolled pressure excursions. The safety relief valves would be designed to handle process upsets and thermal expansion within piping, per NFPA 59A (2001) and ASME Section VIII; and would be designed in accordance with API 520, 521, 526, and 527; ASME B31.3; and other recommended and generally accepted good engineering practices. In addition, Trans-Foreland should verify that the set pressure of the pressure relief valves meet the requirements in 33 CFR 127.407. We recommend in section B.9.6 that Trans-Foreland 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 conducted in accordance with the standards reference and other recommended and generally accepted good engineering practices. If the Project is authorized, constructed, and operated, compliance with the requirements of 33 CFR 127 would be subject to the Coast Guard inspection and enforcement program.

Although Trans-Foreland listed many of the codes and standards as those the Project would meet, Trans-Foreland did not refer to these standards on many of the specifications and data sheets for the proposed process equipment. Therefore, we recommend in section B.9.6 that Trans-Foreland provide the final specifications for all equipment and a summarized list of all referenced codes and standards for review and approval. If the Project is authorized and constructed, Trans-Foreland would install equipment in accordance with its specifications and design, and FERC staff would verify equipment nameplates to ensure equipment is being installed based on the 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.9.6 that Trans-Foreland provide semi-annual reports that include equipment malfunctions and abnormal maintenance activities. In addition, we recommend in section B.9.6 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, safety instrumented systems, and emergency shutdown systems failed to maintain the Project within the mechanical design limits of the piping, containers, and safety relief valves, a release could potentially occur. 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 so that we can assess whether the design would collectively protect against a release. In addition, 18 CFR 380.12(o)(7) requires applicants to provide engineering studies on the design approach and 18 CFR 380.12(o)(14) requires applicants to demonstrate how they comply with 49 CFR 193 and NFPA 59A.

As required by 49 CFR 193 Subpart I and, by incorporation, section 9.1.2 of NFPA 59A (2001), fire protection must be provided for all USDOT PHMSA regulated LNG facilities based on an evaluation of sound fire protection engineering principles, analysis of local conditions, hazards within the facility, and exposure to or from other property. NFPA 59A (2001) also requires evaluation on the type, quantity, and location of hazard detection and hazard control, passive fire protection, emergency shutdown and depressurizing systems, and emergency response equipment, training, and qualifications. If authorized, constructed, and operated, LNG facilities, as defined in 49 CFR 193, must comply with the requirements of 49 CFR 193 Subpart I and would be subject to USDOT PHMSA's inspection and enforcement programs. However, NFPA 59A (2001) also indicates the wide range in size, design, and location of LNG facilities precludes the inclusion of detailed fire protection provisions that apply to all facilities comprehensively and includes subjective performance-based language on where emergency shut down (ESD) systems and hazard controls are required and does not provide any additional guidance on placement or selection of hazard detection equipment and provides minimal requirements on firewater. Also, the marine facilities would be subject to Coast Guard regulations under 33 CFR 127, which incorporates sections of NFPA 59A (1994), which have similar performance-based guidance. Title 33 CFR 127 also has 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. Therefore, FERC staff evaluated the proposed spill containment and spacing, hazard detection, emergency shutdown and depressurization systems, hazard control, firewater coverage, structural protection, and onsite and offsite emergency response to ensure they would provide adequate protection of the LNG facilities as described below.

Trans-Foreland performed a preliminary fire protection evaluation to ensure that adequate mitigations would be in place. While the preliminary fire protection evaluation did include hazard detection, emergency shutdown and depressurization systems, hazard control, and firewater coverage; it did not address spill containment and spacing, structural protection, and onsite and offsite emergency response. Trans-Foreland would utilize existing spill containment systems as discussed in the next section and provided an existing onsite and offsite emergency response plan that is further discussed in section B.9.5.2. A final fire protection evaluation should ensure all aspects of fire protection (both new and existing) are considered. Therefore, we recommend in section B.9.6 that Trans-Foreland 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, hazard detection, hazard control, firewater systems, structural fire protection, and onsite and offsite emergency response procedures.

Spill Containment

In the event of a release, sloped areas at the base of storage and process facilities would direct a spill away from equipment and into the existing impoundment system. 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. FERC regulations under 18 CFR 380.12(o)(4) requires applicants to provide information on spill containment systems. In addition, 18 CFR 380.12(o)(7) and (8) requires applicants to provide engineering studies on the design approach and engineering information on major process components, and 18 CFR 380.12(o)(14) requires applicants to demonstrate how they comply with 49 CFR 193 and by incorporation, NFPA 59A (2001). Under NFPA 59A (2001), section 2.2.2.2, the capacity of impounding areas for vaporization, process, or LNG transfer areas must equal the greatest volume that can be discharged from any single accidental leakage source during a 10-minute period or during a shorter time period based upon demonstrable surveillance and shutdown provisions acceptable to the USDOT PHMSA. If authorized, constructed, and operated, LNG facilities as defined in 49 CFR 193, must comply with the requirements of 49 CFR 193 Subpart C and would be subject to USDOT PHMSA's inspection and enforcement programs.

In addition, Trans-Foreland would unload LNGCs through the existing marine transfer system that is currently not protected by an impoundment system. An impoundment system design for the marine facilities would be subject to the Coast Guard's 33 CFR 127, which does not specify a spill or duration for impoundment sizing. While the existing marine transfer system is not part of the proposed Project, we evaluated whether the proposed modifications to the marine transfer system would benefit from spill containment. Trans-Foreland would install a temporary cooldown skid at the marine facilities to allow initial cooldown of the facility. The cooldown skid would consist of 1-inch-diameter piping segment with hose connections, valves, and instrumentation. This skid is not proposed to have a dedicated spill containment system and would be removed after initial cooldown of the facility.

Trans-Foreland analyzed a release from the 1-inch-diameter connections to the cooldown skid and based on the normal LNGC unloading conditions, concluded that liquid releases from these connections would not result in any liquid reaching the ground. Instead, this release would produce a vapor cloud and the resulting vapor dispersion from a 10-minute release is further discussed in the next section. FERC staff also considered a depressurized scenario from the 1-inch-diameter cooldown skid to analyze the largest amount of liquid that could reach the ground. This release would produce a liquid pool diameter of approximately 10 feet directly below the cooldown skid from a 10-minute release. The release would be small enough to remain on the platform and would be small enough to be extinguished with existing fire extinguishers located nearby. This hazard would also only be present during initial cooldown activity, which would be heavily

monitored. In addition, the pool fire would last approximately until the release could be isolated and the marine transfer area would have emergency shutdown buttons that would facilitate a quick shutdown in likelihood less than 10 minutes. Therefore, given the likely pool fire size and duration and existing emergency shutdown and hazard control provisions, there would not be a significant increase in risk for cascading damage to cause any significant impacts to the safety of the public. Therefore, FERC staff concludes there would not be a benefit from an impoundment system under the temporary cooldown skid.

The Project does not propose any modifications to the existing onshore impoundment systems and the largest 10-minute liquid release would be less than 300 gallons. Trans-Foreland would locate the LNG pumps and trim vaporizer module and associated piping and valves within the existing LNG storage tank spill impoundment structure (tank impoundment) which is sized to contain a spill volume greater than one full LNG storage tank (each LNG storage tank has a capacity of over 9,400,000 gallons). Any liquid release from the LNG pumps, the trim vaporizer module, or associated piping would collect within the tank impoundment around the vaporizer module or within an existing LNG pump pit that would serve as containment. In addition, elevation changes within the tank impoundment would direct liquid releases towards the impoundment walls and away from the existing equipment and LNG storage tanks. And while the tank impoundment dike not being fully enclosed is being addressed in the existing inspection program under docket CP09-34-000, FERC staff estimate that any pool would be approximately 10 feet or less in diameter and would not reach the areas where the dike is not enclosed and would not benefit from an independent impoundment system within the tank impoundment. Given the small spill volumes and pool size, the liquid release would quickly evaporate and produce a vapor cloud. Evaluation of vapor dispersion scenarios are further discussed in the next section.

In addition, Trans-Foreland would install 1-inch-diameter vacuum jacketed LNG quench piping from the trim vaporizer feed pump to the BOG system and has indicated that the outer pipe would serve as spill containment for releases from the inner 1-inch-diameter LNG quench line. This piping would not have any other dedicated spill containment system. USDOT PHMSA regulations do not prohibit the use of vacuum jacketed piping, but USDOT PHMSA regulations in 49 CFR 193.2167 prohibit the use of covered impounding systems. The use of the outer pipe of a vacuum jacketed piping system for spill containment without an external spill conveyance system could be considered a covered impounding system and would potentially need a special permit from USDOT PHMSA. However, we note that NFPA 59A (2001) section 2.2.1.2, incorporated by reference in 49 CFR 193 Subpart C, states that process areas and transfer areas for LNG must be graded, drained, or provided with impoundment to minimize the possibility of accidental spills and leaks from endangering important structures, equipment, adjoining property, or that could reach waterways. Therefore, we evaluated whether a release from the vacuum jacketed piping onto the flat grade below would have

a significant impact to the public directly or indirectly through cascading damage or endanger important structures, equipment, adjoining property, or reach waterways.

FERC staff analyzed the 1-inch-diameter LNG quench line's operating conditions and found that liquid releases from this line would not result in any liquid reaching the ground and therefore would not benefit from a separate spill containment. Instead, this release would produce a vapor cloud and the resulting vapor dispersion from a 10-minute release is further discussed in the next section and would not extend offsite onto any adjoining properties and would not result in explosions that would have damaging overpressures that extend offsite onto any adjoining properties. FERC staff also considered a depressurized scenario from the 1-inch-diameter LNG quench line to analyze the largest amount of liquid that could reach the ground. This release would produce a liquid pool diameter of approximately 10 feet directly below the quench line on a flat grade from a 10-minute release. This pool could contact the pipe rack support structure. As further discussed in the sections below, FERC staff recommended that Trans-Foreland install passive cryogenic and fire protection as well as firewater systems prior to the construction of final design to protect equipment and pipe racks from cryogenic releases and nearby fires. Therefore, FERC staff concludes there would not be a significant risk of failure of any nearby equipment or structures that could result in cascading damage and significant impact.

However, FERC staff cannot interpret compliance with USDOT PHMSA regulations, and it is unclear whether this design would satisfy USDOT PHMSA's interpretation of NFPA 59A (2001) section 2.2.1.2. Therefore, while we do not believe there would be a significant impact from the proposed design, we recommend in section B.9.6 that prior to construction of final design, Trans-Foreland receive a determination from USDOT PHMSA on whether the vacuum jacketed piping complies with 49 CFR 193.2167 and NFPA 59A (2001) section 2.2.1.2. We also recommend in section B.9.6 that Project facilities be subject to regular inspections to verify that impoundments are being properly maintained throughout the life of the facility.

Spacing and Plant Layout

Proper equipment and building spacing and layout is necessary to ensure that potential hazardous conditions do not escalate into a more severe event. The facility layout should minimize any cascading effect of flammable vapors dispersion or heat from a fire on nearby process equipment, safety equipment, occupied buildings, or public areas. FERC regulations under 18 CFR 380.12(o)(1), (2), (4), and (12) requires applicants to provide engineering information on the layout of major process components, fire protection equipment, spill containment systems, and discuss design considerations and safety provisions applied to these components.

In addition, 18 CFR 380.12(o)(7) requires applicants to provide engineering studies on the design approach and 18 CFR 380.12(o)(14) requires applicants to demonstrate how they comply with 49 CFR 193 and NFPA 59A.

The spacing of vessels and equipment between each other, from ignition sources, and to the property line must meet the requirements of 49 CFR 193 Subparts C, D, and E, which incorporate NFPA 59A (2001). NFPA 59A (2001) includes spacing and plant layout requirements and further references NFPA 30, NFPA 58, and NFPA 59 for additional spacing and plant layout requirements. If authorized, constructed, and operated, LNG facilities as defined in 49 CFR 193, must comply with the requirements of 49 CFR 193 and would be subject to USDOT PHMSA's inspection and enforcement programs.

The trim vaporizer module would consist of an LNG coil that would be heated via electrical induction. Because the heat source would be integral to the actual vaporizing exchanger, this design would fall under section 5.1.1.1 of NFPA 59A (2001) that classifies the trim vaporizer module as an integral heated vaporizer. In addition, section 2.2.5.2 in NFPA 59A (2001) specifies that integral heated vaporizers be at least 50 feet from any impounded LNG, the path of travel of an accidental discharge and the impounding area, and the LNG storage containers. However, Tran-Foreland proposed to locate the trim vaporizer module within 50 feet of the LNG storage tank and within the tank impoundment and submitted design details with USDOT PHMSA. On May 7, 2020, USDOT PHMSA issued a "no objection letter" to Trans-Foreland's demonstration of equivalency for the location of the trim vaporizer module.[21] Although the USDOT PHMSA "no objection letter" addressed concerns on locating an ignition source within the existing tank impoundment, additional considerations concerning jet fires emanating from a piping release remain. The effects of potential jet fires are further discussed below.

In addition, 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 spacing to mitigate the potential for cascading damage was not practical, we evaluated whether other mitigation measures were in place and evaluated those systems in further detail as discussed in subsequent sections. We evaluated the spacing of buildings in line with AIChE CCPS *Guidelines for Evaluating Process Plant Buildings for External Explosions and Fires* and API 752, which provide guidance on identifying and evaluating explosion and fire impacts on plant buildings and occupants resulting from events external to the buildings. Trans-Foreland would not

[21] May 7, 2020 letter "Re: Trans-Foreland Pipeline Company, LLC, Kenai LNG Cooldown Project, FERC Docket Number: CP19-118-000, Vaporizer Spacing Requirement Equivalency" from Alan Mayberry to Martin Marz. Filed in Docket Number CP19-118-000 on May 8, 2020. FERC eLibrary accession number 20200508-3007.

install new occupied and other safety related buildings. The existing facility includes a firewater pump building, a control building, and a warehouse that are spaced such that fire hazards originating from the Project would not impact these buildings. In addition, FERC staff evaluated other hazards associated with releases and whether any damage would likely occur at buildings or 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, Trans-Foreland would install LNG pumps within existing concrete pits that utilize elevated stainless-steel power conduits. In addition, LNG piping would be elevated at a minimum of 3 feet above grade and would be supported by concrete supports. Trans-Foreland would install ESD systems to limit spills to small volumes that would not produce appreciably sized pools and elevation changes around LNG piping and equipment would direct any potential cryogenic release towards the impoundment walls. In addition, the BOG booster compressor building, and two electrical and control buildings would be outside the tank impoundment and would not come in contact with cryogenic releases. However, Trans-Foreland did not specify how construction materials provide protection against cold shocks or if the Project would include additional cold spill protection. Therefore, we recommend in section B.9.6 that Trans-Foreland 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 prevent cascading damage from explosions, Trans-Foreland would locate Project buildings outside the tank impoundment. In addition, Project facilities would be in relatively unconfined and uncongested areas. Trans-Foreland performed an analysis that shows vapor dispersion from LNG releases would reach the BOG booster compressor building and the two electrical and control buildings. Because these buildings would have ventilation air intake or air conditioning equipment, Trans-Foreland has proposed to install gas detection to monitor for LNG vapors and indicated design details would be completed in the final design. However, Trans-Foreland did not indicate if gas detection on building air intakes would trigger shut down of the ventilation systems. Therefore, we recommend in section B.9.6 that Trans-Foreland conduct a technical review of the facility, for review and approval, identifying all combustion/ventilation air intake equipment and the distances to any possible flammable gas release; and verify that these areas would be adequately covered by hazard detection devices 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. We also recommend in section B.9.6 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 overpressures from vapor cloud explosions, we evaluated how flammable vapors would be prevented from accumulating within confined areas. The Project would not utilize refrigerants such as ethylene or propane that have a higher propensity to produce overpressures. In addition, the existing LNG storage tanks are on a ring-wall foundation preventing LNG vapors from migrating underneath the tanks. To address methane vapor cloud explosions, Trans-Foreland evaluated impacts to 1 pound per square inch (psi) overpressure hazards from both LNG and natural gas releases. Although the modeled overpressures would not impact existing occupied buildings or offsite public, Trans-Foreland's analysis shows potential impacts on the existing LNG storage tanks. Therefore, we recommend in section B.9.6 that Trans-Foreland file an evaluation showing that overpressures from vapor cloud explosions would not cause cascading damage or mitigate overpressure impacts from failing occupied buildings, pressure vessels, LNG storage tanks, and emergency equipment.

