ARCTIC LNG 2 PROJECT

ENVIRONMENTAL, SOCIAL AND HEALTH IMPACT ASSESSMENT

PART 4

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ACRONYMS AND ABBREVIATIONS

AANII	Arctic and Antarctic Research Institute
AEPS	Arctic Environmental Protection Strategy
AEWA	African-Eurasian Migratory Waterbirds
AGRU	Acid Gas Removal Unit
AIDS	Acquired Immune Deficiency Syndrome
AIIB	Asian Infrastructure Investment Bank
AIS	Automatic Identification System
ALP	Artificial Land Plot
AMAP	Arctic Monitoring and Assessment Programme
AoI	Area of Influence
AP	Action Plan
AS	Anionic Surfactants
AWOU	Automated Wireless Observer Unit
AZRF	Arctic Zone of Russian Federation
BAP	Benz[a]pyrene, Biodiversity Action Plan
BAT	Best Available Technologies
BCC	Biodiversity Conservation Centre
BIMS	Brash Ice Management System
BOD	Biochemical Oxygen Demand
CAFF	Conservation of Arctic Flora and Fauna
CDP	Carbon Disclosure Project
CGTP	Complex Gas Treatment Plant
CIA	Cumulative Impact Assessment
CIS	Commonwealth of Independent States
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CL	Combustible Liquids
CMP	Construction Management Plan
CNODC	China National Oil and Gas Exploration and Development Company
CNOOC	China National Offshore Oil Corporation
CNPC	China National Petroleum Corporation
COD	Chemical Oxygen Demand
CPS	Compressor Pumping Station
CRA	Cryogenic Risk Assessment
CRZ	Conservation Reserve Zone
CS	Compressor Station
DCA	Detrended Correspondence Analysis
DCM	Dispersion Calculation Methods
DEGP&HP	Dangerous Exogenous Geological Processes and Hydrological Phenomena

DPP	Diesel Power Plant
DPRR YNAO	Department of Natural Resources of YNAO
DWW	Drilling Wastewater
E&RA	Evacuation and Rescue Analysis
EBRD	European Bank for Reconstruction and Development
EBSA	Ecologically and Biologically Significant Areas
ECA	Export Credit Agency
EDPS	Emergency Diesel Power Station
EEZ	Exclusive Economic Zone
EGP	Exogenous Geological Process
EHS	Environmental, Health, and Safety
EIA	Environmental Impact Assessment
EP	Equator Principles
EPDR	Emergency Prevention, Preparedness and Response
EPF	Early Phase Facilities
EPFI	Equator Principles Financial Institutions
ERA	Explosion Risk Analysis
ERC	Emergency Response Centre
ERIS	Effluents Re-Injection Site
ESHIA	Environmental, Social and Health Impact Assessment
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
ESMS	Environmental and Social Management System
ESP	Environmental and Social Policy
ESS	Environmental and Social Standards
ESSA	Emergency Systems Survivability Analysis
EU	European Union
EWE	Extreme Weather Events
FAF	Federal Agency for Fishery
FC	Field Camp
FEED	Front-end Engineering Design
FPIC	Free, Prior, and Informed Consent
FRA	Fire Risk Analysis
FSBSI	Federal State Funded Research Institution
FWCC	Federal Waste Classification Catalogue
GBIF	Global Biodiversity Information Facility
GBS	Gravity-Based Structures
GFN	Good Faith Negotiation
GGN	Gas-Gathering Network

GHG	Greenhouse Gases
GIIP	Good International Industry Practice
GIS	Geographical Information System
GN	Hygiene Standards
GOST	State Specific Standard
GPH	Good Practice Handbook
GRP	Gross Regional Product
GT	Gas Turbine
GTCPP	Gas Turbine Compressor Power Plant
GTG	Gas Turbine Generator
GTPP	Gas Turbine Power Plant
GWP	Gas Well Pad
HADCRUT4	Hadley Centre and University of East Anglia
HAZOP	HAZard and Operability
HC	Hydrocarbons
HFL	Highly Flammable Liquid
HIF	Hazardous Industrial Facilities
HIV	Human Immunodeficiency Virus
HNS	Hazardous and Noxious Substances
HOB	Hydrocarbon-Oxidizing Bacteria
HRA	Health Risk Assessment
HSE	Health, Safety & Environmental
HSES	Health, Safety, Environmental and Social Protection
HVAC	Heating, Ventilation and Air Conditioning
ICAO	International Civil Aviation Organisation
ICAO	International Civil Aviation Organisation
ICES	International Council for the Exploration of the Seas
ICP	Informed Consultation and Participation
IEM	Industrial Environmental Monitoring
IEMC	Integrated Emergency Management Course, Industrial Environmental Monitoring and Control
IEP	Integrated Environmental Permit
IFC	International Financial Corporation
IFI	International Financial Institutions
ILO	International Labour Organisation
IMO	International Maritime Organization
IMS	Integrated Management System, Ice Management System
IPCC	Intergovernmental Panel on Climate Change
IPDP	Indigenous People Development Plan
ISPN	Indigenous Small-Numbered Peoples of the North

ITS	Information and Technical Reference Documents
ITSO TB	Transport Safety System Facilities
IUCN	International Union for Conservation of Nature
JBIC	Japan Bank for International Cooperation
JOGMEC	Japan Oil, Gas and Metals National Corporation
KBA	Key Biodiversity Areas
KOT	Key Ornithological Territories
LA	License Area
LDAR	Leak Detection and Repair
LEM	Local Environmental Monitoring
LEPM	List of Environmental Protection Measures
LFG	Liquefied Flammable Gases
LLC	Limited Liability Company
LNG	Liquefied Natural Gas
LOC	Loss of Containment
LTS	Low-Temperature Sepatration
MAC	Maximum Allowable Concentrations
MAE	Maximum Allowable Emission
MAL	Maximum Allowable Levels
MARPOL	International Convention for the Prevention of Pollution from Ships
MDEA	Methyldiethanolamine
MIA	Ministry of Internal Affairs
MMC	Marine Mammal Council
MPC	Maximum Permissible Concentrations
MTPA	Million Tonnes Per Annum
NLR	Northern Latitudinal Railway
NSR	Northern Sea Route
NTS	Non-technical Summary
OBM	Oil-Based Clay Drilling Mud
OCC	Operations control Complex
OCS	Operations Control System
OEC	Operational Environmental Control/Monitoring
OECD	Organization for Economic Cooperation and Development
OGCF	Oil-Gas Condensate Field
OHS	Occupational Health and Safety
OSCY	Offshore Superfacility Construction Centre
OSPAR	Convention for the Protection of the Marine Environment of the North-East Atlantic
OSPRP	Oil Spill Prevention and Response Plan
OST	Industry Specific Standard

PAH	Polyaromatic Hydrocarbons
PAME	Protection of the Arctic Marine Environment
PCB	Polychlorinated Biphenyls
PFHI	Publicly Funded Health Institution
PGTP	Primary Gas Treatment Plant
PHN	Content of Phenols
PJSC	Public Joint Stock Company
POL	Petroleum, Oil and Lubricants
PR	Permafrost Rocks
PS	Performance Standard, Project Standards
PSR	Project Specific Requirements
PSZ	Protective Sanitary Zones
PTS	Package Transformer Substation
QRA	Quantitative Risk Assessment
RC	Reinforced Concrete
RCIA	Rapid Cumulative Impact Assessment
RD	Reference Documents
RF	Russian Federation
SanPiN	Sanitary-Epidemiological Rules and Norms
SC	Startup Complex
SCWQI	Specific-Combinatorial Water Quality Index
SDM	Spent Oil-Based Clay Drilling Mud
SDWG	Sustainable Development Working Group
SEP	Stakeholder Engagement Plan
SGC	Stabilized Gas Condensate
SIL	Safety Integrity Level
SMCIW DS	Solid Municipal, Construction and Industrial Waste Disposal Site
SNiP	Civil Engineering Norms and Rules
SOLAS	International Convention for the Safety of Life at Sea
SP	Code of Rules
SPI	State Public Institution
SPNA	Specially Protected Natural Areas
SPZ	Sanitary Protection Zone
SR	Scoping Report
STD	Sexually Transmitted Diseases
STF	Sewage Treatment Facility
STGCF	South-Tambey Gas-Condensate Field
STL	Seasonally Thawed Layer
TAC	Temporary Accommodation Camp

TEA	Turbo-Expanding Assembly
TFCD	Task Force on Climate-Related Financial Disclosures
TLC	Takeoff-Landing Cycle
TPS	Territorial Planning Scheme
TRTF	Transmitting Radiotechnical Facilities
TS	Topside Structures
TSF	Temporary Site Facilities
TTS	Thermal Treatment System
UNCLOS	United Nations Convention on the Law of the Sea
UNECE	United Nations Economic Commission for Europe
UNEP	United Nations Environmental Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
URZ	Use-restricted Zone
USA	United States of America
USSR	Union of Soviet Socialist Republic
VEC	Valuable Environmental and Social Components
VOC	Volatile Organic Compounds
WBM	Water-Based Clay Drilling Mud
WITF	Water Intake and Treatment Facilities
WPZ	Water Protection Zone
WTF	Water Treatment Facilities
WWF	World Wildlife Fund
WWTP	Wastewater Treatment Plant
YNAO	Yamalo-Nenets Autonomous Okrug