To minimize the risk of pool fires from causing cascading damage, Trans-Foreland proposes to utilize the existing tank impoundment to contain any liquid release. However, FERC staff estimate that a radiant heat exceeding 10,000 Btu/ft^2-hr from a pool fire could impact the LNG storage tanks, the trim vaporizer module, and the existing pipe rack within the tank impoundment. Trans-Foreland would use existing firewater monitors to provide cooling water to this equipment. However, Trans-Foreland did not provide details on passive fire protection to protect from fires. Therefore, we recommend in section B.9.6 that Trans-Foreland file final design drawings and specifications of the passive structural fire protection, for review and approval, for structural supports and equipment. We also recommend in section B.9.6 that Trans-Foreland demonstrate the effectiveness and reliability of passive and active protection provided for each component within the 4,000 Btu/ft^2-hr zone from a pool fire, for review and approval, prior to construction of the final design.

To minimize the risk of jet fires from causing cascading damage that could exacerbate the initial hazard, Trans-Foreland would locate piping and equipment containing flammable and combustible substances away from buildings and process areas that do not handle flammable and combustible materials. However, the spacing of the trim vaporizer module and associated piping could result in jet fire impingement on the existing LNG storage tanks. Trans-Foreland indicated that the Project would mitigate jet fires through the use of active fire protection systems that consist of fire and gas detection systems with alarms; equipment shutdowns and valve closures to isolate the release source; and existing firewater systems to provide cooling water during a jet fire event. However, Trans-Foreland has not provided details on the effectiveness and reliability of these active measures or any provisions for passive protection. If jet fires are not sufficiently mitigated, the hazard could lead to cascading damage that would affect personnel or off-site persons. Therefore, we recommend in section B.9.6 that Trans-Foreland demonstrate the effectiveness and reliability of passive and/or active protection provided for each component within the 4,000 Btu/ft^2-hr zone from a jet fire, for review

and approval, prior to construction of the final design. In addition, we recommend in section B.9.6 that Trans-Foreland file drawings and engineering information for the passive structural fire protection for review and approval for structural supports and equipment.

If the Project is authorized and the above recommendations are resolved, Trans-Foreland would finalize the plot plan, and we recommend in section B.9.6 that Trans-Foreland provide any changes for review and approval to ensure capacities and setbacks are maintained. If the facilities are constructed, Trans-Foreland would install equipment in accordance with the spacing indicated on the final plot plans. In addition, we recommend in section B.9.6 that Project facilities be subject to regular inspections throughout the life of the facility to continue to verify that equipment setbacks from other equipment and ignition sources are being maintained during operations.

Ignition Controls

Ignition controls are necessary to safeguard high temperature process areas and electrical equipment from igniting flammable vapors to minimize the potential to develop into a larger incident. FERC regulations under 18 CFR 380.12(o)(1), (2), (3), (11), and (12) requires applicants to provide engineering information on the layout of major process components, fire protection equipment, and hazard detection equipment; information on the electrical systems; and discuss design considerations and safety provisions applied to the design of plant components. In addition, 18 CFR 380.12(o)(7) requires applicants to provide engineering studies on the design approach and 18 CFR 380.12(o)(14) requires applicants to demonstrate how they comply with 49 CFR 193 and NFPA 59A.

If authorized, constructed, and operated, LNG facilities as defined in 49 CFR 193, must comply with the requirements of 49 CFR 193 and would be subject to USDOT PHMSA's inspection and enforcement programs, which require compliance, by incorporation by reference, with NFPA 59A (2001). NFPA 59A (2001) subsequently references NFPA 70 (1999) for installation of electrical equipment and wiring. NFPA 70 classifies hazardous areas as those where fire or explosion hazards may exist due to the presence of flammable gases, vapors, or liquids. In addition, the marine facilities must comply with similar electrical area classification requirements of NFPA 59A (1994) and NFPA 70 (1993), which are incorporated by reference into the Coast Guard regulations in 33 CFR 127. If the Project is authorized, constructed, and operated, compliance with the requirements of 33 CFR 127 would be subject to the Coast Guard inspection and enforcement program.

Project facilities would be designated with a hazardous electrical classification commensurate with the risk of the hazardous fluids being handled in accordance with NFPA 59A (2001), 70, 497, and API Recommended (RP) 500. Electrical area

classification is needed to determine the existence and extent of these hazardous locations within a facility that contains these hazardous substances. 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 in these areas would be designed such that in the event a flammable vapor is present, the equipment would have a minimal risk of igniting the vapor. We evaluated Trans-Foreland's electrical area classification drawings to determine whether they would meet these requirements and good engineering practices in NFPA 59A, NFPA 70, NFPA 497, and API RP 500.

As discussed in the Spacing and Plant Layout section above, Trans-Foreland would install the trim vaporizer module as well as associated pumps and piping within the existing tank impoundment. Trans-Foreland also indicated that the trim vaporizer module would be in a Class 1 Division 1 area with an explosion proof electrical enclosure. Therefore, the trim vaporizers would be designated the most stringent hazardous area classification. In response to information requests, Trans-Foreland clarified that the electrical area classifications for the BOG booster compressor building and surrounding areas would be determined using company standards as well as NFPA 70, NFPA 497, and API RP 500. However, Trans-Foreland did not provide cross-sectional drawings depicting the Project's hazardous electrical classification areas. Therefore, we recommend in section B.9.6 that Trans-Foreland file final electrical classification drawings, including cross-sectional drawings, for review and approval, for all Project equipment and buildings that demonstrate the design meets recommended and generally accepted good engineering practices, such as NFPA 59A, NFPA 70, NFPA 497, and API RP 500. Trans-Foreland indicated that the BOG compressor building, and the two electrical buildings would consist of mechanical ventilation systems. The ventilation requirements would be finalized during detailed design and would be based on the final dimensions of each building. Therefore, we recommend in section B.9.6 that Trans-Foreland file, for review and approval, final ventilation details and calculations for project buildings that demonstrates the design meets recommended and generally accepted good engineering practices, such as NFPA 59A, NFPA 70, NFPA 497, and API RP 500.

If the Project is authorized, Trans-Foreland would finalize the electrical area classification drawings and would describe changes made from the FEED design. If the Project is constructed, Trans-Foreland would install appropriately classed electrical equipment and we recommend in section B.9.6 that Project facilities be subject to periodic FERC staff inspections during construction 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.9.6 that 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), 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 monitor for process releases or fires, alarm hazardous conditions, and trigger emergency shutdown and depressurization systems. These systems help limit a potentially hazardous scenario from developing into an event that could affect the off-site public. FERC regulations under 18 CFR 380.12(m)(3) and 18 CFR 380.12(o)(1), (3), (8), and (12) require applicants to discuss how design and operational measures avoid or reduce risk; provide layouts of major process components; provide information on hazard detection systems; and discuss design considerations and safety provisions applied to the design of plant components. In addition, 18 CFR 380.12(o)(7) requires applicants to provide engineering studies on the design approach and 18 CFR 380.12(o)(14) requires applicants to demonstrate how they comply with 49 CFR 193 and NFPA 59A.

Trans-Foreland would use existing and new 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, depressurization, or other appropriate procedures, and would meet NFPA 72, ISA Standard 12.13.01, and other recommended and generally accepted good engineering practices. In addition, we recommend in section B.9.6 that Trans-Foreland provide specifications, for review and approval, for the final design of fire safety specifications, including hazard detection, hazard control, and firewater systems.

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 (e.g., vaporizer, pumps, compressors, flanges, and instrument and valve connections). Trans-Foreland stated that cryogenic (low temperature) sensors would be installed to detect LNG spills and clarified the locations and confirmed automatic shutdown functions of the low temperature sensors. Trans-Foreland also provided revised hazard detection drawings showing adequate gas and fire detection near the trim vaporizer module. In addition, Trans-Foreland confirmed that gas and fire detection would be provided within the BOG booster compressor building and gas and smoke detection would be provided within the two electrical and control buildings. We recommend in section B.9.6 that Trans-Foreland file a hazard detection study to evaluate the effectiveness of its flammable and combustible gas detection and flame and heat detection systems. The analysis should take into account the set points, voting logic, wind speeds, wind directions, and complete coverage of the Project facilities. Trans-Foreland states that the hazard detection system would alarm in the control room. However, Trans-Foreland's cause and effect matrices did not show hazard detection. Therefore, we recommend in section B.9.6 that Trans-Foreland provide, for review and approval, the cause and effect matrices for process instrumentation, fire and gas detection system, and emergency shutdown system. We also recommend in section B.9.6 that Trans-Foreland provide additional information, for review and approval, on the

final design of all hazard detection systems (e.g., manufacturer and model, elevations) and hazard detection layout drawings.

If the Project is authorized, constructed, and operated, Trans-Foreland would install hazard detectors according to its final specifications and drawings, and we recommend in section B.9.6 that Project facilities be subject to periodic inspections during construction to verify hazard detectors and ESD pushbuttons are appropriately installed per approved design, and functional based on cause and effect matrices prior to introduction of hazardous fluids. In addition, we recommend in section B.9.6 that 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

Fire suppression systems assist in limiting damage to property and prevent the initiating hazards from escalating to an event with offsite consequences. These hazard control systems include handheld, wheeled, and fixed fire extinguishing systems. FERC regulations under 18 CFR 380.12(m)(1) and (3), and 18 CFR 380.12(o)(1), (2), (8), and (12) require applicants to describe measures to protect the public from failures; discuss measures to reduce risk; provide information on the layout of major process components; provide information on fire protection systems; provide engineering information on major components; and discuss design considerations and safety provisions applied to the design of plant components. In addition, 18 CFR 380.12(o)(7) requires applicants to provide engineering studies on the design approach and 18 CFR 380.12(o)(14) requires applicants to demonstrate how they comply with 49 CFR 193 and NFPA 59A.

If authorized, constructed, and operated, LNG facilities as defined in 49 CFR 193, must comply with the requirements of 49 CFR 193 and would be subject to USDOT PHMSA's inspection and enforcement programs, which require compliance, by incorporation by reference, with NFPA 59A (2001). NFPA 59A (2001) includes requirements for hazard control systems and subsequently references NFPA 10, 12, 17, and 2001. In addition, the marine facilities must comply with similar requirements of NFPA 59A (1994), which are incorporated by reference into the Coast Guard's regulations in 33 CFR 127. If the Project is authorized, constructed, and operated, compliance with the requirements of 33 CFR 127 would be subject to the Coast Guard's inspection and enforcement program. In addition to these requirements, FERC staff also evaluates fire suppression systems against industry standards and recognized and generally accepted good engineering practices.

If ignition of flammable vapors occurred, hazard control devices would be installed to extinguish or control incipient fires and releases, and must meet NFPA 59A (2001), NFPA 10, API 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 plant based on the FEED. We also evaluated whether the spacing of the fire extinguishers would meet NFPA 10 and agent type and capacities would meet NFPA 59A (2009 and later editions). Trans-Foreland indicated that dry chemical extinguishers would be provided in outdoor process areas and CO_2 extinguishers would be provided within buildings. However, Trans-Foreland provided hazard control plans that did not appear to meet NFPA 10 travel distances of 30 to 50 feet to components containing flammable or combustible fluids (Class B) for handheld fire extinguishers. In addition, Trans-Foreland stated clean agent fire suppression systems would not be installed in the two electrical and control buildings. Final travel distances, installation heights, visibility, flow rate capacities, and other requirements would also need to be confirmed in final design and in the field where designs, such as manufacturers, obstructions, and elevations would be better known. Therefore, we recommend in section B.9.6 that Trans-Foreland file for review and approval, the final design of these systems, (e.g., manufacturer and model, elevation, flowrate, capacity) that demonstrate they would meet NFPA 10 travel distances and NFPA 59A for agent type and capacities. We also recommend in section B.9.6 that Trans-Foreland files a design that includes a clean agent system in each electrical building.

If the Project is authorized, constructed, and operated, Trans-Foreland would install hazard control equipment, and we recommend in section B.9.6 that 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.9.6 that Project facilities be subject to regular inspections throughout the life of the facility to verify in the field that hazard control coverage is being properly maintained and inspected.

Passive Cryogenic and Fire Protection

Passive cryogenic and fire protection systems protect equipment and supports from cold releases, and from pool and jet fire events, respectively. These systems would prevent failures and fires from spreading and do not rely on an action to mitigate cold releases or fires. FERC regulations under 18 CFR 380.12(o)(1), (2), and (12) requires applicants to provide engineering information on the layout of major process components, fire protection equipment, and design considerations and safety provisions applied to the design of plant components. In addition, 18 CFR 380.12(o)(7) requires applicants to provide engineering studies on the design approach and 18 CFR 380.12(o)(14) requires applicants to demonstrate how they comply with 49 CFR 193 and NFPA 59A.

If authorized, constructed, and operated, LNG facilities as defined in 49 CFR 193, must comply with the requirements of 49 CFR 193 and would be subject to USDOT

PHMSA's inspection and enforcement programs, which require compliance, by incorporation by reference, with NFPA 59A (2001). 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) should be provided to prevent failure of structural supports of equipment and pipe racks. The structural fire protection must comply with NFPA 59A (2001) and other recommended and generally accepted good engineering practices. NFPA 59A (2001) section 6.4.1 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, if they are subject to such exposure. However, NFPA 59A (2001) does not provide the criteria for determining if they are subject to such exposure or the level of protection needed to protect the pipe supports against such exposures. In addition, NFPA 59A does not address cryogenic or structural protection of pressure vessels or other equipment.

As discussed in the Spacing and Plant Layout section above, Trans-Foreland would locate cryogenic piping within the existing tank impoundment. Trans-Foreland would locate process piping 3-feet above grade on concrete supports and elevation changes in this area would direct cryogenic releases towards the impoundment walls and away from other piping and equipment. However, Trans-Foreland did not specify how materials of construction would provide protection against cold shocks or if the Project would include additional cold spill protection. In addition, radiant heat from releases that result in pool fires or jet fires could cause cascading damage to the nearby LNG storage tanks. Trans-Foreland would rely on the existing firewater system to provide cool down water to the LNG storage tanks. However, Trans-Foreland did not consider passive fire protection to protect against fires. We recommend in section B.9.6 that Trans-Foreland ensure that passive cryogenic protection and passive fire protection is applied to new and existing structural supports stabilizing new piping and cabling and new equipment that could be exposed to cryogenic liquids or radiant heats of 4,000 Btu/ft^2-hr or greater from fires with durations that could result in failures[22] and that the passive protections are specified in accordance with recommended and generally accepted good engineering practices with a fire protection rating commensurate to the exposure. Cryogenic protection should comply with NFPA 59A (2001), ISO 20088, and other recommended and generally accepted good engineering practices. Similarly, passive fire protection should comply with NFPA 59A (2001); API RP 2218; ISO 12944 and 22899; Underwriters Laboratories 1709; and other recommended and generally accepted good engineering practices. Given the potential consequences of a cascading event, we recommend in section B.9.6 that Trans-Foreland file drawings and specifications of the

[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.

final design, for review and approval or the structural passive protection systems to demonstrate protection of equipment and supports from pool or jet fires and cryogenic releases. Trans-Foreland would also need to provide additional information on final design of these systems, for review and approval, where details are yet to be determined (e.g., calculation of structural fire protection materials' thicknesses) 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, FERC staff evaluated whether Trans-Foreland would include blast or fire walls between the two oil-filled transformers that would be installed as part of the Project. Trans-Foreland referenced NFPA 70 and NFPA 855 for separation criteria and discussed NFPA 850 requirements that require either separation distances or the use of firewalls. Trans-Foreland would determine transformer separation criteria in final design and we recommend in section B.9.6 that Trans-Foreland file final design details, for review and approval, of the transformers separation distances or provide fire walls that demonstrate it is in accordance with NFPA 850 or equivalent to prevent cascading damage.

If the Project is authorized, constructed, and operated, Trans-Foreland would install structural cryogenic and fire protection according to its design and we recommend in section B.9.6 that 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.9.6 that 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, including firewater hydrants, firewater monitors, sprinkler systems, and fixed water spray systems are essential to mitigate the consequences of a release and prevent a hazardous event from escalating to an incident that could affect the public. FERC regulations under 18 CFR 380.12(o)(1), (2), and (12) requires applicants to provide engineering information on the layout of major process components, fire protection equipment, and design considerations and safety provisions applied to the design of plant components. In addition, 18 CFR 380.12(o)(7) requires applicants to provide engineering studies on the design approach and 18 CFR 380.12(o)(14) requires applicants to demonstrate how they comply with 49 CFR 193 and NFPA 59A.

If authorized, constructed, and operated, LNG facilities as defined in 49 CFR 193, must comply with the requirements of 49 CFR 193 and would be subject to USDOT PHMSA's inspection and enforcement programs, which require compliance, by incorporation by reference, with NFPA 59A (2001). NFPA 59A (2001) includes requirements for fire water systems and subsequently references NFPA 11, 13, 14, 15, 16,

20, 22, 24, and 25. In addition, the marine facilities must comply with similar requirements of NFPA 59A (1994), which are incorporated by reference into the Coast Guard regulations in 33 CFR 127. If the Project is authorized, constructed, and operated, compliance with the requirements of 33 CFR 127 would be subject to the Coast Guard's inspection and enforcement program. In addition to these requirements, FERC staff also evaluates the design, construction, testing, and operating aspects of firewater systems against industry standards and recognized and generally accepted good engineering practices.

Trans-Foreland would use existing as well as new firewater equipment during an emergency to cool the surface of equipment exposed to heat from a fire. Trans-Foreland's existing firewater system consists of on-site firewater storage, firewater pumps, hydrants and monitors, sprinkler systems, and fixed spray systems.

FERC staff reviewed Trans-Foreland's fire protection study and evaluated the adequacy of its firewater coverage. Trans-Foreland provided firewater coverage drawings to show complete coverage of the area where new equipment and buildings would be located. Trans-Foreland would use existing firewater monitors around the LNG storage tanks to address pool fires and jet fires within the tank impoundment. In response to information requests, Trans-Foreland stated that a manual fixed deluge system would be provided in the BOG booster compressor building, and a new firewater monitor would be added to the west of the BOG booster compressor building. These firewater systems should be designed and would need to be tested, and maintained to meet NFPA 59A (2001), 15, 24, and 25 requirements. Trans-Foreland did not report any change in the firewater demand with the inclusion of new firewater equipment. In addition, Trans-Foreland did not confirm adequate cooling water volumes would be available to protect the LNG storage tanks during a jet fire event. Therefore, Trans-Foreland provides adequate firewater coverage, but has not justified discharge water densities in areas of high radiant heat. We recommend in section B.9.6 that Trans-Foreland file, for review and approval, final design details that demonstrate adequate firewater flow and coverage based on the heat absorbed by equipment from pool and jet fires.

In addition, we recommend in section B.9.6 that Trans-Foreland 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, constructed, and operated, Trans-Foreland would use existing and new firewater equipment, and we recommend in section B.9.6 that Project facilities be subject to periodic inspections during construction and that Trans-Foreland provide results of commissioning tests to verify the new firewater system is installed and functional as designed prior to introduction of hazardous fluids. In addition, we recommend in section B.9.6 that Project facilities be subject to regular

inspections throughout the life of the facility to ensure firewater systems are being properly maintained and tested.

Geotechnical and Structural Design

Trans-Foreland provided geotechnical and structural design information for the Project to demonstrate: (1) the site preparation and foundation designs would be appropriate for the underlying soil characteristics, and (2) the structural design of the Project additions 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 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 purpose of a geotechnical evaluation is to identify hazards present in the soil and rock strata that pose risk to the safety and reliability of the project facilities. The geotechnical evaluation also provides site-specific data inputs required for structural engineering designs. FERC regulations under 18 CFR 380.12(h)(3) requires geotechnical investigations to be provided. In addition, FERC regulations under 18 CFR 380.12(o)(14) requires an applicant demonstrate compliance with regulations under 49 CFR 193 and NFPA 59A. If authorized, constructed, and operated, LNG facilities as defined in 49 CFR 193, must comply with the requirements of 49 CFR 193 and would be subject to USDOT PHMSA's inspection and enforcement programs. USDOT PHMSA regulations incorporate by reference NFPA 59A (2001). NFPA 59A (2001) 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. Therefore, FERC staff evaluated the existing site conditions, geotechnical report, and proposed foundations to ensure they are adequate for the LNG facilities as described below.

The Kenai LNG Plant is on the north central shore of the Kenai Peninsula off the Kenai Spur Highway near Nikiski, Alaska, and directly across from the highway's intersection with North Miller Loop Road. The site is accessible via a paved road along its southern boundary. All Project facilities would be entirely within the boundaries of the existing plant. The area is industrialized with several processing facilities, both active and inactive, neighboring the Kenai LNG Plant. Adjacent natural terrains include glacial lowlands, plains, and outwash fans.

The site was cleared, grubbed, and graded to construct the existing plant in the 1969. There is little native vegetation there today. The topography is generally level

ground, except for the lower terrace providing wharf access. Original grading involved spreading fill material. Though minimal site clearing and preparation would be required for the Project, the proposed design must account for multiple geological factors particular to this site.

To design safe and reliable infrastructure, engineers require an adequate understanding of the surface and subsurface terrains, Trans-Foreland retained McLane Consulting, Inc. to conduct a geotechnical investigation (McLane geotechnical report) to inform the structural and seismic designs.

Soil sampling indicated predominantly dense, homogenous gravelly sands. Sands are non-cohesive. The sands in this profile are also poorly graded, meaning that there is little to no diversity in sand particle size at a specific depth in the soil profile. This suggests that the site has withstood prior seismic events. Although testing indicated generally low water content, this design property varies temporally and based on weather conditions. FERC staff acknowledge that seasonal frost conditions can cause freeze-thaw cycling and weather local soils, but do not expect this to be a significant impact because competent structural design can mitigate this hazard.

Frost also impacts the likelihood and extent a structure experiences settlement. Settlement occurs when the ground elevation suddenly sinks or gradually shifts downward with little or no horizontal motion. The rate and extent that settlement occurs depends on geotechnical conditions (i.e., soil properties) and the size of the load-bearing structure. The McLane geotechnical report approximated a total settlement value but did not justify it based on the limited geotechnical information filed. Therefore, we recommend in section B.9.6 that, prior to construction of final design, Trans-Foreland demonstrate with calculations or modelling that are stamped and sealed by a professional engineer in the State of Alaska that the structural design would be designed to withstand settlement values that exceed 1.5 inches.

Like settlement, subsidence is another form of ground displacement that can affect the safety and reliability of a structure. Several factors exacerbate the likelihood of a structure experiencing subsidence, including movements on surface faults or by subsurface mining or pumping of oil, natural gas, or ground water. In icy environments, subsidence commonly results from freeze-thaw cycling in the soil profile. Trans-Foreland has not addressed the risk of subsidence for the Project. FERC staff determined that the use of engineered backfill material, when properly compacted, could mitigate the risk of subsidence because of reduced potential for water to infiltrate and freeze in place. We also discuss in the *Structural and Natural Hazard Evaluation* that Trans-Foreland should install foundations below the frost depth. Collectively, these mitigations reduce the risk of subsidence.

Therefore, we recommend in section B.9.6 that Trans-Foreland use properly compacted soil backfill material around the foundation areas to prevent foundation structures from freeze-thaw damage. Additional structural recommendations are in the *Structural and Natural Hazard Evaluation* below.

The McLane geotechnical report did not include tests for soil corrosion. Salt could by direct contact with concrete and other building materials degrade material with which it comes into contact. However, as Trans-Foreland proposes shallow foundations, FERC staff do not suspect the presence of corrosive soils in the upper parts of the soil profile because the site has non-native engineered backfill. Any presence of salt in the lower part of the profile would not degrade soil strength because the gravelly sands are not cohesive.

We note that Trans-Foreland indicated the presence of arsenic in the soils at several locations on site. Arsenic is a known corrosive that could potentially impact steel and concrete materials via surface water runoff. The arsenic contamination is concentrated and geographically contained in locations on site that are downslope from the Project facilities. FERC staff finds that this would not impact the Project because they are located upslope from the contamination.

Structural and Natural Hazard Evaluation

The purpose of the structural and natural hazard evaluation is to ensure that the Project facilities would withstand induced loads to which it may be subject. FERC regulations under 18 CFR 380.12(m) requires applicants to 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 it would use to reduce potential hazards. In addition, 18 CFR 380.12(o)(14) requires an applicant to demonstrate how it would comply with 49 CFR 193 and NFPA 59A. USDOT PHMSA regulations under 49 CFR 193 have some specific requirements on designs to withstand certain loads from natural hazards and also incorporates by reference NFPA 59A (2001 and 2006) and ASCE 7-05 and ASCE 7-93 via NFPA 59A (2001). NFPA 59A (2001) section 2.1.1(c) also requires Trans-Foreland to practically consider the plant site location in the design of the proposed additions, and specifically how the proposed additions would withstand natural hazards such as flooding, storm surge, and seismic activities. This was covered in USDOT PHMSA's LOD on 49 CFR 193 Subpart B. However, the LOD covers only 49 CFR 193 Subpart B and would not cover whether the facility is designed appropriately against these hazards, which would be part of 49 CFR 193 Subpart C. Unlike other natural hazards, wind loads are covered in 49 CFR 193 Subpart B and is covered in the LOD. If the proposed additions to the Kenai LNG Plant are authorized, constructed, and operated, LNG facilities as defined in 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 staff also

evaluated whether potential engineering designs would 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.

Trans-Foreland proposed modification of the existing BOG Management System at the existing Kenai LNG Plant, and indicated that it would design and construct the modified structures, systems, components, and buildings to comply with ASCE/Structural Engineering Institute (SEI) 7-05 and ASCE/SEI 7-10 requirements. Trans-Foreland stated the modified building and structures, systems, and components would also be constructed to the requirements of the International Building Code (IBC) 2009 and IBC 2012. The 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. If the Project is authorized and constructed, Trans-Foreland would install equipment in accordance with its final designs. We recommend in section B.9.6 that prior to construction of final design, Trans-Foreland file with the Secretary the final design package (e.g., structures and foundations drawings, design specifications, and calculations) and associated quality assurance and control procedures with the documents reviewed, approved, and stamped and sealed by the professional engineer of record in the State of Alaska.

Trans-Foreland states the proposed equipment and structures would be supported by shallow spread footings and large mat foundations, and the final foundation design would be completed in detailed engineering phase. In response to information requests, Trans-Foreland stated that the proposed design frost line depth would be 42 inches (3.5 feet), also the McLane geotechnical report indicated the exterior footings should be placed a minimum of 4.5 feet below grade and major structures should be based a minimum of 6 feet below grade. However, according to SEI/ASCE 32-01, by references ASCE/SEI 7-05 and 7-10, the frost depth for the Project area should be at least 7 feet (84 inches). Based on their specifications, the foundation design should comply with Project specifications, including ASCE/SEI 7-05 and 7-10, and the bottom of the shallow foundations should be located at the minimum of frost depth below the finished grade to avoid the frost heave that could impair the structural integrity of the foundations. As a result, we recommend in section B.9.6 that prior to initial site preparation, Tran-Foreland should file with the Secretary the frost depth for the final foundation design in compliance with their specifications of complying with ASCE/SEI 7-05 and 7-10 or equivalent. If the Project is authorized, FERC staff will continue its review to ensure foundation designs are appropriate prior to construction of final design and throughout the life of the facilities.

Earthquakes, Tsunamis, and Seiche

The purpose of the earthquake, tsunami, and seiche evaluation is to inform the structural evaluation with respect to loads these natural hazards would assert on the project facilities.

Regarding earthquakes, FERC regulations under 18 CFR 380.12(h)(5) requires evaluation of earthquake hazards based on whether there is potential seismicity, surface faulting, or liquefaction. The Project facilities would not alter the existing plant's exposure to earthquakes, tsunamis, or Seiches. Absent any other regulatory requirements, we recommend that LNG structures classified as Seismic Category II or III (i.e., LNG structures other than LNG storage tanks and related safety systems) be seismically designed to satisfy the Design Earthquake and seismic requirements of the ASCE/SEI 7 in order to demonstrate there is not a significant impact on public safety. ASCE/SEI 7 is recommended because 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/SEI 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.

Earthquakes are the product of tectonic activity. They can be both activate faults and the product of fault displacement. Vibrations produced in the earthquake may be expressed as ground motions. The damage ground motions can cause to structures is a function of the fault type, fault direction, the specific fault activity, the distance the seismic waves must travel to the structure, and the soil type through which the ground motions travel. Note that sources other than fault displacements can cause ground motions, such as volcanic activity.

The McLane geotechnical report indicates that the Site Class[23] was determined in accordance with IBC 2009 based on site location and information obtained during site soils exploration. Furthermore, Trans-Foreland states the site should be classified as Site Class D with long-period transition period T_L=16 seconds. The Project site mapped Maximum Considered Earthquake spectral response acceleration parameters at short period 0.2 second S_S=1.50 g with site coefficient F_a=1.0, and S_1=0.6 g at a period of 1 second with site coefficient F_v=1.5, respectively. FERC staff evaluated the ground

[23] There are six different site classes in ASCE 7-05, A through F, that are representative of different soil conditions that affect 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), and 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).

motions and seismic design conditions for the Project. In addition, FERC staff reviewed the site boring logs and soil lab reports for the proposed Project, along with the ASCE/SEI 7-10 and IBC codes. We agree with the Site Class D characterization for the Project.

Regarding tsunamis and seiches, ASCE 7-16 Chapter C6 covers Tsunami Loads and Effects. NFPA 59A Section 12.2 (2019) also requires that building, equipment, piping, and structures shall be designed for seismic activity including tsunami, wind, ice, flood including hurricane storm surge, and snow in accordance with sections 12.2.1 through 12.2.3.

Seismic events in bodies of water can lead to a sudden rise or fall of the earth's crust under or near the body of water, which can lead to tsunamis and seiches. In response to information requests, Trans-Foreland stated Tsunami and Seiche are not applicable to the Project site. Although the Kenai LNG Plant location is not included in the State of Alaska Tsunami Inundation Mapping, we determined that Anchorage and Kenai (Nikiski) area are largely safe from tsunamis because of their location within the Upper Cook Inlet, surrounded by the shallow silty waters of the Knik Arm and Turnagain Arm.[24] The inland location on top of a 100 foot bluff relative to the mouth of the inlet insulates the area from impacts from tsunami waves. Therefore, we conclude the Project would be adequate to withstand tsunami, seiche, and flood natural hazards.

Regardless of whether the seismic event originates on land or in water, it 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. The Project would be located inside the existing Kenai LNG Plant approximately 700 feet from the shore. The McLane geotechnical report indicates there are no liquefiable soils present at the Project area located at the existing Kenai LNG Plant site[25]. We agree liquefaction is unlikely to occur in the Project area at the existing Kenai LNG Plant and in the event liquefaction were to occur, the impact would be low because there is minimal water content in the sand, native soils are relatively dense, and the structural designs would adequately protect the Project facilities.

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[24] Alaska Department of Natural Resources: http://dggs.alaska.gov/pubs/tsunami. Accessed March 2020.