BASIC TERMS AND DEFINITIONS

Customer, Company	Arctic LNG 2, LLC
Consultant	Ramboll CIS LLC, an independent environmental and social consultant
Project Operator	The organization responsible for managing the project at the construction, commissioning, operation and decommissioning phases (Arctic LNG 2, LLC)
Stakeholders	Persons or groups directly or indirectly affected by the Planned activity, as well as those who may be interested in its implementation and / or are able to influence it in a favorable or unfavorable way
GBS LNG & SGC Plant (Complex)	The gravity-based structure Complex for production, storage and offloading of liquefied natural gas and stabilised gas condensate, which includes three process trains and onshore infrastructure
Process Train	The gravity-based structure Complex will include three process trains for the production, storage and offloading of liquefied natural gas (LNG) and stabilised gas condensate (SGC) with a stated annual capacity of about 6.6 million tons of LNG each. The total peak capacity of SGC production can be as much as 1.6 million tons per year
Associated facilities	Facilities that meet the following conditions: 1) they are not funded by the Project (by the planned activity); 2) they would not be built or expanded without the Project (the Planned activity fails to be implemented); 3) they ensure the viability of the Project (Planned activity)
Arctic LNG 2 Project (Project)	The Project, including, along with the GBS LNG & SGC Plant construction of the Utrenniy Terminal (Port) and development of the Salmanovskoye (Utrenneye) oil and gas condensate field (OGCF) (Project Operator – 'Arctic LNG 2' LLC)
Utrenniy Terminal (Port)	A section of the Sabetta seaport, the purpose of which is to provide offshore logistics for gas carriers and tankers for LNG and SGC offloading, reception and storage of processing and construction cargo
Salmanovskiy (Utrenniy) license area	A subsoil plot of federal importance, including the Salmanovskoye (Utrenneye) oil and gas condensate field, within which Arctic LNG 2 LLC was licensed to use the subsoil resources – License No. CFL 15745 NE dated 06.20.2014 for the exploration and production of hydrocarbons
Field	Facilities and activities involved in setting up the Salmanovskoye (Utrenneye) OGCF to ensure production and preparation of raw materials for production of LNG and SGC, and providing engineering resources to all the facilities of the Arctic LNG 2 Project
Principles of the Equator	The internationally accepted environmental and social risk management system for financial organizations, including 10 key provisions (principles)[1]
IFC Performance Standards	A set of environmental and social sustainability requirements of the International Finance Corporation which the organizations to be funded must follow throughout the lifecycle of an investment project. Available at: http://www.ifc.org/performancestandards

[1] The Equator Principles. A financial industry benchmark for determining, assessing and managing environmental and social risk in projects. The Equator Principles Association, 2019.

Environmental, social and health impact assessment (ESHIA)	In the IFC terminology, the process of identifying, predicting and assessing the significance of favorable (positive) and adverse (negative) environmental and social project impacts, including a description of the project implementation conditions, analysis of alternative options for the Planned activity, consideration of global, transboundary and cumulative impacts including their possible quantitative representation, an impact management programme. In the terminology of the International Association for Impact Assessment (IAIA[2]) - the process of identifying, predicting, assessing and mitigating environmental and social impacts, as well as other adverse effects of the Planned activity, before making a decision on its implementation
Planned activity's (Project's) area of influence[4]	The land and water area, including: 1) land plots and water area sections, within which the Planned activities are directly implemented; 2) other land and water areas used or controlled by the Project's operator and its subcontractors (contractors); 3) land and water areas where the associated facilities are sited (see the corresponding definition); 4) land and water areas that may be subjected to cumulative impacts from the Planned activity; 5) land and water areas potentially affected by impacts from unplanned but predictable developments caused by project-related activities that may occur later or at a different location. The Project's area of influence does not include the area of dispersion of impacts which can be observed with a no-project version (abandonment of the Planned activity) or without the Project
The area of influence of air pollutant emission sources[5]	For a sole air pollutant emission source it is the circumference of the largest of the two radii, the first of which is equal to ten times the distance from the source to the point of the ground level concentration of the pollutant having the greatest prevalence (among the pollutants emitted by this source), and the second one is equal to the distance from the emission source to the most distant contour line of the ground level concentration of the pollutant, equal to 0.05 one time MPC. For the totality of air pollutant emission sources it is land or water areas that include all single source influence areas within this totality, as well as the 0.05 one time MPC contour for the estimated total concentration of each pollutant emitted by the totality of sources
Areas with controlled habitat quality indicators	Areas, where the existing hygienic air standards for chemical, biological and physical factors must be strictly followed. These include areas such as residential development, cottage development, sports and children's playgrounds, landscape and recreational areas, recreation areas, resorts, sanatoriums, rest homes; horticultural partnerships, collective or individual dachas and garden plots; sports facilities; educational and childcare facilities; general medical treatment and rehabilitation facilities
Social impact area	Areas and communities that may experience positive and negative impacts of the planned (project related) and associated activities

[2] Global leader among best practice networks as regards impact assessment for informed decisions concerning policies, programs, plans, and projects (http://www.iaia.org/).

[4] The definition is consistent with the IFC terminology (IFC Policy & Performance Standards and Guidance Notes. Glossary and Terms - http://www.ifc.org/). In this and all other common cases, the term "project" is a traditional synonym of the phrase "planned activity". As applicable to the ESHIA subject, the term **Project** (capitalized in the text) covers the activity under assessment designated as "Arctic LNG 2" to include Salmanovskoye (Utrenneye) OGCF **Facilities Setup**, construction and operation of the GBS LNG & SGC Plant (LNG **Complex)**, and construction and operation of the **Port** (Utrenniy Terminal).

[5] In the terminology of MRR-2017 (Dispersion Modeling of Harmful Air Pollutants. Approved by the Russian Ministry of Nature Order 273 dated June 006, 2017).

11. DECOMMISSIONING

The actual length of the Project life will eventually depend on availability of hydrocarbon resources. The existing license for exploration and production activities within the Salmanovskiy (Utrenniy) subsoil area is issued for the period of 100 years (till 2120). The known reserves of natural gas and gas condensate in the Salmanovskoye (Utrenneye) OGCF are sufficient for 16-years operation of the Plant at full capacity. On the other hand, the ongoing exploration activities inform regular updates of the estimation of the reserves and other parameters of the field, and the LA boundaries are revised accordingly; therefore, the Company assumed that the Salmanovskoye (Utrenneye) OGCF provides a sufficient resource base for the whole design life of the Project.

The artificial land plot (ALP) to be created for the Port and Plant on the coast of the Ob Estuary will have a comparable design life – about 100 years.

Service life of the hydraulic structures related to the Port - the ice barriers, drainage channel, and berths – is less than 50 years. The gravity-based structures of the Plant process trains and related LNG and SGC storage tanks are designed for 40-years' service life. At the end of the above period, industrial safety review will either demonstrate their fitness for further safe operation or identify the need for decommissioning, dismantling and disposal.

The Plant topside modules and process piping are designed for a minimum service life of 25 years. Regular inspections during the operation period will identify the need for the equipment repair and/or replacement to extend service life of the modules.

Most of the Field facilities will be gradually decommissioned commensurate with cessation of respective activities - prospecting and production of hydrocarbons, production of soil-based construction materials, use of accommodation camps, roads, etc. On the other hand, some facilities in this category, namely solid wastes treatment and disposal sites, will also be needed during the period of dismantling of other Project facilities (for treatment and disposal of specific types of wastes). Unlike other permanent facilities, the waste disposal sites cannot be completely liquidated at the end of Project: disposal of low-hazard wastes does not allow for their subsequent removal elsewhere, therefore, the technical design should provide for their safe isolation in the landfill cells.

The Field design provides for one waste disposal site which is currently under construction (referred to as "Solid municipal, construction and industrial waste disposal site" in the design documentation). Its capacity (disposal of about 63 thousand tons of wastes) and service life (25 years) are too small for the total quantity of wastes that will remain within the license area. Therefore, the Consultant recommends designing and implementing other solid waste treatment and disposal capacities in the area, a part of which will be designated for acceptance of wastes that result from dismantling of the Project buildings and structures.

Since the Project life cycle will be defined by a complex combination of external and internal factors including industrial and associated development in the area of the Project location, economic environment, socio-economic and environmental conditions (particularly the global changes of climate and World Ocean level), etc. , estimation of the time of decommissioning of specific elements of the Project and associated facilities is not possible at this stage.