[25] We recognize that even non-cohesive soils subject to seismic events have a low but nonnegligible risk of liquefying, though the extent of potential damage is contingent upon the intensity of the event and structural design factors.

Hurricanes, Tornadoes, and other Meteorological Events

The purpose of the hurricane, tornado, and other meteorological events evaluation is to inform the structural evaluation with respect to loads these natural hazards would assert on the proposed project facilities. 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. The severity of these events are often determined on their probability of occurrence, 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 Project must meet 49 CFR 193.2067, under Subpart B for wind load requirements for LNG facilities. FERC regulations for 18 CFR 380.12(o)(14) requires applicants to demonstrate how they comply with 49 CFR 193 and NFPA 59A. There are several corresponding authorities on this topic. Applicants are required to address hazards to the public from natural catastrophes and disclose how design features reduce these potential hazards by 18 CFR 380.12(m), as incorporated into Resource Report 11. Also, in accordance with the MOU, the USDOT PHMSA evaluated in its LOD whether an applicant's proposed Project meets the USDOT PHMSA siting requirements of 49 CFR 193 Subpart B.

Trans-Foreland states that all new structures would be designed to comply with ASCE/SEI 7-05/10 and IBC 2012 to meet requirements in 49 CFR 193 under Subpart B for wind load requirements. For new structures, Trans-Foreland proposed a design wind speed of 136 mph, 3-second gust wind speed at 33 feet above ground. However, in response to USDOT PHMSA information requests, Trans-Foreland also confirmed that new Project *equipment* would be designed per 49 CFR 193 under Subpart B to meet wind design maximum of 150 mph. Trans-Foreland confirmed that the new equipment required for the proposed Project would be designed per the requirements contained in 49 CFR 193 Subpart B, but did not specify the wind speed loads for those equipment structure supports or other structures. It is also unclear whether all the facilities would be designed to comply with 49 CFR 193. Our independent review determined that a wind speed load of 136 mph is inadequate for the proposed equipment structure supports design. Therefore, we recommend in section B.9.6 that, prior to initial site preparation, Tran-Foreland should file its wind speed criteria for all other facilities not covered by USDOT PHMSA's LOD to be designed to withstand wind speeds commensurate with the risk and reliability associated with the facilities in accordance with ASCE/SEI 7-05, 7-10, or equivalent.

We note that this discrepancy between the terms "structures" and "equipment" may readily be resolved by designing the structures to withstand at least the same wind forces required for the equipment. If the Project is authorized, constructed, and becomes operational, the facilities would be subject to the USDOT PHMSA's inspection and

enforcement programs. Final determination of whether the facilities are in compliance with the requirements of 49 CFR 193 would be made by the USDOT PHMSA staff.

Beyond determinations made in the USDOT PHMSA LOD, FERC staff conducted an internal review of structural design with respect to wind loads. FERC staff evaluated historical tropical storm, hurricane, and tornado tracks in the vicinity of the Project facilities using data from the Department of Homeland Security homeland infrastructure foundation level data and National Oceanic and Atmospheric Administration (NOAA) historical Hurricane Tracker. There is no historical hurricane or storm that has been reported within 100 nautical miles of the proposed Liquefaction Facilities site. Hurricanes do not occur near the Project site as the environment does not support these barotropic, warm core systems. However, because of its location, the Project site could be subject to powerful Pacific storms with hurricane level force winds during the life of the Project.

Also, as noted in the limitations of ASCE/SEI 7-05 section 6.5.4.3 and ASCE/SEI 7-10 section 26.5.4, tornadoes were not considered in developing basic wind speed distributions. Therefore, FERC staff evaluated the potential for tornadoes independently using the Applied Technology Council (ATC) Hazards tool and ASCE/SEI 7-10 and 7-16 wind speed maps.[26] ASCE/SEI 7-10 would require Risk Category II and III/IV facilities to withstand 133 and 136 mph 3-second gusts, respectively. Later editions of ASCE/SEI 7 (ASCE/SEI 7-16) would require Risk Category II, III, and IV facilities to withstand 134 mph, 141 mph , and 148 mph 3-second gusts, respectively. ASCE/SEI 7 refers to International Code Council 500, Standard for Design and Construction of Storm Shelters, for 10,000-year tornadoes. According to the ATC website, if a tornado occurred, it would exert a wind speed of approximately 130 mph 3-second gust. The wind speed load a structure or equipment must withstand is contingent upon its Risk Category.

Furthermore, Appendix C of ASCE/SEI 7 also refers 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 Nuclear Regulatory Commission publication (NUREG)/CR-4461, Tornado Climatology of the Contiguous U.S., Rev. 2 (NUREG 2007). As suggested in NUREG, a maximum wind speed of about 100 mph is appropriate for tornadoes with a best estimated probability of 100,000 mean year return period for regions of the United States with similar design ICC 500 wind speeds of analogous geographies. No historic tornado has been reported within 100 nautical miles of the Project site. Therefore, we do not find the risk of a tornado strike to pose the potential for a significant impact on the Project.

[26] ATC website https://hazards.atcouncil.org/#/wind?lat=60.55444439999999&lng=-151.2583333&address=Kenai%2C%20AK%2C%20USA. Accessed March 2020.

FERC staff also evaluated the potential for flooding. The Project facilities would be within the existing Kenai LNG Plant main facility that sits atop a coastal bluff with an elevation at +129.2 feet North American Vertical Datum (NAVD) 88, including process area foundations, utilities, buildings, roads, and all new work for the Project that would be on the level plain at +120 feet NAVD 88 elevation inside the existing Kenai LNG Plant. Therefore, the threat of flooding due to storm surge, sea level rise, and subsidence is considered insignificant and would be outside the 100- and 500-year flood elevations for the Project area using data from FEMA maps 1981 and 2016.[27],[28],[29]

FERC staff evaluated the basis of design for the Project relating to withstanding rain, ice, and snow events. Trans-Foreland indicated that the design rain and ice loads for the Project would comply with ASCE/SEI 7-05 and 7-10. In addition, Trans-Foreland stated that the snow design for this Project would be based on ASCE/SEI 7-05 and 7-10, and the snow load design bases for this Project would be 70 pounds per square foot for the ground snow load and 57 pounds per square foot for the flat roof snow load with importance factor I_S=1.2. FERC staff agree that the proposed design for rain, ice, and snow loads would be adequate for the Project.

Landslides and Other Natural Hazards

The purpose of the landslide and other natural hazard evaluation is to inform the structural evaluation with respect to loads these natural hazards would assert on the proposed project facilities. With respect to wildfires and solar flares, we assess these risks because they pose structural threats, although the appropriate mitigations may include aspects other than structural design.

The bluff near which the Project would be built is susceptible to coastal erosion caused by waves, currents, and vessel wakes. Such erosion may also be a precursor to coastal landsliding. Waves (particularly during powerful storms) could undercut the base of the bluff, leading to shallow sliding, raveling, and gullying of the bluff face. Weathered debris flows have already been observed in several locations along the coast, as evidenced by head scarps. The Kenai LNG Plant already implemented erosion mitigations on this bluff, including geotextiling, soil stabilization, vegetation ground cover, and wave barriers. Furthermore, Trans-Foreland mitigated the risk of coastal

[27] FEMA Flood Map Service Center: https://msc.fema.gov/portal/search?AddressQuery=kenai%2C%20ak#searchresultsanchor. Accessed March 2020.

[28] FEMA Flood Insurance Study: https://map1.msc.fema.gov/data/02/S/PDF/02122CV000A.pdf?LOC=50353958d1752b23a6f23e3518ea785c. Accessed March 2020.

[29] FEMA Flood Map Service Center: https://msc.fema.gov/portal/availabilitySearch?addcommunity=020114&communityName=KENAI,%20CITY%20OF#searchresultsanchor. Accessed March 2020.

erosion by siting the Project additions 330 feet inland from the bluff. We conclude these measures are an effective way to mitigate risk otherwise posed to the Project additions.

Landslides in the United States occur in all 50 states. The regions primarily susceptible to landslides are the coastal and mountainous areas of California, Oregon, and Washington, the states comprising the intermountain west, and the mountainous and hilly regions of the eastern United States. Trans-Foreland indicated that slope instability is unlikely at the Project site, as the site is located on mostly level to moderately undulating terrain. There only moderate to steep slope near the site is the Cook Inlet bluff, which is located 330 feet west from the trim vaporizer module and 500 feet from the start of the causeway. Because of where the Project would be constructed and the coastal erosion mitigations already protecting the bluff, we conclude landslides do not pose risk of a significant impact to the Project additions.

Volcanic activity is primarily a concern along plate boundaries on the West Coast and in Alaska. The *2018 Update to the U.S. Geological Survey National Volcanic Threat Assessment*[30] actively monitors 161 volcanoes in the United States, 86 of which are in Alaska. Five of the 18 "very high threat" volcanos nationwide are in Alaska near population centers. Furthermore, volcanoes in Alaska dominate the high and moderate threat categories as they tend to have higher rates of activity and explosiveness. The Project would be within close proximity of the Aleutian Arc Range, a formation of active volcanoes.

Trans-Foreland did not address volcanic hazards in its application materials. Based on publicly available scientific studies and peer-reviewed literature, FERC staff assessed the risk volcanic hazards pose to the Kenai LNG Plant. Eruptions can eject ash into the atmosphere, posing hazards both to human health and operability of equipment. The nearest volcanoes to the Kenai LNG Plant are approximately 50 miles away. If one erupts, ash could plausibly reach the Kenai LNG Plant. However, we do not find the that volcanic ash poses a credible risk to the safety of the plant.

Eruptions can also eject tephra, or molten fragmented rock, into the atmosphere. Pieces of tephra greater than 2.5 inches in diameter are called volcanic bombs. The distance tephra travels depends on the mass of the ejecta, height of the volcano, magnitude of eruptive force, air temperature, and wind. Pieces of tephra with large mass settle close to the volcano, while smaller ash-sized pieces can disperse tens of miles before depositing. We do not consider volcanic bombs or smaller tephra ejecta to pose a credible risk to the plant.

A lahar is debris flow of rock, soil, and water materials downslope of a volcano commonly associated with those in the Aleutian volcanic arc in Alaska and the western

[30] USGS Website: https://pubs.usgs.gov/sir/2018/5140/sir20185140.pdf. accessed March 2020.

United States. According to the USGS, lahars are known to increase in volume as they move and can grow up to 10 times their initial size. The USGS has documented lahars moving at rates up to 120 mph, though this rate is highly variable and depends on mineralization of the flow, slope of the land upon which it is traveling, resistance posed by colliding with large debris and structures, water content, and a variety of other factors. Some lahars have traveled over one hundred miles before ceasing. They are known to cause serious damage to roads, bridges, and structures. Though typically triggered by volcanic seismic activity, substantial rain fall, ice melt, and erosion of fine-grained sediments can trigger a lahar. The Kenai LNG Plant is proximal to Mt. Redoubt, such that it is within the potential zone of impact from a lahar. In fact, the 2009 Mt. Redoubt eruption produced a lahar that flowed into Cook Inlet. However, because large eruptions are rare, we do not consider a volcanic-induced lahar to be a substantial risk to the Kenai LNG Plant.

Wildfires are prevalent in the Pacific Northwest, especially in Alaska. According to the Alaska Department of Natural Resources Division of Forestry, there is a history of wildfires occurring within 100 miles of the Project site. None reached the Kenai LNG Plant. Prevailing wind direction in the summer months is from the southwest. In winter, the winds are usually from the northeast to north. Ambient winds affect the direction and speed in which wildfires travel, which depending on the original location of the fire, could put the Kenai LNG Plant in a zone of potential impact. Several factors mitigate the potential for wildfire impact on the Kenai LNG Plant. First, only sparse and patchy vegetation surround the plant. Second, the Plant is near the ocean, which produces sea breeze. Sea breeze is a thermally produced wind blowing from the ocean, which potentially could buffer against an encroaching wildfire. Third, the Kenai LNG Plant has existing administrative controls to respond to fire emergencies. Taken collectively, these three factors reduce the probability and extent of harm wildfire could cause the Kenai LNG Plant.

Solar flares and other space weather events can cause geomagnetic disturbance (GMD), causing induced currents to potentially disrupt the operation of transformers and other electrical equipment. The USGS provides a map of GMD intensities with an estimated 100-year-mean return interval.[31] The USGS GMD intensity map indicates the Kenai LNG Plant could experience GMD intensities of 70 to 400 nano-Tesla with a 100-year-mean return interval. However, the Kenai LNG Plant would be designed such that if a loss of power were to occur, actuated process valves would move into a fail-safe position.

[31] USGS Magnetic Anomaly Maps and Data for North America, https://mrdata.usgs.gov/magnetic/map-us.html#home, accessed August 2018.

External Impact Review

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 Kenai LNG Plant, and the safeguards in place to mitigate the risk from events, where warranted. FERC staff coordinated the results of the reviews with other federal agencies to assess potential impacts from vehicles and rail; aircraft impacts on and from nearby airports and heliports; impacts from nearby pipelines; impacts on and from adjacent facilities that handle hazardous materials under the EPA's Risk Management Plan regulations, and power plants, including nuclear facilities under the Nuclear Regulatory Commission's 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.

FERC staff uses a risk-based approach to assess the potential impact of the external events and the adequacy of the mitigation measures. The risk-based approach uses data based on the frequency of events that could lead to an impact and the potential severity of consequences posed to the Project site and the resulting consequences to the public beyond the initiating events. The frequency data is based on past incidents and the consequences are based on past incidents and/or hazard modeling of potential failures.

Road

FERC staff reviewed whether any truck operations would be associated with the Project and whether any existing roads would be near the site. FERC staff uses this information to evaluate whether the Project site 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. In addition, if authorized, constructed, and operated, LNG facilities, as defined in 49 CFR 193, must comply with the requirements of 49 CFR 193 and would be subject to the USDOT PHMSA's inspection and enforcement programs. The USDOT PHMSA regulations under 49 CFR 193.2155(a)(5)(ii), under Subpart C, require that structural members of an impoundment system must be designed and constructed to prevent impairment of the system's performance reliability and structural integrity as a result of a collision by or explosion of a tank truck that could reasonably be expected to cause the most severe loading if the Project adjoins the right-of-way of any highway. Similarly, NFPA 59A (2001), section 8.5.4, requires transfer piping, pumps, and compressors to be located, or protected by barriers, so that they are safe from damage by rail or vehicle movements. However, the USDOT PHMSA's regulations and NFPA 59A (2001) requirements do not indicate what collision(s) or explosion(s) could reasonably be expected to cause the most severe loading. FERC staff evaluated consequence and frequency data from these events to evaluate these potential impacts.

FERC staff evaluated the risk of the truck operations based on the consequences from a release, incident data from the USDOT Federal Highway Administration (FHWA),[32] the USDOT National Highway Traffic Safety Administration (NHTSA),[33] USDOT PHMSA,[34] EPA, NOAA,[35] and other reports,[36,37,38] and proposed mitigation to prevent or reduce the impacts of a vehicular incident. Note that FERC staff typically evaluate the potential for impacts due to truck operations; however, the Project does not anticipate trucking operations.

Incident data from the FHWA, NHTSA, and PHMSA indicates hazardous material incidents are very infrequent (4e-3 incidents per lane mile per year), and that nearly 75 to 80 percent of hazardous material vehicular incidents occur during unloading and loading operations, while the other 20 to 25 percent occur while in transit or in transit storage. In addition, approximately 99 percent of releases are 1,000 gallons or less, and catastrophic events that would spill 10,000 gallons or more make up less than 0.1 percent of releases. In addition, less than 1 percent of all reportable hazardous material incidents with spillage result in injuries and less than 0.1 percent of all reportable hazardous material incidents with spillage resulting in fatalities.

The EPA and NOAA report that 80 percent of fires that lead to container ruptures results in projectiles and that 80 percent of projectiles from liquefied petroleum gas (LPG) incidents, which constitute the largest product involved in boiling liquid expanding vapor explosion (BLEVEs), travel less than 660 feet. The EPA also reports that on average container ruptures would result in less than four projectiles for cylindrical containers and 8.3 for spherical vessels. FERC staff evaluated other reports that affirmed the EPA estimates based on data for approximately 150 experimental and accidental pressure vessel bursts and BLEVEs with approximately 683 total projectiles (4.6 average fragments per incident) that showed approximately 80 percent of fragments traveled 490

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32 FHWA, Office of Highway Policy Information, Highway Statistics 2016, https://www.fhwa.USDOT PHMSA.gov/policyinformation/statistics/2016/, accessed March 2019.

33 NHTSA, Traffic Safety Facts Annual Report Tables, https://cdan.nhtsa.gov/tsftables/tsfar.htm, accessed March 2019.

34 PHMSA, Office of Hazardous Material Safety, Incident Reports Database Search, **Error! Hyperlink reference not valid.**, accessed March 2019.

35 EPA, NOAA, ALOHA®, User's Manual, The CAMEO® Software System, February 2007.

36 Birk, A.M., BLEVE Response and Prevention Technical Documentation, 1995.

37 AiChE CCPS, *Guidelines for Vapor Cloud Explosion, Pressure Vessel Burst, BLEVE, and Flash Fire Hazards, Second Edition, 2010.*

38 Lees, F.P, Lees *Loss Prevention in the Process Industries, Hazard Identification, Assessment, and Control, Volume 2, Second Edition, 1996.*

to 820 feet and within 6.25 times the estimated or observed fireball radius. The data also showed projectiles have traveled up to 3,900 feet for large LPG vessels and 1,200 feet for LPG rail cars. In all the documented cases, the projectiles traveled less than 15 times the fireball diameter, but one of the reports indicated up to 30 times the fireball diameter is possible, albeit very rare.

Unmitigated consequences under average ambient conditions from releases of 1,000 gallons through a 1-inch hole would result in distances ranging from 25 to 200 feet for flammable vapor dispersion, and 75 to 175 feet for jet fires. Unmitigated consequences under worst case weather conditions from catastrophic failures of trucks proposed at sites generally can range from 200 to 2,000 feet for flammable vapor dispersion, 275 to 350 feet for radiant heat of 5 kW/m^2 from jet fires, 800 to 1,050 feet to a 1 psi overpressure from a BLEVE, 850 to 1,500 feet for a heat dose equivalent to a radiant heat of 5 kW/m^2 over 40 seconds from 250 to 325 radii fireballs burning for 5 to 15 seconds from a BLEVE, and projectiles from BLEVEs possibly extending farther. Based on distribution function of the projectile distances, FERC staff estimate approximately 90 percent of all projectiles for a 10,000-gallon tanker truck would be within 0.5 mile, and that there is about a 1-percent probability they would extend beyond 1 mile and less than 0.1 percent probability they would extend 30 times the fireball diameter. These values are also close to the distances provided by the FHWA[39] for designating hazardous material trucking routes (0.5 mile for flammable gases for potential impact distance) and PHMSA[40] for emergency response (0.5 to 1 mile for initial evacuation and 1 mile for potential BLEVEs for flammable gases).

There would be no regular LNG trucking operations associated with the Project. Additionally, because the plant would no longer be liquefying, there would be no trucks associated with condensate removal or deliveries of new refrigerant. The only commodity trucking deliveries to the site that would be associated with the Project would be diesel fuel refills for the firewater pump tanks; diesel fuel is non-volatile and difficult to ignite fluid and would pose insignificant fire and explosion risk to the Project. Lastly, the Project would not modify any of the existing segments of the Kenai Spur Highway or entrances to the facility. Aside from the entrance to the facility, there are additional existing measures in place that would obstruct vehicular access to the process facilities. Therefore, we conclude that the risk posed to the Kenai LNG Plant following a potential hazardous trucking incident to be insignificant. Lastly, due to a reduction in the amount of hazardous chemicals associated with the Project when compared to previous export operations at the Kenai LNG plant, we conclude that the operations of the Project would not increase the risk to traffic along the Kenai Spur Highway.

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[39] FHWA, Office of Highway Safety, *Guidelines for Applying Criteria to Designate Routes for Transporting Hazardous Materials*, September 1994.

[40] PHMSA, *Emergency Response Guidebook*, 2016.

Rail

FERC staff reviewed whether any rail operations would be associated with the Project and whether any existing rail lines would be near the Kenai LNG Plant. There would be no rail transportation associated with the Kenai LNG Plant. The closest rail to the Kenai LNG Plant would be about 60 miles away. Using incident data from USDOT Federal Rail Administration (FRA) and USDOT PHMSA, this 60-mile distance would be farther than the consequence distances under unmitigated worst-case weather conditions and events. Given the distance from the rail lines and lack of rail associated with these facilities, we conclude the Project would not pose a significant risk or significant increase in risk to the public from proximity of the Project sites to the rail lines.

Air

FERC staff reviewed whether any aircraft operations would be associated with the Project and whether any existing aircraft operations would be near the existing facility. FERC staff uses this information to evaluate whether the Project and any associated aircraft operations could increase the risk to the public and whether any pre-existing unassociated aircraft operations could adversely increase the risk to the Project sites and subsequently increase the risk to the public. In addition, if authorized, constructed, and operated, LNG facilities, as defined in 49 CFR 193, must comply with the requirements of 49 CFR 193 and would be subject to the USDOT PHMSA's inspection and enforcement programs. The USDOT PHMSA regulations under 49 CFR 193.2155(b), under Subpart C require that an LNG storage tank must not be within a horizontal distance of 1 mile from the ends, or one quarter mile from the nearest point of a runway, whichever is longer, and that the height of LNG structures in the vicinity of an airport must comply with the USDOT Federal Aviation Administration (FAA) requirements. In addition, FERC staff evaluated the risk of an aircraft impact from nearby airports.

There would be no aircraft associated with the Project or the existing facility (e.g., helipads) that would warrant a review that would increase the risk to the public from aircraft operations. FERC staff identified a total of 24 airports and 3 heliports within a 22-mile radius of the existing Kenai LNG Plant. The closest general aviation airport with an appreciable volume of air traffic is the Kenai Municipal Airport located 8.75 miles southeast from the site. The closet airport is the Island Lake Seaplane Base, approximately 3 miles to the northeast from the site. Both airports are farther than the 0.25 mile distance referenced in the USDOT PHMSA's regulations under 49 CFR 193.2155(b).

The USDOT FAA regulations in 14 CFR 77 require Trans-Foreland to provide a notice to the FAA of its proposed construction at the existing facility. This notification should identify all equipment that is more than 200 feet above ground level or lesser heights if the facilities are within 20,000 feet of an airport (at 100:1 ratio or 50:1 ratio depending on length of runway) or within 5,000 feet of a helipad (at 100:1 ratio). In

addition, mobile objects, including the LNGC that would be above the height of the highest mobile object that would normally traverse it would require notification to the FAA. The FAA aeronautical study would identify which structures and mobile objects (e.g., LNGCs) exceed obstruction standards and would indicate if the identified structures would be a hazard to air navigation. Based on this study, FAA would issue a determination for each structure and mobile object that exceeds the obstruction standards. However, the Project would not include construction equipment, structures, or buildings taller than 200 feet and the existing facility has previously received LNGCs (i.e., mobile objects). Therefore, Trans-Foreland does not plan to provide notice to the FAA of its proposed construction.

In addition, FERC staff analyzed existing aircraft operation frequency data based on the airports identified above and their proximity to the project areas, the type and frequency of aircraft operations, take-off and landing directions, and the non-airport flight paths using the DOE Standard, DOE-STD-3014-2006, *Accident Analysis for Aircraft Crash into Hazardous Facilities*. DOE Standard 3014 uses a 22-mile-radius from the hazardous facility as the threshold for consideration of hazards posed by airport and heliport operations. Per the DOE Standard 3014, heliports need only be considered if there are local overflights associated with facility operations and/or area operations; because the Kenai LNG Plant does not have facility or area-associated helicopter flights, and does not have an on-site heliport, the impact risk due to heliport operations is considered insignificant for the Kenai LNG Plant.

As discussed above, there are a total of 24 airports (a mixture of commercial airports, general aviation airports, and private airstrips) and three heliports within the 22-mile-radius. Of the airports and heliports, a total of 11 airports fell within the analysis criteria for consideration; that is, these airports fell within a 22-mile-radius of the proposed sites, had documented air traffic, and were in locations that fell within distance criteria that allows for the DOE Standard 3014 crash location probability assignments. The total aircraft crash probability at the Kenai LNG Plant was calculated to be less than 3E-05 and, therefore, we found the risk to be insignificant.

Based upon the USDOT PHMSA's requirements and our review, we conclude the Project would not pose a significant risk or significant increase in risk to the public due to nearby aircraft operations as a result of the potential consequences, incident data, and distance and position of the closest aircraft operations relative to the populated areas near the Project site.

Pipelines

FERC staff reviewed whether any pipeline operations would be associated with the Project and whether any existing pipelines would be near the Kenai LNG Plant. FERC staff uses this information to evaluate whether the Project and any associated

pipeline operations could increase the risk to the pipeline facilities and subsequently to the public, and whether any pre-existing unassociated pipeline operations could adversely increase the risk to the Project sites and subsequently increase the risk to the public. In addition, existing pipelines associated with this Project must meet the USDOT PHMSA's regulations under 49 CFR 192. If authorized, constructed, and operated, LNG facilities, as defined in 49 CFR 193, must comply with the requirements of 49 CFR 192 and 49 CFR 193 and would be subject to the USDOT PHMSA's inspection and enforcement programs. FERC staff evaluated the risk of a pipeline incident affecting the Project sites and the potential of cascading damage increasing the risk to the public based on the consequences from a release, incident data from PHMSA, and proposed mitigation to prevent or reduce the impacts of a pipeline incident from the Project.

For existing pipelines near the Kenai LNG Plant, FERC staff identified four existing pipelines that run along the length of the Kenai Spur Highway to the east of the site: a 16-inch-diameter natural gas pipeline operated by Agrium Inc., and a 10-inch, 12-inch, and 20-inch-diameter natural gas pipelines called Harvest Alaska operated by Harvest Midstream. FERC staff evaluated the potential risk from an incident from these pipelines and their potential impacts by considering the design and operating conditions, failure rates, and lengths of the pipelines along the Kenai LNG Plant site east perimeter and found the risk to be acceptably low (less than 3E-05). Therefore, these pipelines would not pose a significant risk to the operation of the Kenai LNG Plant and the public. Additionally, there is one 8.5-inch-diameter natural gas pipeline that exits the facility that would be used as part of the Project to supply fuel gas to the adjacent refinery.

Hazardous Material Facilities and Power Plants

FERC staff reviewed whether any EPA Risk Management Plan regulated facilities handling hazardous materials and power plants were near the Kenai LNG Plant to evaluate whether the facilities could adversely increase the risk to the Project sites, and whether the Project sites could increase the risk to the EPA Risk Management Plan facilities and power plants and subsequently increase the risk to the public.

The Kenai LNG Plant is along the coastline of Nikiski along with other industrial facilities. The closest facilities to the Kenai LNG Plant handling hazardous materials would be the currently idle Agrium Kenai Nitrogen Operations and Fertilizer Plant which is adjacent to the Kenai LNG Plant and the Marathon Kenai Refinery & Cogeneration Plant about 0.5 mile away. The closest power plants would be the Nikiski Combined Cycle Plant adjacent to the site and the Bernice Lake Combustion Turbine Plant about 0.9 mile away. FERC staff evaluated the EPA Risk Management Plan worst case distances and found that, using the EPA RMP*Comp tool, the Kenai LNG Plant would be within the 1-psi explosion radius for an explosion of hydrogen or hydrogen at the Agrium Kenai Nitrogen Operations Plant or an explosion of tank inventory at the adjacent refinery. The current Emergency Action Plan includes emergency contact numbers and coordination

between the Kenai Refinery, Kenai Dock, and the Agrium Fertilizer Plant. Additionally, the Kenai LNG Plant would be about 0.5 mile north of the proposed Alaska LNG site. Lastly, the closest nuclear power plant would be Bilibino Nuclear Station in Russia about 1,300 miles away.

In addition, the proposed Alaska LNG Terminal would be located to the southeast of the existing Kenai LNG Plant. Specifically, Alaska LNG's proposed LNG storage tanks would be approximately 1 mile southeast from Trans-Foreland's existing LNG storage tanks. The Alaska LNG Terminal proposal would also be subject to 49 CFR 193, Subpart B regulatory requirements that establishes exclusion zones for safety of plant personnel and the surrounding public. Therefore, the Alaska LNG Terminal proposal would consider potential incidents and safety measures that would need to be incorporated in the design or operation to ensure risk to surrounding public is not increased.

Given the distances calculated above using the EPA's risk management plan tool for emergency response (RMP*Comp) for the inventories of Agrium Nitrogen Operations and the adjacent refinery, we conclude that there is potential for a release and subsequent explosion at the Agrium facility adjacent refinery that could affect the safe operations of the Kenai LNG Plant, and therefore, pose risk to the public. However, FERC staff recognize that the Agrium Nitrogen Operations Plant is currently idle and that the established Emergency Action Plan includes coordination with local emergency responders to address onsite and offsite impacts.

Onsite and Offsite Emergency Response Plans

In accordance with the Energy Policy Act of 2005, FERC must also approve an emergency response plan covering the terminal and LNGC transit prior to construction. Section 3A(e) of the NGA, added by section 311 of the Energy Policy Act 2005, stipulates that in any order authorizing an LNG terminal, FERC must require the LNG terminal operator to develop an ERP in consultation with the Coast Guard and state and local agencies. The Kenai facility has an existing Emergency Action Plan that is used to respond to emergency conditions and to protect human health and safety, minimize environmental impacts, and minimize socio-economic impacts. Trans-Foreland has indicated that the Project would comply with this plan and has not proposed any changes. However, certain information and drawings related to equipment layouts and safety systems would need to be updated to include the proposed facilities.[41] Therefore, we recommend in section B.9.6 that Trans-Foreland provide an updated emergency response plan, for review and approval, prior to introduction of hazardous fluids. In addition, we

[41] As part of the FERC's inspection program, a Post-inspection recommendation letter was issued on June 18, 2020 and consisted of a recommendation to address a number of items in the existing Emergency Action Plan. See FERC eLibrary Accession Number 20200618-3004.

recommend in section B.9.6 that Project facilities be subject to regular inspections throughout the life of the facility and would continue to require Trans-Foreland to file updates to the emergency response plan.

9.6 RECOMMENDATIONS FROM FERC PRELIMINARY ENGINEERING AND TECHNICAL REVIEW

Based on our preliminary engineering and technical review of the reliability and safety of the Kenai LNG Cool Down 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 facility to enhance the reliability and safety of the facility and to mitigate the risk of impact on the public.

- **<u>Prior to initial site preparation</u>, Trans-Foreland should file its design wind speed criteria for all other facilities not covered by DOT Pipeline Hazardous Materials Safety Administration (PHMSA) Letter of Determination to be designed to withstand wind speeds commensurate with the risk and reliability associated with the facilities in accordance with ASCE/SEI 7-05, 7-10, or equivalent.**
- **<u>Prior to initial site preparation,</u> Trans-Foreland should file with the Secretary the frost depth for the final foundation design in compliance with project specifications, including ASCE/SEI 7-05 and 7-10 or equivalent.**
- **<u>Prior to initial site preparation</u>, Trans-Foreland should use properly compacted soil backfill material around the foundations area to prevent foundation structures from freeze-thaw damage.**
- **<u>Prior to construction of final design</u>, Trans-Foreland should file with the Secretary correspondence regarding USDOT PHMSA's determination on whether the vacuum jacketed piping complies with 49 CFR 193.2167 and NFPA 59A (2001) section 2.2.1.2, as applicable.**
- **<u>Prior to construction of final design</u>, Trans-Foreland file with the Secretary the final design package (e.g., structures and foundations drawings, design specifications, and calculations, etc.) and associated quality assurance and control procedures with the documents reviewed, approved, and stamped and sealed by the professional engineer of record in the State of Alaska.**
- **<u>Prior to construction of final design</u>, Trans-Foreland should demonstrate with calculations or modelling that are stamped and**

sealed by a professional engineer in the State of Alaska that the structural design would be designed to withstand settlement values that exceed 1.5 inches.