11.1 General Approach and Requirements for Decommissioning of the Project and Associated Facilities

Russian law does not require preparation of preservation or demolition (dismantling) design for capital projects at the time of design development for their construction. Such future activities will include preparation of specific design documents preceded by design survey, and the prepared design documents will be subject to the State Expert Review.

Environmental studies at that time will be informed, inter alia, by the environmental monitoring data collected over the period of the facilities operation. The environmental studies for the permanent facilities disposal projects shall include, inter alia, assessment of changes in the natural and industrial environment over the facilities operation period (including those under their influence), assessment of potential environmental deterioration and its effect on health of local communities, assessment of contamination of disposed or moved soil, recommendations for selection of facilities dismantling (demolition) methods, and environmental rehabilitation proposals.

The disturbed land reclamation measures proposed in Annex 9 may be used as an efficient method for reclamation after dismantling of decommissioned buildings and structures, and for restoration of environmental functions of the soil and vegetation cover in the affected area. The operational monitoring data from the post-reclamation areas will be assessed for identification of need for adjustment of technical and biological reclamation design to achieve the best performance and fastest restoration of disturbed land for the original mode of use (reindeer herding and associated activities).

Due to the phased process of commissioning of the Project and associated facilities, and the differences in duration of their service life, the stage of decommissioning and disposal (if necessary) will also be extended in time - from several years to few decades. Certain facilities, in particular the Port, may be left in operation after decommissioning of the Plant. Such decision will be made by the facilities' operators considering the economic benefits of their further use.

In accordance with *IFC EHS Guidelines for Onshore Oil and Gas Development*:

- Wells should be abandoned in a stable and safe condition. The hole should be sealed to the ground surface with cement plugs and any known hydrocarbon zones should be isolated to prevent fluid migration. Water-bearing horizons should also be isolated. If the land is used for agriculture, the surface casing should be cut and capped below plow depth.
- Decommissioning options for pipelines include: 1) leaving them in place, or 2) removing them for reuse, recycling or disposal, especially if they are above ground and interfere with use of the land plots for other purposes. Pipelines left in place should be disconnected and isolated from all potential sources of hydrocarbons; cleaned and purged of hydrocarbons; and sealed at the ends.
- A preliminary decommissioning and restoration plan should be developed that identifies disposal options for all equipment and materials, including products used and wastes generated on site. The plan should consider the removal of surface equipment and facilities, well abandonment, pipeline decommissioning and reinstatement. The plan should be further developed and adjusted during field operations.

In accordance with *IFC EHS Guidelines for Crude Oil and Petroleum Product Terminals:*

- Terminals should have formal procedures to address and manage the planned or unplanned discovery of site decommissioning waste.
- Removal operations of any tanks and connected piping should include the following procedures:
  - Residual fuel should be removed from the tank and all associated pipes and managed as a hazardous waste;
  - Before commencing tank removal operations, the tanks should be inerted so as to remove the risk of explosion.
- All vent pipes and risers associated with the tank should be dismantled and / or capped-off.
- Tank dismantling should be carried out off-site, if the facility is currently used to store fuel and there is not sufficient space to carry out the dismantling work safely.
- If tanks and piping are left in situ, recommended closure methods should include cleaning and removing contents, inerting, and filling with sand and cement slurry, hydrophobic foams, or foamed concrete.

From the perspective of Russian law, most of the demolition (dismantling) operations and subsequent reclamation of the areas under the demolished (dismantled) buildings and structures is regarded as a special type of construction works which does not differ from other types of construction activities in terms of environmental requirements. General regulatory requirements to demolition (dismantling) design of capital projects (other than linear facilities) are listed in p.24 of the Regulation on the Scope of Design Documents and Requirements to their Content (approved by *the RF Government Resolution of 16.02.2008 No.87*). In particular, narrative part of Section 7 "Management plan for demolition (dismantling) of capital projects" shall describe the following:

- Authorizing reference for development of the Management Plan for demolition or dismantling of capital projects;
- List of buildings, structures and facilities of the capital project subject to demolition (dismantling);
- List of measures to be taken for decommissioning of buildings, structures and facilities of the capital project;

- List of measures to be taken to protect buildings, structures and facilities being abandoned from access of persons and animals into the hazardous zone and into the facilities, and to protect vegetation;
- Description and substantiation of the selected method of demolition (dismantling);
- Calculation and substantiation of dimensions of the downfall zones and hazardous areas, as appropriate depending on the adopted method of demolition (dismantling);
- Estimation of probability of potential damage of utility infrastructure by the demolition (dismantling) activities, including damage of operating underground utility networks;
- Description and substantiation of methods of protection and safety arrangements for the utility networks approved by owner of the networks;
- Description and substantiation of safe methods of managing the demolition (dismantling) works;
- List of measures to ensure community safety including alerting and evacuation (if necessary);
- Description of waste removal and disposal schemes;
- List of the site reclamation and landscaping measures (if necessary);
- Information on the communications, structures and facilities that will be left in ground and water after demolition (dismantling); information on availability of state supervision authorities permits for leaving such communications, structures and facilities in ground and water - in situations where such permits are required by Russian law;
- Information on availability of authorities' approvals, including approvals of the state supervision authorities for the technical design for demolition (dismantling) of the facility by explosion, incineration or any other potentially hazardous method; a list of enhanced safety measures in case hazardous methods are used for demolition.

In addition to the narrative part, the graphic part of the design documentation for demolition (dismantling) of capital projects shall be provided in accordance with the following scope:

- Plan view of the land plot and surrounding areas showing the location of the facilities subject to demolition, utility networks, downfall zones and hazardous areas during the period of demolition (dismantling), and storage areas for the dismantled materials, structures, products and equipment;
- Drawings of protection system for utility infrastructure and underground communications;
- Schematic process charts of the sequence of demolition (dismantling) of building structures and equipment.

In accordance with the *Federal Law of 21.07.1997 No. 116-FZ "On industrial safety of hazardous industrial facilities (HIF)"*, documentation for preservation and abandonment of hazardous operational facilities is subject to the state industrial safety expert review. Upgrading, preservation and abandonment of a hazardous industrial facility may not be implemented without an approval from the State Industrial Safety Expert Review Board which should be duly recorded in the Register of conclusions of the State Industrial Safety Expert Review Board, or in case of a hazardous facility upgrading design included in the design package of such facility - without approval of the facility design package by the Expert Review Board.

During implementation of the construction, reconstruction, capital repair, upgrading, preservation or liquidation of a HIF, developers of the respective design documentation provide designer's supervision in accordance with the established procedures.

In accordance with Art. 26 of the *RF Law of 21.01.1992 No. 2395-1 "On Subsoil"*, in case of complete or partial abandonment or preservation of a project or underground facility, the mines or drilled wells should be brought to a state that guarantees health and safety of local communities, protection of the environment, buildings and structures, and in case of suspension - also safety of the mineral deposits, mines and drilled wells for the whole period of preservation

Requirements for suspension and abandonment of wells, wellhead assemblies and bores are established by the Safety Rules in Oil and Gas Industry (*approved by Rostekhnadzor Order of 12.03.2013 No. 101 "On approval of the Federal industrial safety standards and regulations "Safety rules in oil and gas industry").*

In accordance with the above Rules, subsoil user must identify the category under which specific well will be abandoned. Generally, there are four categories of wells subject to abandonment:

- I - wells wilt fulfilled purpose;
- II - wells abandoned for geological reasons;

- III - wells abandoned for technical reasons;
- IV - wells abandoned for technological, ecological, and other reasons.

The wells abandonment documentation shall describe specific decommissioning measures depending on:

- Subsurface conditions of the soil profile, including presence of permafrost;
- Technological state of well;
- Wellhead location in land of different designations and status of nature conservation.

Subsoil user or his representative shall establish a Committee for preparation of the set of well abandonment documentation. The Committee resolution on abandonment of a group of wells (single well) provides the basis for preparation of development of a well-specific Plug and Abandon Plan.

Subsoil user is responsible for annual monitoring of state of wellhead elements of abandoned wells. Inspection intervals are defined by subsoil user, but at least once every two years (for wells abandoned upon completion), and once a year (for wells abandoned in the course of operation). Subsoil user shall provide the necessary workover to address any identified faults or violations of safety regulations for subsoil use, community health and safety, environmental protection, on the basis of work plans prepared by the work performer and approved by the subsoil user.

Wells suspension is conducted in the course of drilling, upon completion, and during operation. Inspection intervals for suspended wells are defined by subsoil users subject to approval by the territorial authority of Rostekhnadzor, but at least once a year (for wells suspended in the course of drilling, upon completion and in the course of operation, where cement plugs are installed), and on a quarterly bases (for wells suspended in the course of operation, if no cement plugs are installed). Results of the inspections must be recorded in special logs.

If, for some reason, duration of well suspension exceeded (or may exceed) the designed term, or a well has been suspended for more than 15 years (well shut-down period is not included in this period), and observations of its state (operational monitoring, industrial safety expert review, state environmental control) indicate a threat to health and safety of human, environment, property, then, on the request of competent state supervision and control authority, or on his own initiative, the subsoil user shall develop and implement further safety measures to prevent the risk of accident, or abandon the well in compliance with the Safety Rules.