Information pertaining to the following 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 would be subject to public disclosure. All information should be filed **a minimum of 30 days** before approval to proceed is requested.

- **<u>Prior to initial site preparation</u>, Trans-Foreland should file an overall Project schedule, which includes the proposed stages of the commissioning plan.**
- **<u>Prior to initial site preparation</u>, Trans-Foreland should file quality assurance and quality control procedures for construction activities.**
- **<u>Prior to construction of final design</u>, Trans-Foreland should file lighting drawings for the Project facilities. The lighting drawings should show the location, elevation, type of light fixture, and lux levels of the lighting system and should illustrate adequate coverage in accordance with federal regulations (e.g., 49 CFR 193, 33 CFR 127, 33 CFR 105) and API 540 or equivalent.**
- **<u>Prior to construction of final design</u>, Trans-Foreland should file security camera drawings for the Project facilities. The security camera drawings should show the locations, areas covered, and features of each camera (e.g., fixed, tilt/pan/zoom, motion detection alerts, low light, mounting height, etc.) to verify coverage of the project facilities with redundancies to enable rapid and reliable monitoring of the facility.**
- **<u>Prior to construction of final design</u>, Trans-Foreland should file change logs that list and explain any changes made from the FEED provided in the Project'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.**

- **<u>Prior to construction of final design</u>, Trans-Foreland should file a plot plan of the final design showing all major equipment, structures, buildings, and impoundment systems.**

- **<u>Prior to construction of final design</u>, Trans-Foreland should file an up-to-date equipment list, process and mechanical data sheets, and specifications. The specifications should include:**

  a. building specifications (e.g., electrical buildings, compressor buildings, storage buildings, pressurized buildings, ventilated buildings, blast resistant buildings);
  b. mechanical specifications (e.g., piping, valve, insulation, rotating equipment, heat exchanger, storage tank and vessel, other specialized equipment);
  c. electrical and instrumentation specifications (e.g., power system, control system, safety instrument 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>, Trans-Foreland 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>, Trans-Foreland should file up-to-date PFDs and P&IDs including vendor P&IDs. The PFDs should include heat and material balances. 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. storage tank pipe penetration size and nozzle schedule;
  d. valve high pressure side and internal and external vent locations;
  e. piping with line number, piping class specification, size, and insulation type and thickness;
  f. piping specification breaks and insulation limits;
  g. all control and manual valves numbered;
  h. relief valves with size and set points; and
  i. drawing revision number and date.

- **<u>Prior to construction of final design</u>, Trans-Foreland 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>, Trans-Foreland 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>, Trans-Foreland should file the safe operating limits (upper and lower), alarm and shutdown set points for all instrumentation (e.g., temperature, pressures, flows, and compositions).**
- **<u>Prior to construction of final design</u>, Trans-Foreland should file cause-and-effect matrices for the process instrumentation, fire and gas detection system, and emergency shutdown system. The cause-and-effect matrices should include alarms and shutdown functions, details of the voting and shutdown logic, and set points.**
- **<u>Prior to construction of final design</u>, Trans-Foreland should specify that all emergency shutdown valves are to be equipped with open and closed position switches connected to the DCS/SIS.**
- **<u>Prior to construction of final design</u>, Trans-Foreland 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>, Trans-Foreland should include LNG tank fill flow measurement with high flow alarm.**
- **<u>Prior to construction of final design</u>, Trans-Foreland 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>, Trans-Foreland should file the sizing basis and capacity for the final design of the pressure relief valves for major process equipment and vessels.**
- **<u>Prior to construction of final design</u>, Trans-Foreland should file vent stack design information showing that it could handle the maximum vapor loads during ship unloading operations when the BOG compression system is not available and would not result in flammable**

vapors reaching ignition sources and areas that would cause cascading damage. Alternatively, Trans-Foreland should file procedures to cease LNGC unloading operations when the BOG compression system is not available.

- **<u>Prior to construction of final design</u>, Trans-Foreland should locate the inlet emergency shutdown valve 10 feet from the trim vaporizer module.**

- **<u>Prior to construction of final design</u>, Trans-Foreland 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 (2001). The justification for flammable and combustible gas detection should take into account the set points, voting logic and degradation logic, wind speeds, and wind directions and flame and heat detection systems should account for coverage of all project facilities containing flammable or combustible fluids. The justification for firewater should provide evaluation of the total area that may experience firewater demand due to each governing scenario; calculations for all firewater demands (including firewater coverage on the LNG storage tanks) based on design densities, surface area, and throw distance as well as specifications for the corresponding hydrant and monitors needed to reach and cool equipment.**

- **<u>Prior to construction of final design</u>, Trans-Foreland should file final electrical classification drawings, including cross-sectional drawings, for all Project equipment and buildings. The drawings should demonstrate compliance with NFPA 59A, NFPA 70, NFPA 497, and API RP 500, or equivalents. In addition, the electrical area classification drawings should specify the trim vaporizer module as Class 1 Division 1 per USDOT PHMSA's vaporizer spacing equivalency determination.**

- **<u>Prior to construction of final design</u>, Trans-Foreland should file final ventilation details and calculations for project buildings to demonstrate the design meets recommended and generally accepted good engineering practices, such as NFPA 59A, NFPA 70, NFPA 497, and API RP 500.**

- **<u>Prior to construction of final design</u>, Trans-Foreland 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 (2001).**

- **<u>Prior to construction of final design</u>, Trans-Foreland 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>, Trans-Foreland 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, shutdown functions of the hazard detection equipment, and manufacturer and model.**

- **<u>Prior to construction of final design</u>, Trans-Foreland should file a technical review of facility design that:**

  a. identifies all combustion/ventilation air intake equipment and the elevation and 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 construction of final design</u>, Trans-Foreland should file a design that includes hazard detection suitable to detect high temperatures and smoldering combustion products in electrical buildings.**

- **<u>Prior to construction of final design</u>, Trans-Foreland 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>, Trans-Foreland 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 by tag number of all fixed, wheeled, and hand-held extinguishers and should demonstrate the spacing of extinguishers meet prescribed NFPA 10 travel distances. The list should include the equipment tag number, type, capacity, equipment covered, discharge rate, and automatic and manual remote signals initiating discharge of the units and should demonstrate they meet NFPA 59A.

- **<u>Prior to construction of final design</u>, Trans-Foreland should file a design that includes clean agent systems in each electrical building that serve safety and security systems.**
- **<u>Prior to construction of final design</u>, Trans-Foreland should file drawings and specifications for the structural passive protection systems demonstrating protection of the new and existing equipment and supports from cryogenic releases from the project facilities.**
- **<u>Prior to construction of final design</u>, Trans-Foreland should file calculations or test results for the structural passive protection systems demonstrating protection of the new and existing equipment and supports from cryogenic releases from the project facilities.**
- **<u>Prior to construction of final design</u>, Trans-Foreland should file drawings and specifications for the structural passive protection systems demonstrating protection of the new and existing equipment and supports from pool and jet fires from the project facilities.**
- **<u>Prior to construction of final design</u>, Trans-Foreland 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 and jet fires that could cause failure of the component. A combination of passive and active protection for pool fires and passive and/or active protection 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 vessel.**
- **<u>Prior to construction of final design</u>, Trans-Foreland should file an evaluation showing that overpressures from vapor cloud explosions would not cause or would be mitigated from causing cascading damage onto occupied buildings, pressure vessels, LNG storage tanks, and emergency equipment.**

- **<u>Prior to construction of final design</u>, Trans-Foreland should file specifications and drawings demonstrating how cascading damage of transformers would be prevented (e.g., fire walls or spacing) in accordance with NFPA 850 or equivalent.**

- **<u>Prior to construction of final design</u>, Trans-Foreland should file facility plan drawings showing the proposed location of the firewater systems. Plan drawings should clearly show the location of firewater piping, post indicator valves, and the location and area covered by, each monitor, hydrant, hose, deluge system, and sprinkler. The drawings should also include piping and instrumentation diagrams of the firewater systems.**

- **<u>Prior to commissioning</u>, Trans-Foreland 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. Trans-Foreland should file documentation certifying that each of these milestones has been completed <u>before</u> authorization to commence the next phase of commissioning and startup will be issued.**

- **<u>Prior to commissioning</u>, Trans-Foreland 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>, Trans-Foreland should file the procedures for pressure/leak tests which address the requirements of ASME BPVC Section VIII and ASME B31.3. In addition, Trans-Foreland should file a line list of pneumatic and hydrostatic test pressures.**

- **<u>Prior to commissioning</u>, Trans-Foreland 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>, Trans-Foreland should file updates to the operation and maintenance procedures and manuals, as well as safety procedures, which cover the receipt of LNG into the facility.**

- **<u>Prior to commissioning</u>, Trans-Foreland should tag all equipment, instrumentation, and valves in the field, including drain valves, vent valves, main valves, and car-sealed or locked valves.**

- **Prior to commissioning, Trans-Foreland should file a plan to maintain a detailed training log to demonstrate that operating, maintenance, and emergency response staff have completed the required training.**

- **Prior to introduction of hazardous fluids, Trans-Foreland 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, Trans-Foreland should complete and document a firewater monitor and hydrant coverage test. The actual coverage area from each monitor and hydrant should be shown on facility plot plan(s).**

- **Prior to introduction of hazardous fluids, Trans-Foreland should complete and document clean agent acceptance tests.**

- **Prior to introduction of hazardous fluids, Trans-Foreland 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, Trans-Foreland should file an updated emergency response plan that includes the Project facilities. The emergency response plan updates should be coordinated with federal, state, and local agencies and neighboring facilities and should include processes and procedures to be used in the event of an incident at the Kenai LNG Plant or neighboring facilities.**

- **Trans-Foreland should file a request for written authorization from the Director of OEP, or the Director's designee, prior to receiving the first LNGC. Problems of significant magnitude encountered during or after unloading of the first LNGC, including during any commissioning activities, should be reported to the FERC within 24 hours.**

- **Prior to receiving the first LNG cargo, including any commissioning cargoes, Trans-Foreland should file a request for authorization from the Director of OEP, or the Director's designee. 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 Trans-Foreland or other appropriate parties.

- **<u>Prior to commencement of service</u>, Trans-Foreland should notify FERC staff of any proposed revisions to the security plan and physical security of the plant.**
- **<u>Prior to commencement of service</u>, Trans-Foreland should label piping with fluid service and direction of flow in the field, in addition to the pipe labeling requirements of NFPA 59A (2001).**
- **<u>Prior to commencement of service</u>, Trans-Foreland should provide updates addressing the import of LNG and project facilities, in the plans for any preventative and predictive maintenance program that performs periodic or continuous equipment condition monitoring.**

In addition, we recommend that the following measures should apply **throughout the life** of the Kenai LNG terminal.

- **The facility should be subject to regular FERC staff technical reviews and site inspections on at least an <u>annual</u> basis or more frequently as circumstances indicate. Prior to each FERC staff technical review and site inspection, Trans-Foreland 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.**
- **<u>Semi-annual</u> operational reports should be filed with the Secretary to identify changes in facility design and operating conditions; abnormal operating experiences; activities (e.g., ship 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 tank, storage tank vibrations and/or vibrations in associated cryogenic piping, storage tank settlement, significant equipment or instrumentation malfunctions or failures, non-scheduled maintenance or repair (and reasons therefore), relative movement of storage tank**

inner vessels, hazardous fluids releases, fires involving hazardous fluids and/or from other sources, negative pressure (vacuum) within a storage tank, and higher than predicted boil off rates. Adverse weather conditions and the effect on the facility also should be reported. Reports should be submitted <u>within 45 days after each period ending June 30 and December 31</u>. In addition to the above items, a section entitled "Significant Plant Modifications Proposed for the Next 12 Months (dates)" should be included in the <u>semi-annual</u> operational reports. Such information would provide 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 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 <u>immediately</u>, without unduly interfering with any necessary or appropriate emergency repair, alarm, or other emergency procedure. In all instances, notification should be made to FERC staff <u>within 24 hours</u>. This notification practice should be incorporated into the liquefaction 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, or the Director's designee, has delegated authority to take whatever steps are necessary to ensure operational reliability and to protect human life, health, property, or the environment, including authority to direct the LNG facility to cease operations. Following the initial company notification, FERC staff would determine the need for a separate follow-up report or follow up in the upcoming <u>semi-annual</u> operational report. All company follow-up reports should include investigation results and recommendations to minimize a reoccurrence of the incident.

9.7 CONCLUSIONS ON LNG FACILITY AND CARRIER RELIABILITY AND SAFETY

As part of the NEPA review and NGA determinations, FERC staff assesses the potential impact on 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 FERC by determining whether the Project's proposed design would meet the USDOT PHMSA's 49 CFR 193, Subpart B siting requirements. On March 25, 2020, USDOT PHMSA provided a Letter of Determination on the Project's compliance with 49 CFR 193 Subpart B. This determination was provided to FERC as further consideration to FERC on 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, and final determination of whether the 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 FERC staff by reviewing the proposed Project and the associated LNGC traffic. On January 23, 2019, the Coast

Guard indicated that a new or revised LOR would not be required for the Project. If the Project is authorized, constructed, and operated, the facility 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 Project 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 to enhance the reliability and safety of the facility and to mitigate the risk of impact on the public. With the incorporation of these mitigation measures and oversight, FERC staff conclude that the Project 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

In accordance with NEPA and FERC policy, we identified other actions in the vicinity of the Project facilities and evaluated the potential for a cumulative impact on the environment. A cumulative effect is the impact on the environment from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions. Cumulative impacts can result from individually minor, but collectively significant actions, taking place over time. In this analysis, we consider the impacts of past projects within the region as part of the affected environment (environmental baseline) which was described and evaluated in the preceding environmental analysis. However, present effects of past actions that are relevant and useful are also considered

This cumulative effects analysis generally follows a method set forth in relevant CEQ and EPA guidance and focuses on potential impacts from the Project on resource areas or issues where the incremental contribution would be potentially significant when added to the potential impacts of other actions. To avoid unnecessary discussions of insignificant impacts and to adequately address and accomplish the purposes of this analysis, an action must first meet the following three criteria to be included in the cumulative analysis:

- the action impacts a resource area potentially affected by the Project;
- the action causes this impact within all, or part of, the Project area; and
- the action causes this impact within all, or part of, the timespan for the potential impact for the Project.

10.1 PROJECTS IDENTIFIED WITHIN THE GEOGRAPHIC SCOPE

Our cumulative impacts analysis considers actions that impact environmental resources affected by the proposed action, within all or part of the Project areas affected by the proposed action (i.e., geographic scope), and within all or part of the time span of the impacts. Based on the impacts of the Project as identified and described in the EA and as consistent with CEQ guidance, we have determined the following resource-specific geographic scopes listed in table 11, are appropriate to assess cumulative impacts

As described in section B of this EA, we conclude that the Project-related construction and operational activities would have minor or no impacts on the following resources: geology; soils; groundwater; surface water; wildlife and aquatic resources; threatened, endangered, and other special status species; land use; socioeconomics; and environmental justice. Because the Project would not contribute to adverse impacts on these resources, we do not consider them further in this analysis. Additionally, although the Project facilities are within 2-miles of, but not located within, an EJ community, and impacts would not result in disproportionately high and adverse impact, as discussed in section B.7, cumulative impacts on EJ communities are not discussed further.

Table 11
Geographic Scope for Cumulative Impact Analysis

Environmental Resource	Geographic Scope
Air Quality	Construction: 0.25-mile radius around Project facilities Operation: 50-km radius (31 miles) around Project facilities
Noise	Construction: NSAs within 0.25 mile of the Project facilities, and within 0.5 mile of Project facilities. Operation: Any facility that could have an impact on an NSA within 1-mile of the Project facilities.

10.2 POTENTIAL CUMULATIVE IMPACTS OF THE PROPOSED ACTION

Table 12 below lists the past, present, and reasonably foreseeable projects we identified within the geographic scope for air quality and noise resources, and we considered these projects in our cumulative impact analysis for the Project. These projects include one FERC-jurisdictional project, six utility projects, one roadway improvement project, two industrial projects, and one energy project.

Table 12
Past, Present, and Reasonably Foreseeable Future Projects that Could Cumulatively Affect Noise Levels or Air Quality with the Kenai LNG Cool Down Project

Project/Activity	Closest Location Relative to Kenai LNG Cool Down Project	Project Description	Area Affected	Federal Permits Required	Status	Resources with Potential Cumulative Impacts
Kenai Refinery-Tyonek Pipeline	Adjacent to the Kenai LNG Plant	Construction of approximately 375 feet of 10-inch-diameter aboveground piping tying into an existing 6-inch flange and tee on the Refinery's existing 6-inch-diameter natural gas supply manifold.	No ground disturbance.	None	Pending approval of Project facilities	Air Quality during Project construction, Noise
Alaska LNG Project	Approximately 1 mile south Nikiski	The Alaska LNG Project will involve the construction and operation of natural gas treatment, pipeline, and liquefaction facilities.	Roughly 800-mile-long pipeline and LNG Terminal project. Construction impacts approximately 35,548 acres; operation (permanent) impacts approximately 16,479 acres.	PSD and Title V	Order issued by FERC in May 2020.	Air Quality during Project operation, Noise

Table 12
Past, Present, and Reasonably Foreseeable Future Projects that Could Cumulatively Affect Noise Levels or Air Quality with the Kenai LNG Cool Down Project

Project/Activity	Closest Location Relative to Kenai LNG Cool Down Project	Project Description	Area Affected	Federal Permits Required	Status	Resources with Potential Cumulative Impacts
Kenai Spur Highway Relocation	Adjacent; northernmost portion of the selected route located at the Kenai LNG Plant property boundary	Relocation of a 1.3-mile segment of the highway.	93 acres	Unknown	Routing selected in August 2018, public involvement ongoing.	Air Quality during Project Construction and Operation, Noise
Gas Interconnection to Alaska LNG	Approximately 1 mile south Nikiski	Offtake point to facilitate potential natural gas pipeline lateral extending from the Alaska LNG Project pipeline to end users.	Interconnect for Kenai would tie into existing pipeline and may not require lateral pipeline; aboveground facilities for metering, valving, pressure regulating, etc. will require approximately 5-10 acres.	Unknown	Unknown	Air Quality during Project operation, Noise

Table 12
Past, Present, and Reasonably Foreseeable Future Projects that Could Cumulatively Affect Noise Levels or Air Quality with the Kenai LNG Cool Down Project

Project/Activity	Closest Location Relative to Kenai LNG Cool Down Project	Project Description	Area Affected	Federal Permits Required	Status	Resources with Potential Cumulative Impacts
Kenai Water System Upgrades	Approximately 5 miles southwest Kenai	Upgrades to the City of Kenai municipal water system for the Alaska LNG Project, including: 1) installation of two new wells, yard piping at an existing well site, two new distribution pump houses, and a 6.1- mile-long, 16-inch-diameter water pipeline; 2) possible expansion of the water treatment plant from 1.5 to 2.5 million gallons per day; and 3) replacement of approximately 500 feet of distribution piping.	Unknown	Unknown	Preliminary engineering studies complete. Preliminary discussions have been held between Alaska Gas Development Corporation and the City of Kenai.	Air Quality during Project operation

Table 12
Past, Present, and Reasonably Foreseeable Future Projects that Could Cumulatively Affect Noise Levels or Air Quality with the Kenai LNG Cool Down Project

Project/Activity	Closest Location Relative to Kenai LNG Cool Down Project	Project Description	Area Affected	Federal Permits Required	Status	Resources with Potential Cumulative Impacts
Cook Inlet Gas Gathering System (CIGGS) – Marine Pipeline Conversion	Approximately 17 miles north Cook Inlet	Conversion of a subsea 10-inch-diameter, 21-mile-long natural gas pipeline to oil service. No physical changes to the existing pipeline, no heating or refrigeration, and no changes to existing pump stations will be required.	No disturbance is anticipated from the conversion.	No further permits required.	Application for a right-of-way lease filed with ADNR September 2017. Conversion completed in October 2018.	Air Quality during Project operation
Furie Operating Alaska	Approximately 22 miles northeast Cook Inlet	New offshore gas wells and modifications to existing offshore wells in Cook Inlet.	Unknown	Unknown	The company completed three wells in 2018, but has filed for Chapter 11 bankruptcy.	Air Quality during Project operation

Table 12
Past, Present, and Reasonably Foreseeable Future Projects that Could Cumulatively Affect Noise Levels or Air Quality with the Kenai LNG Cool Down Project

Project/Activity	Closest Location Relative to Kenai LNG Cool Down Project	Project Description	Area Affected	Federal Permits Required	Status	Resources with Potential Cumulative Impacts
Chuitna Coal Mine	Approximately 23 miles north Tyonek	Surface coal mine with contemporaneous reclamation to recover an estimated 300 million tons of sub-bituminous ultra-low-sulfur coal. Facilities include surface coal mine, access road, coal transport conveyor, personnel housing, air strip, logistic center, and coal export terminal.	Unknown	Unknown due to stalled status.	Preliminary Draft Supplemental EIS released for cooperating agency review in November 2015. All permitting activities suspended as of March 31, 2017 (ADNR 2017).	Air Quality during Project operation

Table 12
Past, Present, and Reasonably Foreseeable Future Projects that Could Cumulatively Affect Noise Levels or Air Quality with the Kenai LNG Cool Down Project

Project/Activity	Closest Location Relative to Kenai LNG Cool Down Project	Project Description	Area Affected	Federal Permits Required	Status	Resources with Potential Cumulative Impacts
Agrium Kenai Nitrogen Operations Facility	0.4 mile north Nikiski	Nitrogenous fertilizer manufacturing facility, the purpose of which is to produce ammonia and urea for bulk sale.	No additional impacts on existing facility.	Unknown due to stalled status.	Facility closed in 2007. ADEC Air Quality Control Construction Permit was issued for 2015-2020. Agrium also applied for an ADEC discharge permit for the facility (ADEC 2017). Reopening still on hold as of early 2018.	Air Quality during Project operation, Noise
Kenai Refinery – CoGen Project	0.5 mile Nikiski	Marathon may construct and operate a combined heat and power cogeneration system to directly serve the electricity and steam needs of the refinery.	None; all work within the property line of the Kenai Refinery.	Minor Air Permit from ADEC	Permit approved.	Air Quality during Project operation, Noise

Table 12
Past, Present, and Reasonably Foreseeable Future Projects that Could Cumulatively Affect Noise Levels or Air Quality with the Kenai LNG Cool Down Project

Project/Activity	Closest Location Relative to Kenai LNG Cool Down Project	Project Description	Area Affected	Federal Permits Required	Status	Resources with Potential Cumulative Impacts
Kenai Refinery – IMO Project	0.5 mile Nikiski	Marathon plans to begin producing low sulfur fuel oil in addition to the high sulfur fuel oil that is already produced due to the up-coming IMO fuel specification change on January 1, 2020.	None; all work within the property line of the Kenai Refinery.	Minor Air Permit from ADEC	Permit approval pending; construction and start-up planned for 2020.	Air Quality during Project operation, Noise

Air Quality

Construction of the Project would result in short-term and temporary impacts on air quality in the vicinity of the Project area. The Kenai Spur Highway Relocation and Tyonek Pipeline projects may occur concurrently and within the same geographic scope as the proposed Project and may contribute cumulatively to air quality impacts during project construction. Trans-Foreland proposes to minimize construction emissions by applying water to disturbed surfaces and requiring contractors to meet applicable emission standard on construction equipment. Based on the mitigation measures proposed and the minor and temporary nature of construction activities (expected to last about 5 months for the Project), impacts from the Project are not expected to contribute to significant cumulative impacts on air quality during construction.

Project operation at the LNG Terminal would result in an increase in CO_2e emissions from the current warm idle state. Permitted emissions at the existing Kenai Refinery would remain unchanged. Multiple projects in table 12 are within the geographic scope and may contribute cumulatively to impacts on air quality during Project operation. However, because the Project would result in very low pollutant emissions (other than CO_2e), we conclude the Project would not contribute to significant cumulative impacts on criteria pollutant ambient air quality levels during operation.

Noise

The geographic scope for noise was estimated as any facility that could affect an NSA within 1 mile of the Project for operation, and 0.25 mile for construction. Noise generated by existing past and present actions is part of the measured ambient noise levels and have therefore already been taken into account.

For construction cumulative impacts, only two additional projects were identified within the geographic scope. These projects could cumulatively affect the local noise environment along with the Project and cause increased noise at the NSAs. Only two additional projects were identified within the geographic scope. The Kenai Spur Highway Relocation project and the Kenai Refinery- Tyonek Pipeline project were identified as projects that could cumulatively affect the local noise environment along with the Project during construction. The Project construction impacts are discussed in Section 8.2.3. The nearest NSA is about 0.5 mile from the Project and the Project contribution to cumulative impacts would decrease with distance. However, Project impacts would only occur from 7am to 7pm, and the specific construction timetables are variable. Therefore, we conclude that even if construction of both projects would occur simultaneously, noise impacts on nearby NSAs would not be significant.

For operational cumulative impacts, other projects identified as within the geographic scope with the potential to affect noise levels include the following:

- Alaska LNG Project,
- Gas Interconnection to Alaska LNG,
- Agrium Kenai Nitrogen Operations Facility,
- Kenai Refinery CoGen Project, and
- Kenai Refinery IMO Project.

One of the above-mentioned projects is FERC-regulated, and the Alaska LNG Terminal and any aboveground facilities at the Gas Interconnection to the Alaska LNG Project would be limited to generating no greater than 55 dBA L_{dn} at any NSA during operation, including the NSAs evaluated as part of the Kenai LNG Cool Down Project. We have no available noise data for the non-FERC regulated projects (Agrium Kenai Nitrogen Operations Facility, Kenai Refinery CoGen Project, and Kenai Refinery IMO Project); however, there would certainly be overlapping operational noise impacts on the NSAs for the Project. However, while there may be an increased overall cumulative noise impact from all of these facilities on nearby NSAs, the impact of the Project would be a minor component. Therefore, we conclude that the cumulative noise impacts would not be significant.

SECTION C – ALTERNATIVES

In accordance with NEPA and Commission policy, we evaluated alternatives to the Project to determine whether they would be reasonable and environmentally preferable to the proposed action. These alternatives included the no-action alternative, system alternatives, and site alternatives. The evaluation criteria used for developing and reviewing alternatives were:

- ability to meet the Project's stated objective;
- technical and economic feasibility and practicality; and
- significant environmental advantage over the proposed action.

Through environmental comparison and application of our professional judgment, each alternative is considered to a point where it becomes clear if the alternative could or could not meet the three evaluation criteria. To ensure a consistent environmental comparison and to normalize the comparison factors, we generally use desktop sources of information (e.g., publicly available data, geographic information system data, aerial imagery) and assume the same general workspace requirements.

1.0 NO-ACTION ALTERNATIVE

Under the no-action alternative, the proposed facilities would not be constructed, and the environmental impacts associated with the Project would not occur. However, the Project's objectives would not be met. The no-action alternative would prevent the proposed Project from being developed to cool down the existing LNG storage tanks and associated LNG facilities by importing LNG for delivery to the storage tanks, and subsequently deliver BOG generated under normal operations from the Kenai LNG Plant to the Refinery to be used as a fuel source. The no-action alternative would not meet the Project's purpose and need. Furthermore, our analysis of the Project concludes there would be no significant impacts. Therefore, we do not recommend the no-action alternative.

2.0 SYSTEM ALTERNATIVES

System alternatives are alternatives to the proposed action that would make use of existing, modified, or proposed Project(s) systems to meet the stated objective of the proposed Project. System alternatives involve the transportation of the equivalent amount of natural gas by the modification or expansion of existing pipeline systems or by other new pipeline systems.

To be a system alternative, any alternate systems must provide 7 MMscf/d to the Refinery and cool down the existing LNG storage tanks and associated LNG facilities and return these systems to active status to meet the Project purpose and need. We have

not identified other existing systems that would be able to meet the objectives of this Project. Therefore, this alternative has been removed from further consideration.

3.0 SITE ALTERNATIVES

As discussed in section B above, all of the construction would occur within the existing Kenai LNG Plant and previously disturbed areas. Our review of the Project found that environmental impacts associated with the modifications at the Kenai LNG Plant have been minimized.

Based on the limited environmental impact associated with this Project, we did not identify any unresolved resource conflicts that would present a need to examine further alternatives. Additionally, no comments were received regarding alternatives that should be considered or resources that would be impacted by the Project that could be avoided by an alternative. Because the impacts associated with the proposed Project are not significant, we did not evaluate additional alternatives. Therefore, we conclude that the Project, as modified by our recommendations, is the preferred alternative to meet the Project objectives.

SECTION D - CONCLUSIONS AND RECOMMENDATIONS

Based on the analysis contained in this EA, we have determined that if Trans-Foreland constructs and operates the proposed facilities 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. Trans-Foreland 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. Trans-Foreland must:

    a. request any modification to these procedures, measures, or conditions in a filing with the Secretary;
    b. justify each modification relative to site-specific conditions;
    c. explain how that modification provides an equal or greater level of environmental protection than the original measure; and
    d. receive approval in writing from the Director of OEP, or the Director's designee, **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 life, health, property, and the environment 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 project construction and operation.

3. **Prior to any construction**, Trans-Foreland shall file an affirmative statement with the Secretary, certified by a senior company official, that all company personnel, EIs, 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 location shall be as shown in the EA, as supplemented by filed facility diagrams and plot plans. **As soon as they are available, and before the start of construction**, Trans-Foreland shall file with the Secretary any revised detailed survey facility diagrams/plot plans at a scale not smaller than 1:6,000 with station positions for the facility 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 diagrams/plans.

5. Trans-Foreland shall file with the Secretary detailed facility diagrams/plot plans and aerial photographs at a scale not smaller than 1:6,000 identifying all facility relocations, and staging areas, 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 diagrams/aerial photographs. Each area must be approved in writing by the Director of OEP, or the Director's designee, **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***,* Trans-Foreland shall file an Implementation Plan with the Secretary for review and written approval by the Director of OEP, or the Director's designee. Trans-Foreland must file revisions to the plan as schedules change. The plan shall identify:

   a. how Trans-Foreland 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 Trans-Foreland 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 Trans-Foreland will give to all personnel involved with construction and restoration (initial and refresher training as the project progresses and personnel change);

f. the company personnel (if known) and specific portion of Trans-Foreland's organization having responsibility for compliance;

g. the procedures (including use of contract penalties) Trans-Foreland will follow if noncompliance 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. Trans-Foreland shall employ at least one EI during Project construction and restoration. 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. 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

e. responsible for maintaining status reports.

8. Beginning with the filing of its Implementation Plan, Trans-Foreland 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 Trans-Foreland's efforts to obtain the necessary federal authorizations;
    b. Project schedule, including current construction status of the Project and work planned for the following reporting period;
    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 Trans-Foreland from other federal, state, or local permitting agencies concerning instances of noncompliance, and Trans-Foreland's response.