The *"Instruction on procedures for abandonment and preservation of hazardous facilities related to subsoil use" (approved by the RF Gosgortekhnadzor Resolution of 02.06.1999 No.33*) defines the procedure of technical abandonment and preservation of hazardous facilities related to subsoil use, and the applicable industrial safety, subsoil protection and environmental protection requirements.

Requirements to preservation and liquidation of hydraulic structures are defined by the *Rules for Preservation and Liquidation of Hydraulic Structures (approved by the RF Government Resolution of 20.10.2014 No.1081 on the approval of the Rules for Preservation and Liquidation of Hydraulic Structures)*.

A minor uncertainty about the future disposal of the Plant and associated facilities is related to waste management: designed service life of the solid municipal, construction and industrial waste disposal site to be constructed within the scope of the Salmanovskoye (Utrenneye) OGCF Facilities Setup is comparable to duration of the Project service life. If the landfill capacity is used up by the time of the Project decommissioning, the waste from demolition of buildings and structures of the Arctic LNG 2 Project would have to be disposed at remote disposal sites, entailing the cost of transportation of waste of significant volume and weight. Extension of service life of the existing waste disposal site appears to be a better alternative, from the technical and logistical perspective. Furthermore, it is currently expected that after the Plant decommissioning and upon disconnection from the onshore infrastructure, the gravity-based structures can be separated from the gravel pad and towed by sea to a remote site. Implementation of this scenario would help to keep the quantity of waste generated at the final stages of the Plant life cycle to the unavoidable minimum. According to the Company, the whole assembly of GBS and topside can be towed to a remote facility for rehabilitation and reuse, or for dismantling. This method is considered as the most probable solution for the final stage of the Project life cycle.

11.2 Decommissioning of the Plant Process Trains

Considering that decommissioning the Plant Process Trains is expected in the remote future, it is not possible to establish all details of the process at this stage, due to a wide range of causes and inherent uncertainties, including the following:

- Regulatory framework and legislative requirements may change by the time of decommissioning and disposal of the designed facilities;
- Lack of knowledge of the Project development and its state by the end of the life cycle;
- New technologies and methods of preservation and disposal may be developed by the time of decommissioning of the designed facilities, including on the basis of experience of similar industrial facilities.

Actual procedures of the preservation and decommissioning can be described and arranged in the form of a high-level plan to be developed with due regard to provisions of the national legislation of the Russian Federation, laws of the Constituent Entity, and considering the good international industry practice (GIIP) applicable at the time of the planned closure of the Project. The latter is provided in particular in the MFC Standards. In accordance with the above principles, a project decommissioning and closing down (preservation) process would normally include the following activities:

- Development of a Risk Management Strategy to protect community against physical, chemical and other risks associated with decommissioning;
- Assessment of feasibility of further use of the emptied and cleaned structures, facilities and equipment in order to identify the best solution from socio-economic perspective, in compliance with applicable contemporary industry practice (international and local);
- Further survey for assessment of environmental pollution caused by the Project facilities and infrastructure, and development of reinstatement plan to restore the original state in accordance with international best industry practice applicable at the time;
- Safe phased shutting down of the production/technological processes;
- Removal of liquid and solid products/wastes and sending them for treatment and recycling/disposal; for the pipelines, tanks and process vessels – further washing and cleaning to remove residual petroleum products and other process liquids and wastes;
- Dismantling and removal of decommissioned above-ground and underground vessels and piping.

In accordance with IFC EHS Guidelines for Offshore Oil and Gas Development, offshore structures e.g. platforms should be decontaminated and, in most cases, removed, whereas other operational components should be detoxicated and left in place. In accordance with the international practice, monitoring programmes should be developed and implemented in relation to the gravity-based structures which are completely or partially left in place, considering the time period needed for natural decay of the structures in water.

The following requirements of the national legislation listed above (in Section 11.1) may be applied. In accordance with the "*Rules for creation, operation and use of artificial islands, structures and installations in the internal marine waters and territorial sea of the Russian Federation" (approved by the RF Government Resolution of 19.01.2000 No.44*), any abandoned or unused structures and installations shall be removed (abandoned) by their constructors within the timeframes specified in the permit.

Provisions on regulations on decommissioning of offshore oil and gas platforms may be applied as advisory requirements. In accordance with *GOST R 54483-2011 "Petroleum and natural gas industries. General requirements"*[3], platform decommissioning, preservation and dismantling measures should be considered at the stage of design development.

These works consist of the following main stages:

- Offshore survey as necessary;
- Inspection of the platform equipment and structures;

[3] A modified version of international standard ISO 19900:2002 Petroleum and natural gas industries - General requirements for offshore structures). This standard is only applicable to fixed oil and gas producing platforms (except for jack-up drilling rig and artificial islands)

- Development and approval of solutions for the platform equipment and structures decommissioning, preservation and dismantling;
- Decommissioning of the platform;
- Platform preservation and dismantling;
- Transportation of dismantled platform to the disposal or storage site;
- Acceptance of the completed works.

Selection and justification of the method of the platform decommissioning, preservation or dismantling shall consider the following:

- Type of the structure;
- Results of inspection of current status of the equipment and structures;
- Natural and climatic conditions in the work area, including characteristics of the water area;
- Technical equipment available for the work.

The following principles shall form the basis for the platform decommissioning, preservation or dismantling project:

- Engagement of contractors (preferably local) with experience of similar works;
- Use of advanced technologies and methods for the works implementation;
- Assessment and consideration of risks at all stages of the works;
- Ensuring works quality and safety and industrial health;
- Prevention of pollution of the environment.

Considering the uncertainties mentioned above, determination of significance of potential environmental and social impacts of decommissioning and disposal of the designed facilities is not possible at this stage of the Project. However, it is expected that the impacts will be minimized and mitigated to an acceptable level by application of good international industry practice.

Specific solutions related to selection of methods of the Project decommissioning and dismantling will be identified on the basis of the applicable national and international requirements, considering the prevailing environmental, economic and social aspects at the time.

12. TRANSBOUNDARY IMPACTS

12.1 Transboundary Impact Criteria

In accordance with IFC Guidance Note 1[4], transboundary impacts are impacts that extend to multiple counties, beyond the host country of the project, but are not global in nature.

In the Convention on Environmental Impact Assessment in a Transboundary Context (Espoo, 2001[5]), the notion of "transboundary impact" is defined as any impact, not exclusively of a global nature, within an area under the jurisdiction of a Party caused by a proposed activity the physical origin of which is situated wholly or in part within the area under the jurisdiction of another Party.

In accordance with the ESHIA methodology adopted by Ramboll (Chapter 3), transboundary impact is an impact that affects receptors, beyond the boundaries of the country in which the project is located and produces transboundary effects, including global effects.

Location of the Project facilities in relation to the national frontier of the Russian Federation is shown in Figures 12.1 and 12.2. The nearest land frontiers of other countries are located at a distance of 1700-1800 km (Norway and Finland – to the west, Kazakhstan – to the south) from the Project, i.e. at the distance where presence of any predictable impact is unlikely.

In the Arctic Ocean, the width of the territorial sea of the Russian Federation is 12 nautical miles measured from so called "baselines" (Figure 12.2) positions of which are determined in accordance with the criteria established by Article 4 of the Federal Law No.155-FZ "On internal marine waters, the territorial sea and the contiguous zone of the Russian Federation"[6].

Beyond the boundaries of the territorial sea of the RF is the exclusive economic zone (EEZ) where special sovereign rights and jurisdiction is established by Federal Law No. 191-FZ[7]. The width of EEZ is 200 nautical miles (370.4 km) maximum, from the baselines. Considering the limitation of RF sovereignty and legitimacy of activities of other countries in this zone, an impact across the EEZ boundary, in certain situations, may be considered as a transboundary impact, similarly to potential transboundary impacts of activities of foreign vessels or operation of underwater pipelines by foreign companies in the EEZ of RF which may extend to the territorial sea or coastal areas of the Russian Federation.

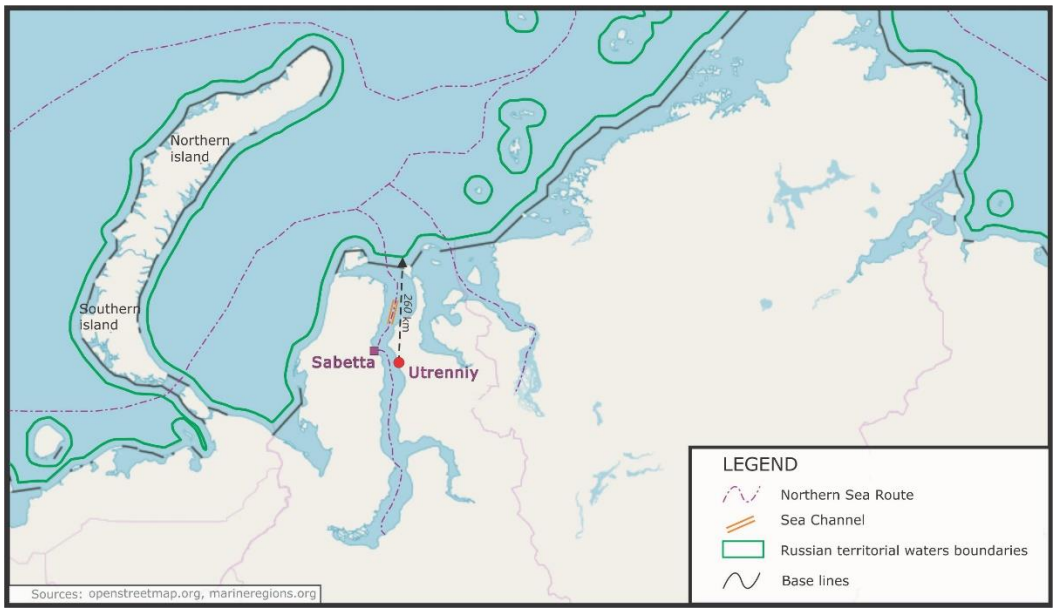
[4] International Finance Corporation's Guidance Notes: Performance Standards on Environmental and Social Sustainability, 2012

[5] The document was signed by the USSR on 06.07.1991 and took effect on 10.09.1997 (not ratified by present)

[6] Federal Law of 31.07.1998 No. 155-FZ "On internal marine waters, the territorial sea and the contiguous zone of the Russian Federation"

[7] Federal Law of 17.12.1998 No. 191-FZ "On the exclusive economic zone of the Russian Federation"

Figure 12.1: Project site location in the transboundary context[8]



[8] Schematic maps in Figures 12.1 and 12.2 are based on the following sources:

Northern Sea Route: Projection (as of September 2017) of the volumes of transportation of mineral resource produced in the Russian Arctic zone by the Northern Sea Route for the period till 2030 (https://arctic-consult.com/archives/7044)

Boundary of the RF Exclusive Economic Zone: Flanders Marine Institute (2018). Maritime Boundaries Geodatabase: Maritime Boundaries and Exclusive Economic Zones (200NM), version 10. Available online at http://www.marineregions.org/ https://doi.org/10.14284/312.

Territorial waters boundary: Flanders Marine Institute (2018). Maritime Boundaries Geodatabase: Territorial Seas (12NM), version 2. Available online at http://www.marineregions.org/ https://doi.org/10.14284/313.

Figure 12.2: Project site location in the transboundary context[5]

12.2 Potential Transboundary Impacts

Considering the circumstances described in Chapter 9, it can be concluded that most impacts of construction and operation of the Arctic LNG 2 Project will not reach beyond the boundaries of Russian jurisdiction.

Impact of transboundary transport of polluting substances in air and water. Certain quantity of pollutants will inevitably be involved in the trans-regional circulation processes in air and water, however significance of its effects is expected to be **negligible**, due to negligible increment of pollution levels beyond the boundaries of Russian jurisdiction. Calculations for the Project facilities (Section 9.1) indicate that size of the area of significant impact on atmospheric air quality will be only few kilometres from the main LNG and SGC production site, while contribution of the planned activities to water pollution in the Ob Estuary will be traceable at a maximum distance of 30-–35 km from the Utrenniy Terminal, whereas distance from the Terminal to the nearest sea border is about 260 km.

One of the most common regional phenomena related to chemical pollution of air is so called "arctic haze" – build-up of pollutants transported by air from middle latitudes. The phenomenon has been observed in the Arctic region over past few decades in the form of smog which typically appears in winter (i.e. it correlates in time with the period of higher intensity of emissions). The arctic haze phenomenon may be caused by circulation of air: air masses are carried from Europe and Siberia through subarctic regions to the north of Canada. Polluting substances persist in air over Arctic for extended time, due to the low temperatures and scarce precipitation. When the temperature increases (in spring and summer), the Arctic air masses are transformed, and a part of polluting substances is settled onto land and ocean surface with atmospheric precipitation. The smog reportedly contains increased concentrations of sulphur oxides, nitrogen and carbon, sulphate, suspended solids, heavy metals, chlorine, and a number of other elements and compounds. Contribution of the Project to this phenomenon is considered to be **negligible**.

The main components of emissions to be considered in the global context are the gases and fumes with greenhouse effect – CO_2, CH_4, N_2O, etc. According to the information provided in Section 9.9, estimated annual quantity of GHG emissions from the Project will be over 100 thousand tons of CO2-e (threshold level for the EP4 reporting), therefore, the emissions are subject to monitoring, records shall be kept, and the emission parameters shall be reported on an annual basis.

Significance of the potential impact of construction and operation of the Project on air and water quality in the Arctic region is assessed as **negligible**.

Assessment of the emergency impacts (Section 9.10) did not reveal any risk of impact beyond the boundaries and territorial waters of Russia in case of unplanned events and emergency situations. In case of a maximum design spill resulting from through loss of containment of SGC tank, thin film of condensate may extend 100 km to the north and south in the Ob Estuary[9].

A relatively higher risk of transboundary pollution of water environment is related to the third-party marine operations, particularly navigation along the Northern Sea Route (NSR), most part of which is located in the international waters (not covered by the ESHIA).– Traffic flows on the Route will grow due to construction and operation of the Project facilities, therefore, impacts of the sea transport and the risks of emergency oil spills and of discharge of liquid and solid wastes to water will inevitably increase. As discussed in Section 5.8, the Arctic LNG 2 Project will increase the number of vessel journeys in the sea channel across the Ob Bar by 53, which is equivalent to about 50% of the total number of vessel journeys for the projects existing by the time of commissioning of the Arctic LNG 2 Project (i.e. Yamal LNG (45 vessel journeys), Obsky LNG (11 journeys), and Arctic Gates (39 journeys)). In 2019, the total volume of transportation on the NSR (including transit cargoes) was about 30 million tons[10]. Cargo flow on the NSR is planned to increase to 80 M ton by 2024[11], and to 160 M ton by 2035. Due to the robust design and personnel skills, modern LNG carriers are highly resilient to external dynamic impacts, particularly when exposed to the ice and iceberg hazards, which is the main contributing factor of their trouble-free service

[9] GBS Plant for production, storage and offloading of liquefied natural gas and stabilised gas condensate. Gravity-based structures. Oil and petroleum products spill prevention and response. Science and Technology Report under Contract No. АСПГ-021/НИ-054/2018 of 01.04.2019 - Moscow: RGC Risk Informatics LLC, 2019. 88 p.

[10] https://fedstat.ru/indicator/51479

[11] RF President Decree of 07.03.2018 No. 204 "On the national targets and strategic development tasks of the Russian Federation for the period till 2024"

during more than 50 years[12]. It should be noted that likelihood of such accidents is very low, and significance of impact during accident-free operation of NSR is assessed as **negligible**.

Receptors of the **transboundary impacts on biodiversity** may include migrating species of birds, fish and marine mammals in the habitats that extend beyond the boundaries of Russian jurisdiction. Among the migrating species that may be present in the Project area, such species are geese, brants, ducks and waders on migration from the nesting grounds on the Gydan Peninsula and Taymyr to the wintering grounds in Europe and Western Asia (refer to Section 7.6). Among the marine mammals with ranges extending beyond the Russian Arctic zone the Project may affect white whale[13] and ringed seal. According to the information provided in Section 9.5, potential impact on migrating birds and marine mammals is assessed as low in significance, with zero transboundary effect.

A special group of environmental impacts of the planned activities which also belong to the category of transboundary impacts is transport of living organisms by marine vessels. The most common ways of such transport are through intake, transportation and discharge of ballast water containing plankton and other organisms by tankers and gas carriers, and transport of living organisms on shells of vessels and other floating craft. Considering the measures applied in accordance with international regulations and ballast water management guidelines, the Project is not expected to cause any significant impact through transboundary transport of invasive species. Potential transboundary impact related to transport of invasive species during shipping activity is assessed as **low**.

12.3 Conclusions

The impact assessment did not identify any potential impacts of the planned activities which could cause significant effects beyond the national borders. Most impacts will be of local scale and will not extend further than few dozen kilometres from source. Contribution of the Project to the regional and global pollution of atmospheric air and the world ocean is assessed as **negligible**, however, it is subject to monitoring and registration, particularly in terms of GHG emissions. No transboundary impact is expected on populations of migrating birds and marine mammals in the habitats that extend beyond the boundaries of Russian Federation.

[12] V. S. Safonov 2018. Modern approach to examining stability (survivability) of LNG carriers under extreme external dynamic impacts Science and Technology Digest "Vesti Gazovoi Nauki" ("Gas Science Newsletter") No.2 (34), 2018. http://vesti-gas.ru/sites/default/files/attachments/vgn-2-34-2018-150-165.pdf

[13] Listed in Annex II on the migratory species of the Convention on the Protection of Migratory Species of Wild Animals.