9. Trans-Foreland shall employ a special inspector during construction, and a copy of the special inspector's reports shall be included in the **monthly** status reports filed with the Secretary (see condition 8 above). The special inspector shall be responsible for:

    a. observing the construction of the Project facilities to be certain it conforms to the design drawings and specifications;
    b. furnishing inspection reports to the engineer- or architect- of-record and other designated persons. All discrepancies shall be brought to the immediate attention of the contractor for correction, and then if uncorrected, to the engineer- or architect- of-record; and
    c. submitting a final signed report stating whether the work requiring special inspection was, to the best of his/her knowledge, in conformance with the approved plans and specifications and the applicable workmanship provisions.

10. Trans-Foreland must receive written authorization from the Director of OEP, or the Director's designee, **before commencing construction of any Project**

facilities. To obtain such authorization, Trans-Foreland must file with the Secretary documentation that it has received all applicable authorizations required under federal law (or evidence of waiver thereof).

11. Trans-Foreland must receive written authorization from the Director of OEP, or the Director's designee, **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.

12. Trans-Foreland must receive written authorization from the Director of OEP, or the Director's designee, **before placing the Project into service**. Such authorization will only be granted following a determination that the facilities have been constructed in accordance with the FERC approval, can be expected to operate safely as designed, and the rehabilitation and restoration of areas affected by the project are proceeding satisfactorily.

13. **Within 30 days of placing the authorized facilities in service**, Trans-Foreland shall file an affirmative statement with the Secretary, certified by a senior company official:

    a. that the facilities have been constructed and installed 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 Trans-Foreland 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.

14. Trans-Foreland shall **not begin** construction activities **until**:

    a. FERC staff receives comments from the NMFS regarding the proposed action;
    b. FERC staff completes ESA consultation with the NMFS; and
    c. Trans-Foreland has received written notification from the Director of OEP, or the Director's designee, that construction or use of mitigation may begin.

15. Trans-Foreland shall file noise surveys with the Secretar**y no later than 60 days** after placing the Project into service. If full-load condition noise surveys are not possible, Trans-Foreland shall provide an interim survey at the maximum possible load **within 60 days** of placing the Project into service and provide the full-load surveys **within 6 months**. If the noise attributable to operation of the equipment at the Terminal exceeds an L_{dn} of 55 dBA at the nearest NSAs under interim or

full load conditions, Trans-Foreland shall file a report on what changes are needed and shall install the additional noise controls to meet the level **within 1 year** of the in-service date. Trans-Foreland shall confirm compliance with the above requirement by filing an additional noise survey with the Secretary **no later than 60 days** after it installs the additional noise controls.

16. **Prior to initial site preparation**, Trans-Foreland shall file its design wind speed criteria for all other facilities not covered by DOT Pipeline Hazardous Materials Safety Administration (PHMSA) Letter of Determination to be designed to withstand wind speeds commensurate with the risk and reliability associated with the facilities in accordance with ASCE/SEI 7-05, 7-10, or equivalent.

17. **Prior to initial site preparation**, Trans-Foreland shall file with the Secretary the frost depth for the final foundation design in compliance with project specifications, including ASCE/SEI 7-05 and 7-10 or equivalent.

18. **Prior to initial site preparation**, Trans-Foreland shall use properly compacted soil backfill material around the foundations area to prevent foundation structures from freeze-thaw damage.

19. **Prior to construction of final design**, Trans-Foreland shall file with the Secretary correspondence regarding USDOT PHMSA's determination on whether the vacuum jacketed piping complies with 49 CFR 193.2167 and NFPA 59A (2001) section 2.2.1.2, as applicable.

20. **Prior to construction of final design**, Trans-Foreland file with the Secretary the final design package (e.g., structures and foundations drawings, design specifications, and calculations, etc.) and associated quality assurance and control procedures with the documents reviewed, approved, and stamped and sealed by the professional engineer of record in the State of Alaska.

21. **Prior to construction of final design**, Trans-Foreland shall demonstrate with calculations or modelling that are stamped and sealed by a professional engineer in the State of Alaska that the structural design would be designed to withstand settlement values that exceed 1.5 inches.

Conditions 22 through 76 shall apply to the Project. 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 recommendation. 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 will be subject to public disclosure. All information shall be filed <u>a minimum of 30 days</u> before approval to proceed is required.

22. **Prior to initial site preparation**, Trans-Foreland shall file an overall Project schedule, which includes the proposed stages of the commissioning plan.

23. **Prior to initial site preparation**, Trans-Foreland shall file quality assurance and quality control procedures for construction activities.

24. **Prior to construction of final design**, Trans-Foreland shall file lighting drawings for the Project facilities. The lighting drawings shall show the location, elevation, type of light fixture, and lux levels of the lighting system and shall illustrate adequate coverage in accordance with federal regulations (e.g., 49 CFR 193, 33 CFR 127, 33 CFR 105) and API 540 or equivalent.

25. **Prior to construction of final design**, Trans-Foreland shall file security camera drawings for the Project facilities. The security camera drawings shall show the locations, areas covered, and features of each camera (e.g., fixed, tilt/pan/zoom, motion detection alerts, low light, mounting height, etc.) to verify coverage of the project facilities with redundancies to enable rapid and reliable monitoring of the facility.

26. **Prior to construction of final design**, Trans-Foreland shall file change logs that list and explain any changes made from the FEED provided in the Project'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.

27. **Prior to construction of final design,** Trans-Foreland shall file a plot plan of the final design showing all major equipment, structures, buildings, and impoundment systems.

28. **Prior to construction of final design**, Trans-Foreland shall file an up-to-date equipment list, process and mechanical data sheets, and specifications. The specifications shall include:

    a. building specifications (e.g., electrical buildings, compressor buildings, storage buildings, pressurized buildings, ventilated buildings, blast resistant buildings);
    b. mechanical specifications (e.g., piping, valve, insulation, rotating equipment, heat exchanger, storage tank and vessel, other specialized equipment);

c. electrical and instrumentation specifications (e.g., power system, control system, safety instrument system [SIS], cable, other electrical and instrumentation); and
d. security and fire safety specifications (e.g., security, passive protection, hazard detection, hazard control, firewater).

29. **Prior to construction of final design**, Trans-Foreland shall file a list of all codes and standards and the final specification document number where they are referenced.

30. **Prior to construction of final design**, Trans-Foreland shall file up-to-date PFDs and P&IDs including vendor P&IDs. The PFDs shall include heat and material balances. 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. storage tank pipe penetration size and nozzle schedule;
    d. valve high pressure side and internal and external vent locations;
    e. piping with line number, piping class specification, size, and insulation type and thickness;
    f. piping specification breaks and insulation limits;
    g. all control and manual valves numbered;
    h. relief valves with size and set points; and
    i. drawing revision number and date.

31. **Prior to construction of final design**, Trans-Foreland 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.

32. **Prior to construction of final design**, Trans-Foreland shall file a car seal philosophy and a list of all car-sealed and locked valves consistent with the P&IDs.

33. **Prior to construction of final design**, Trans-Foreland shall file the safe operating limits (upper and lower), alarm and shutdown set points for all instrumentation (e.g., temperature, pressures, flows, and compositions).

34. **Prior to construction of final design**, Trans-Foreland shall file cause-and-effect matrices for the process instrumentation, fire and gas detection system, and emergency shutdown system. The cause-and-effect matrices shall include alarms and shutdown functions, details of the voting and shutdown logic, and set points.

35. **Prior to construction of final design**, Trans-Foreland shall specify that all emergency shutdown valves are to be equipped with open and closed position switches connected to the DCS/SIS.

36. **Prior to construction of final design**, Trans-Foreland 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).

37. **Prior to construction of final design**, Trans-Foreland shall include LNG tank fill flow measurement with high flow alarm.

38. **Prior to construction of final design**, Trans-Foreland 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.

39. **Prior to construction of final design**, Trans-Foreland shall file the sizing basis and capacity for the final design of the pressure relief valves for major process equipment and vessels.

40. **Prior to construction of final design**, Trans-Foreland shall file vent stack design information showing that it could handle the maximum vapor loads during ship unloading operations when the BOG compression system is not available and would not result in flammable vapors reaching ignition sources and areas that would cause cascading damage. Alternatively, Trans-Foreland shall file procedures to cease LNGC unloading operations when the BOG compression system is not available.

41. **Prior to construction of final design**, Trans-Foreland shall locate the inlet emergency shutdown valve 10 feet from the trim vaporizer module.

42. **Prior to construction of final design**, Trans-Foreland 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 (2001). The justification for flammable and combustible gas detection shall take into account the set points, voting logic and degradation logic, wind speeds, and wind directions and flame and heat detection systems shall account for coverage of all project facilities containing flammable or combustible fluids. The justification for firewater shall provide evaluation of the total area that may experience firewater demand due to each governing scenario; calculations for all firewater

demands (including firewater coverage on the LNG storage tanks) based on design densities, surface area, and throw distance as well as specifications for the corresponding hydrant and monitors needed to reach and cool equipment.

43. **Prior to construction of final design**, Trans-Foreland shall file final electrical classification drawings, including cross-sectional drawings, for all Project equipment and buildings. The drawings shall demonstrate compliance with NFPA 59A, NFPA 70, NFPA 497, and API RP 500, or equivalents. In addition, the electrical area classification drawings shall specify the trim vaporizer module as Class 1 Division 1 per USDOT PHMSA's vaporizer spacing equivalency determination.

44. **Prior to construction of final design**, Trans-Foreland shall file final ventilation details and calculations for project buildings to demonstrate the design meets recommended and generally accepted good engineering practices, such as NFPA 59A, NFPA 70, NFPA 497, and API RP 500.

45. **Prior to construction of final design**, Trans-Foreland 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 (2001).

46. **Prior to construction of final design**, Trans-Foreland 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.

47. **Prior to construction of final design**, Trans-Foreland 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, shutdown functions of the hazard detection equipment, and manufacturer and model.

48. **Prior to construction of final design**, Trans-Foreland shall file a technical review of facility design that:

    a. identifies all combustion/ventilation air intake equipment and the elevation and 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.

49. **Prior to construction of final design**, Trans-Foreland shall file a design that includes hazard detection suitable to detect high temperatures and smoldering combustion products in electrical buildings.

50. **Prior to construction of final design**, Trans-Foreland 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 would be accessible during an emergency.

51. **Prior to construction of final design**, Trans-Foreland 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 by tag number of all fixed, wheeled, and hand-held extinguishers and shall demonstrate the spacing of extinguishers meet prescribed NFPA 10 travel distances. The list shall include the equipment tag number, type, capacity, equipment covered, discharge rate, and automatic and manual remote signals initiating discharge of the units and shall demonstrate they meet NFPA 59A.

52. **Prior to construction of final design**, Trans-Foreland shall file a design that includes clean agent systems in each electrical building that serve safety and security systems.

53. **Prior to construction of final design**, Trans-Foreland shall file drawings and specifications for the structural passive protection systems demonstrating protection of the new and existing equipment and supports from cryogenic releases from the project facilities.

54. **Prior to construction of final design**, Trans-Foreland shall file calculations or test results for the structural passive protection systems demonstrating protection of the new and existing equipment and supports from cryogenic releases from the project facilities.

55. **Prior to construction of final design**, Trans-Foreland shall file drawings and specifications for the structural passive protection systems demonstrating protection of the new and existing equipment and supports from pool and jet fires from the project facilities.

56. **Prior to construction of final design**, Trans-Foreland shall 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 and jet fires that could cause failure of the component. A combination of passive and active protection for pool fires and passive and/or active protection 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 would mitigate the heat absorbed by the vessel.

57. **Prior to construction of final design**, Trans-Foreland shall file an evaluation showing that overpressures from vapor cloud explosions would not cause or would be mitigated from causing cascading damage onto occupied buildings, pressure vessels, LNG storage tanks, and emergency equipment.

58. **Prior to construction of final design**, Trans-Foreland shall file specifications and drawings demonstrating how cascading damage of transformers would be prevented (e.g., fire walls or spacing) in accordance with NFPA 850 or equivalent.

59. **Prior to construction of final design**, Trans-Foreland shall file facility plan drawings showing the proposed location of the firewater systems. Plan drawings shall clearly show the location of firewater piping, post indicator valves, and the location and area covered by, each monitor, hydrant, hose, deluge system, and sprinkler. The drawings shall also include piping and instrumentation diagrams of the firewater systems.

60. **Prior to commissioning**, Trans-Foreland 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. Trans-Foreland shall file documentation certifying that each of these milestones has been completed **before** authorization to commence the next phase of commissioning and startup will be issued.

61. **Prior to commissioning**, Trans-Foreland 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.

62. **Prior to commissioning**, Trans-Foreland shall file the procedures for pressure/leak tests which address the requirements of ASME BPVC Section VIII and ASME B31.3. In addition, Trans-Foreland shall file a line list of pneumatic and hydrostatic test pressures.

63. **Prior to commissioning**, Trans-Foreland 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.

64. **Prior to commissioning**, Trans-Foreland shall file updates to the operation and maintenance procedures and manuals, as well as safety procedures, which cover the receipt of LNG into the facility.

65. **Prior to commissioning**, Trans-Foreland shall tag all equipment, instrumentation, and valves in the field, including drain valves, vent valves, main valves, and car-sealed or locked valves.

66. **Prior to commissioning**, Trans-Foreland shall file a plan to maintain a detailed training log to demonstrate that operating, maintenance, and emergency response staff have completed the required training.

67. **Prior to introduction of hazardous fluids**, Trans-Foreland 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.

68. **Prior to introduction of hazardous fluids**, Trans-Foreland shall complete and document a firewater monitor and hydrant coverage test. The actual coverage area from each monitor and hydrant shall be shown on facility plot plan(s).

69. **Prior to introduction of hazardous fluids**, Trans-Foreland shall complete and document clean agent acceptance tests.

70. **Prior to introduction of hazardous fluids**, Trans-Foreland 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.

71. **Prior to introduction of hazardous fluids**, Trans-Foreland shall file an updated emergency response plan that includes the Project facilities. The emergency response plan updates shall be coordinated with federal, state, and local agencies and neighboring facilities and shall include processes and procedures to be used in the event of an incident at the Kenai LNG Plant or neighboring facilities.

72. Trans-Foreland shall file a request for written authorization from the Director of OEP, or the Director's designee, **prior to receiving the first LNGC**. Problems of significant magnitude encountered during or after unloading of the first LNGC, including during any commissioning activities, shall be reported to the FERC **within 24 hours**.

73. **Prior to receiving the first LNG cargo**, including any commissioning cargoes, Trans-Foreland shall file a request for authorization from the Director of OEP, or the Director's designee. 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 Trans-Foreland or other appropriate parties.

74. **Prior to commencement of service**, Trans-Foreland shall notify FERC staff of any proposed revisions to the security plan and physical security of the plant.

75. **Prior to commencement of service**, Trans-Foreland shall label piping with fluid service and direction of flow in the field, in addition to the pipe labeling requirements of NFPA 59A (2001).

76. **Prior to commencement of service**, Trans-Foreland shall provide updates addressing the import of LNG and project facilities, in the plans for any preventative and predictive maintenance program that performs periodic or continuous equipment condition monitoring.

In addition, conditions 77 through 79 shall apply <u>throughout the life</u> of the Kenai LNG facility.

77. 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, Trans-Foreland 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.

78. **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., ship 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 tank, 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 FERC staff with early notice of anticipated future construction/maintenance at the LNG facilities.

79. Significant non-scheduled events, including safety-related incidents (e.g., LNG, condensate, refrigerant, or natural gas releases; fires; explosions; mechanical failures; unusual over pressurization; and major injuries) and security-related incidents (e.g., attempts to enter site, suspicious activities) shall be reported to FERC staff. In the event 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 FERC staff **within 24 hours**. This notification practice shall be incorporated into the liquefaction 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, or the Director's designee, has delegated authority to take whatever steps are necessary to ensure operational reliability and to protect human life, health, property, or the environment, including authority to direct the LNG facility to cease operations. Following the initial company notification, FERC staff would determine the need for a separate follow-up report or follow up in the upcoming **semi-annual** operational report. All company follow-up reports shall include investigation results and recommendations to minimize a reoccurrence of the incident.

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