13. CUMULATIVE IMPACTS

13.1 Introduction

This Chapter provides the Project's Cumulative Impacts Assessment (CIA) covering the environmental and social impacts of the existing and planned activities in the area and nearby.

Cumulative impacts are the impacts that result from the incremental impact, on areas or resources used or directly impacted by the project, from other existing, planned or reasonably defined developments at the time the risks and impacts identification process is conducted (IFC, 2012). The methodology applied for the cumulative impact assessment (CIA) is described in Section 3.6.

13.2 Results of Scoping Phase I – Valuable Environmental and Social Components, Spatial and Temporal Boundaries

The valuable environmental and social components (VECs) were identified by the earlier ESHIA for the Plant (2018) and further clarified by the current Project ESHIA (Chapters 7, 8, Appendix 5) using the new and updated information on the Project facilities (design documentation, EIA materials for the Project facilities, records of the local environmental monitoring (LEM) and operational environmental monitoring and control), and the basic environmental and social data available at the regional level, including updated information on the planned development projects.

Based on the analysis of the scientific research results with a focus on the Gydan Peninsula and the Ob Estuary, the results of public consultations with regard to various facilities of the Arctic LNG 2 Project, as well as consultations with stakeholders during the Plant ESHIA process in 2018, the list was compiled highlighting the issues of concern to the local indigenous population of the Tazovskiy Municipal District and which, at the same time, are being proactively discussed by the scientific community. These include the context of the future comprehensive development of the Gydan Peninsula, the Ob Estuary area and the relevant subsoil areas as follows:

- Adverse changes in the geological environment caused by the extraction of hydrocarbons (including the activation of geodynamic processes over the field extractive area);
- Adverse impact of pollution emissions (including flare units) on atmospheric air quality in the Gyda Tundra;
- Transformation of the Ob Estuary thermohaline structure as a result of widening and operation of the sea channel across the Ob bar;
- Increased turbidity of the Ob Estuary water and surface water bodies of Gydan Peninsula as a result of dredging, underwater dumping of soil and development of soil-based construction materials quarries (increased suspended solids content in water and sediment accumulation rates in the areas of turbidity plumes);
- Chemical pollution of surface water bodies as a result of emergency spills of technical fluids and wastewater discharges;
- Transformation of the species composition and abundance of hydrobionts (primarily ichthyofauna and representatives of the fish food base) in the areas of traditional ISPN fisheries as a result of combined impact of the planned activities;
- Adverse changes in the environment caused by various forms of management of industrial and domestic waste (temporary accumulation, transportation, disposal) as a result of violation of the relevant regulatory requirements and design solutions;
- Loss and fragmentation of terrestrial vertebrate habitats and agricultural lands (pastures) which may undermine natural biodiversity and population of reindeer;
- Degradation of pastures productivity (primarily degradation of reindeer moss resource) and consequential reduction of reindeer population;
- Adverse impacts of vibration and noise from construction and operation of the designed facilities;
- Build-up of conditions supporting degradation of permafrost soil, activation of exogenous geological processes, with resulting disturbance of soil and vegetation cover and increased risk of epizootic outbreak of anthrax;
- Increased community morbidity rates as an integral consequence of the adverse impacts listed above.

Results of Scoping Phase I and Phase II activities which were conducted in accordance with the scoping process described in Section 3.6 are summarized in Appendix 5 . The following VECs were identified for further assessment by the CIA process:

- Atmospheric air;
- Marine environment and habitats (Ob Estuary);
- Ichthyofauna and fish resource;
- Marine mammals;
- Vegetation and natural tundra habitats;
- Geological environment;
- Avifauna (migratory bird species);
- Protected terrestrial mammal species (wild reindeer);
- Land use and traditional activities of indigenous people;
- Health and safety of indigenous people;
- Cultural heritage;
- Priority ecosystem services.

Spatial boundaries of the assessment cover the potential area of influence of the Arctic LNG 2 Project, i.e. mainly within the Tazovskiy Municipal District (so called Gyda and Antipayuta tundras potentially exposed to indirect impact of the Project, as defined in Section 8.3.2 – Project Social Impact Area, Figure 13.8), and the Ob Estuary water area (as defined in Section 15.1, Figure 15.2). Yamal Municipal District which is located on the western shore of the Ob Estuary and does not have a land border with Tazovskiy Municipal District was also considered by the CIA, mainly in the context of potential impact on the Ob Estuary.

13.3 Results of Scoping Phase II - Other Activities and Environmental Drivers

13.3.1 Current, Planned and Future Activities

Identification of the current, planned and potential activities in the CIA area, as well as the prospects for the development of the region to understand the context of the cumulative assessment is based on the analysis of the policy documents related to the development of the study area, as well as information provided by the local self-government authorities in 2018, and in May-June 2020.

By the time of reporting, the following policy documents are applicable for the study area development:

- Long-term socio-economic development concept of the Russian Federation for the period till 2020 (adopted by the RF Government Decree of 17.11.2008 No.1662-r);
- Energy Strategy of the Russian Federation for the period till 2035 (adopted by the RF Government Decree of 09.06.2020 No.1523-r);
- Strategy for Development of the Arctic Zone of the Russian Federation and for National Security Protection for the period until 2020 (approved by the RF President on 20.02.2013);
- National Programme of the Russian Federation "Socio-Economic Development of the Arctic Zone of the Russian Federation" (approved by the RF Resolution of 21.04.2014 No.366);
- Transport Strategy of the Russian Federation for the period till 2030 (adopted by the RF Government Decree of 22.11.2008 No.1734-r);
- The RF Territorial Planning Scheme for the Federal Transport Sector (in terms of railway, air, marine, and inland water transport) and motor roads of federal significance (approved by the RF Government Decree of 19.03.2013 No.384-r);
- The RF Sea Port Infrastructure Development Strategy till 2030 (approved by the Maritime Board at the RF Government on 28.09.2012);
- The Northern Sea Route Infrastructure Development Plan for the period till 2035 (approved by the RF Government Instruction #3120-r of 21.12.2019);
- The RF Inland Water Transport Development Strategy for the period till 2030 (approved by the RF Government Instruction #327-r of 29.02.2016);
- The RF Mineral Resources Development Strategy till 2035 (approved by the RF Government Instruction #2914-r of 22.12.2018);
- Action Plan (Road Map) for Development of Russian Petrochemical Industry for the period till 2025 (approved by the RF Government Instruction No.348-r of 28.02.2019);
- Maritime Activities Development Strategy of the Russian Federation for the period till 2030 (adopted by the RF Government Decree of 30.08.2019 No.1930-r);
- The RF Fisheries Industry Development Strategy for the period till 2030 and Implementation Action Plan (approved by the RF Government Decree of 26.11.2019 No.2798-r);

- The RF Territorial Planning Scheme for the Federal Transport Sector (in terms of the pipeline transport) (approved by the RF Government Decree of 06.05.2015 No.816-r);
- Programme for Integrated Development of Hydrocarbon Deposits in Yamal-Nenets Autonomous Okrug and North of Krasnoyarsk Krai (approved by the RF Ministry of Energy, Order of 10.09.2010 No.441);
- Yamal-Nenets Autonomous Okrug Socio-Economic Development Strategy till 2020 (approved by the YNAO Legislative Assembly, Resolution of 14.12.2011 No.839);
- Yamal-Nenets Autonomous Okrug Socio-Economic Development Strategy till 2030 (Draft), 2018;
- Yamal-Nenets Autonomous Okrug Socio-Economic Development Strategy Implementation Action Plan 2017-2020 (approved by YNAO Government Resolution of 18.09.2017 No.933-P) (revisions as of 11.03.2019);
- YNAO State Programme "Environmental Protection 2014-2024" (with amendments as by 14.02.2020);
- Territorial Planning Scheme (TPS) of the Yamal-Nenets Autonomous Okrug (approved by YNAO Government Resolution of 09.01.2020 No.2-P);
- TPS of Tazovskiy Municipal District (approved by District Duma Resolution of 16.12.2009 No.7-8-91) (revised as of 20.12.2019);
- TPS of Yamal Municipal District (approved by District Duma Resolution of 26.02.2009 No.12) (revised as of 23.12.2015);
- Tazovskiy Municipal District Socio-Economic Development Strategy till 2025 (approved by District Duma Resolution of 28.11.2012 No.9-11-80);
- Tazovskiy Municipal District Investment Passport, 2019;
- Yamal Municipal District Investment Passport, 2019;
- List of priority projects being implemented in the Arctic Zone of the Russian Federation (approved by the RF Government Instruction of 21.04.2016 No. RD-P16-2680);
- Medium and long term Investment Programmes of the key fuel and energy industries (Gazprom, NOVATEK, etc.);
- Notices on public hearings and expert reviews published on official sites of the RF Government, YNAO Administration, Administrations of the Municipal Districts;
- Other public announcements.

The total of 237 hydrocarbon fields have been discovered in YNAO. 89 of them have been developed for production, and 147 fields are under exploration[14] (Figure 13.1).

[14] Draft Yamal-Nenets Autonomous Okrug Socio-Economic Development Strategy till 2030.

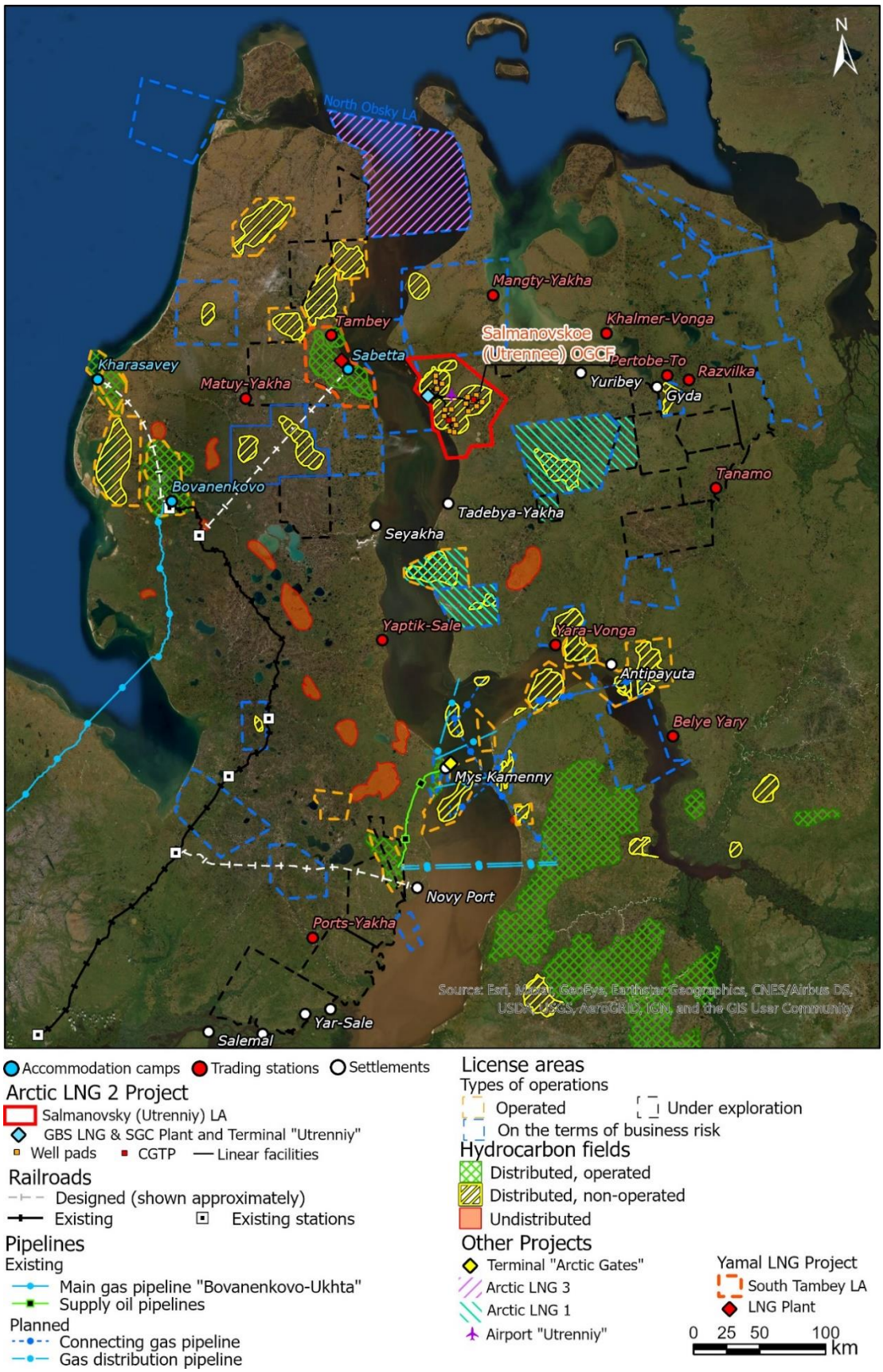


Figure 13.1: Fields and license areas in the north of YNAO[15]

[15] Compiled by Ramboll, sources: Online map of subsoil resources of the Russian Federation, 2020 https://openmap.mineral.ru, Unified Mapping System of the Yamal-Nenets Autonomous Okrug, https://karta.yanao.ru/eks/territorialPlanning

In accordance with the current Arctic Zone Development Programme, the area of the planned activities is a part of the Yamal-Nenets base area for development in Arctic. According to the Programme and the key strategic documents of Russian Government, one of the most promising directions of the country's energy sector is development of petrochemical cluster on the basis of mineral resources of the Yamal Peninsula and Gydan Peninsula, and offshore areas of Kara Sea, Ob and Taz Estuaries.

The key measures contemplated by the new Energy Strategy of the RF till 2035 targeted to develop production and consumption of liquefied natural gas include establishing an LNG production cluster on the Yamal Peninsula and Gydan Peninsula.

Draft of the Yamal-Nenets Autonomous Okrug Socio-Economic Development Strategy till 2030 was published in 2018, and in January 2020 new Territorial Planning Scheme of YNAO was approved. These documents provide for further active development of new oil and gas production hubs at the Bovanenkovskoye, Tambeyskoye and Novoportovskoye fields on the Yamal Peninsula, as well as the Messoyakhskoye field in the north-east and Kamennomysskoye offshore field in the Ob Estuary. The main strategic infrastructure projects in the energy sector that have been commenced or will be launched in the near future include development of the port and transport infrastructure for transportation of liquid hydrocarbons, construction of a system of gas mains for transportation of gas from the fields located in the Ob and Taz estuaries, and further development of gas transportation system on the Yamal Peninsula (Figure 13.1).

Implementation of the Yamal LNG Project will continue, as well as development of a new Russian LNG production centre on the Yamal Peninsula on the resource base of the South Tambey field. Another focus area is development of the fields of the Gydan Peninsula including the Arctic LNG 2 Project comprising three commissioning lines of the LNG plant for 6.6 MTPA each. NOVATEK will continue LNG production using the existing resource base. The resource base available for production of LNG (according to the NOVATEK Strategy till 2030) is shown in Figure 13.2.

Oil production will remain a prospective sector of the region's economy, as the plans provide for increasing production at Vostochno-Messoyakhskoye, Pyakyakhinskoye, Russkoye, Yaro-Yakhinskoye and Novoportovskoye fields.

Most efforts for the region's infrastructure development will be focused on provision of inter-regional transport corridors to unlock the transit potential of the Autonomous Okrug, and to enable uninterrupted year-round communication lines between local settlements and the regional road network, and to connect districts' administrative centres and villages to the motor road system at the regional and/or national level. A major railway investment project will be implemented in the region by year 2024 – the Northern Latitudinal Railway (Obskaya – Salekhard – Nadym – Pangody – Novy Urengoy – Korotchayevo). It is also planned to provide a 169.5 km non-public railway line Bovanenkovo – Sabetta (NLR-2). This project will provide infrastructure to bring the future hydrocarbons production from the fields in the Yamal Peninsula straight to the export channels of the Northern Sea Route via Sabetta Port, while the port will be developed for the function of the anchor point for advancement in the Arctic shelf.

A transport corridor from st. Korotchayevo to Utrenneye field (the Gydan Transport Corridor) will be needed for development of the Gydan Peninsula fields in the future. This corridor will be constructed after 2025, at an early stage of development of deposits of the Bolshekhetskaya Area[16]. This section represents a developing oil and gas production area.

[16] The following fields have been discovered within the Bolshekhetskaya Depression: Nakhodkinskoye, Yuzhno-Messoyakhskoye, Perekatnoye, Pyakyakhinskoye, Khalmerpayutinskoye, Severo-Khalmerpayutinskoye

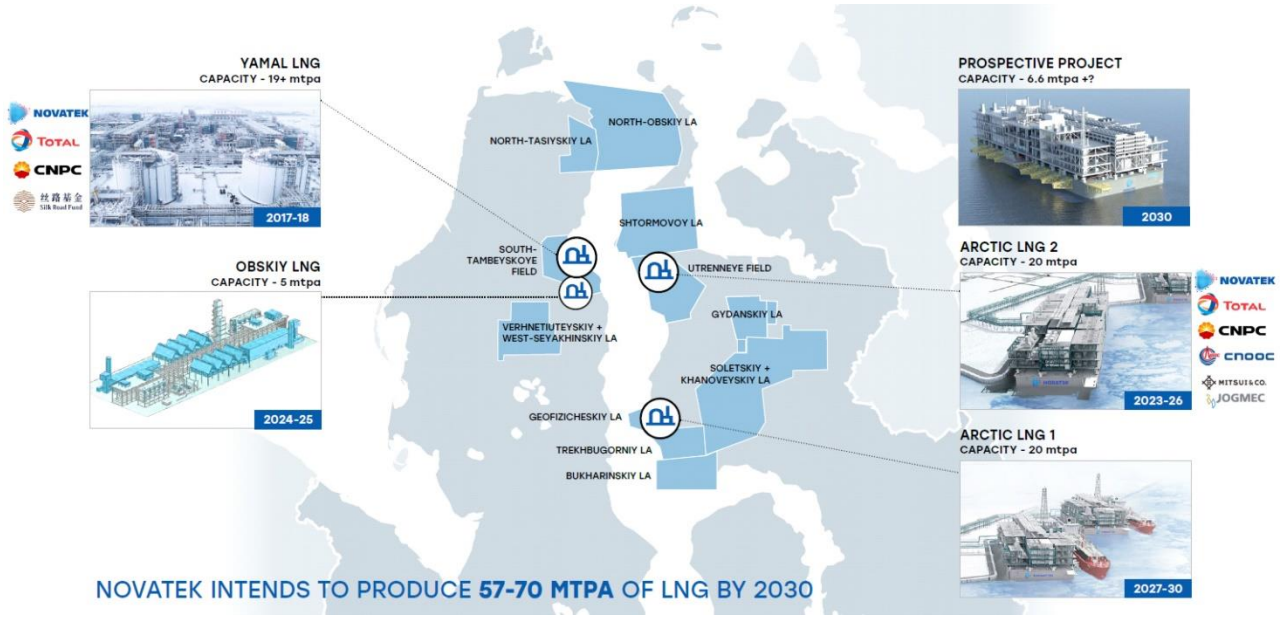


Figure 13.2: LNG production using the available resource base (till 2030)[17]

Brief description of the key regional development projects (existing and planned) that can be considered by CIA is provided in the sections below.

13.3.1.1 Tazovskiy Municipal District

The producing industry and its ancillary infrastructure are extensively developing in the south of Tazovskiy Municipal District, particularly in the major producing fields, such as Zapolyarnoye, Yamburgskoye, Nakhodkinskoye, Russkoye, Vostochno-Messoyakhskoye, Pyakyakhinskoye, Tazovskoye. These areas are located at a significant distance from the Project area - 300-450 km to the south and south-east of the Salmanovskiy (Utrenniy) LA. The main subsoil users in the District are subsidiaries of Gazprom, Lukoil and NOVATEK.

Extensive industrial development of Gydan Peninsula is planned in the mid-term future including Antipayutinskoye, Geofizicheskoye, Ladertoyskoye, Trekhbugornoye, Minkhovskoye, Toto-Yakhinskoye, Zapadno-Messoyakhinskoye, Yuzhno-Messoyakhinskoye, Khalmerpayutinskoye, Severo-Khalmerpayutinskoye, Vostochno-Tazovskoye, Severo-Russkoye, Russkoye, Dorogovskoye, and other fields. Subsoil areas in the Tazovskiy Municipal District of YNAO and adjacent water areas of the Kara Sea allocated for hydrocarbons prospecting, exploration and production in the Project area are listed in Table 13.1.

[17] NOVATEK Strategy till 2030

Table 13.1: Subsoil areas in the Tazovskiy Municipal District of YNAO and adjacent water areas of the Kara Sea allocated for hydrocarbons prospecting, exploration and production[18]

No.	Subsoil areas of federal significance: name and reference to hydrocarbons deposits	Subsoil license			Nature use	Location	Subsoil user
		Reference	Date of registration	Validity period			
Arctic LNG 2 Project							
1	Area including the Salmanovskoye (Utrenneye) oil, gas, and condensate field	СЛХ15745НЭ	20.06.2014	31.12.2120	Hydrocarbons exploration and production (field exploitation)	Territory of Tazovskiy Municipal District and Ob Estuary of Kara Sea	LLC "Arctic LNG 2"
Arctic LNG 1 Project							
2	Area including the Gydan gas field	СЛХ16399НР	26.07.2017	31.12.2044	Geological exploration, including prospecting and appraisal of mineral deposits. Mineral exploration and extraction	Territory of Tazovskiy Municipal District	LLC "Arctic LNG 1"
3	Gydansky 1 Area including a wing of the Gydan Gas field	СЛХ02561НП	27.09.2018	27.09.2025	Geological exploration, including prospecting and appraisal of mineral deposits	Territory of Tazovskiy Municipal District	
4	Trekhbugorniy Area including the Trekhbugornoye and Vostochno-Bugornoye gas fields	СЛХ02423НР	18.12.2014	17.12.2039	Geological exploration, including prospecting and appraisal of mineral deposits. Mineral exploration and extraction	Territory of Tazovskiy Municipal District	
5	Area including the Geofizicheskoye oil, gas, and condensate field	СЛХ15744НЭ	20.06.2014	31.08.2034	Geological exploration, including prospecting and appraisal of mineral deposits	Territory of Tazovskiy Municipal District and Ob Estuary of Kara Sea	
6	Geofizicheskiy 1 area including a wing of the Geofizicheskoye oil, gas, and condensate field under exploration	СЛХ02589НП	13.12.2019	13.12.2026		Territory of Tazovskiy Municipal District	

[18] Referenced sources: Map information resource https://openmap.mineral.ru/, Consolidated National Register of Subsoil Areas and Licenses https://rfgf.ru/license/

No.	Subsoil areas of federal significance: name and reference to hydrocarbons deposits	Subsoil license			Nature use	Location	Subsoil user
		Reference	Date of registration	Validity period			
7	Area including the Soletsko-Khanaveyskoye gas, and condensate field	СЛХ16618НР	25.10.2019	31.10.2046	Geological exploration, including prospecting and appraisal of mineral deposits. Mineral exploration and extraction	Territory of Tazovskiy Municipal District	
8	Bukharinskiy area	No data is available	Q4 2019	No data is available	Geological exploration, including prospecting and appraisal of mineral deposits	Territory of Tazovskiy Municipal District, and water areas of the Ob Estuary and Taz Estuary of Kara Sea	
Arctic LNG 3 Project							
9	Severo-Obskiy area	СЛХ15746НР	20.06.2014	31.08.2041	Geological exploration, including prospecting and appraisal of mineral deposits	Offshore area of the RF, Ob Estuary of Kara Sea	LLC "Arctic LNG 3"
Other subsoil areas used by subsidiaries of NOVATEK							
10	Area including the Shtormovoye gas, Taz condensate field	СЛХ16470НР	05.09.2018	31.12.2047	Geological exploration, including prospecting and appraisal of mineral deposits. Mineral exploration and extraction	Territory of Tazovskiy Municipal District, and water areas of the Ob Estuary and Gydan Estuary of Kara Sea	NOVATEK-YURKHAROV-NEFTEGAS LLC
11	Shtormovoy 1 Area including a wing of the Stormovoye gas Taz condensate field	СЛХ02583НП	09.07.2019	08.07.2026	Geological exploration, including prospecting and appraisal of mineral deposits	Territory of Tazovskiy Municipal District	
12	Vostochno-Tambeyskiy area	ШКМ15201НР	12.09.2011	31.08.2041	Geological exploration, including prospecting and appraisal of mineral deposits. Mineral exploration and extraction	Ob Estuary of Kara Sea	
13	Ladertoyskiy 1 Area including a wing of the Ladertoyskoye gas Taz condensate field	СЛХ02560НП	27.09.2018	27.09.2025	Geological exploration, including prospecting and appraisal of mineral deposits	Territory of Tazovskiy Municipal District	
14	Nyavuyakhskiy area	СЛХ02475НП	30.06.2016	30.06.2023			

No.	Subsoil areas of federal significance: name and reference to hydrocarbons deposits	Subsoil license			Nature use	Location	Subsoil user
		Reference	Date of registration	Validity period			
15	Zapadno-Solpatinskiy area	СЛХ02476НП	30.06.2016	30.06.2023			
16	Ladertoyskiy area	СЛХ02528НР	05.12.2017	17.12.2032	Geological exploration, including prospecting and appraisal of mineral deposits. Mineral exploration and extraction		
17	Tsentralno-Nadoyakhskiy area	СЛХ02538НП	02.04.2018	02.04.2025	Geological exploration, including prospecting and appraisal of mineral deposits		
18	Palkurtoiskiy area	СЛХ02554НП	20.04.2018	20.04.2025			
19	Severo-Tanamskiy area	СЛХ02474НП	30.06.2016	30.06.2023			
Subsoil areas used by other companies							
20	Minkhovskiy Area including the Minkhovskoye and Vostochno-Minkovskoye gas fields	СЛХ02511НР	10.02.2017	06.10.2039	Geological exploration, including prospecting and appraisal of mineral deposits. Mineral exploration and extraction	Territory of Tazovskiy Municipal District	Rosneft Oil Company PJSC

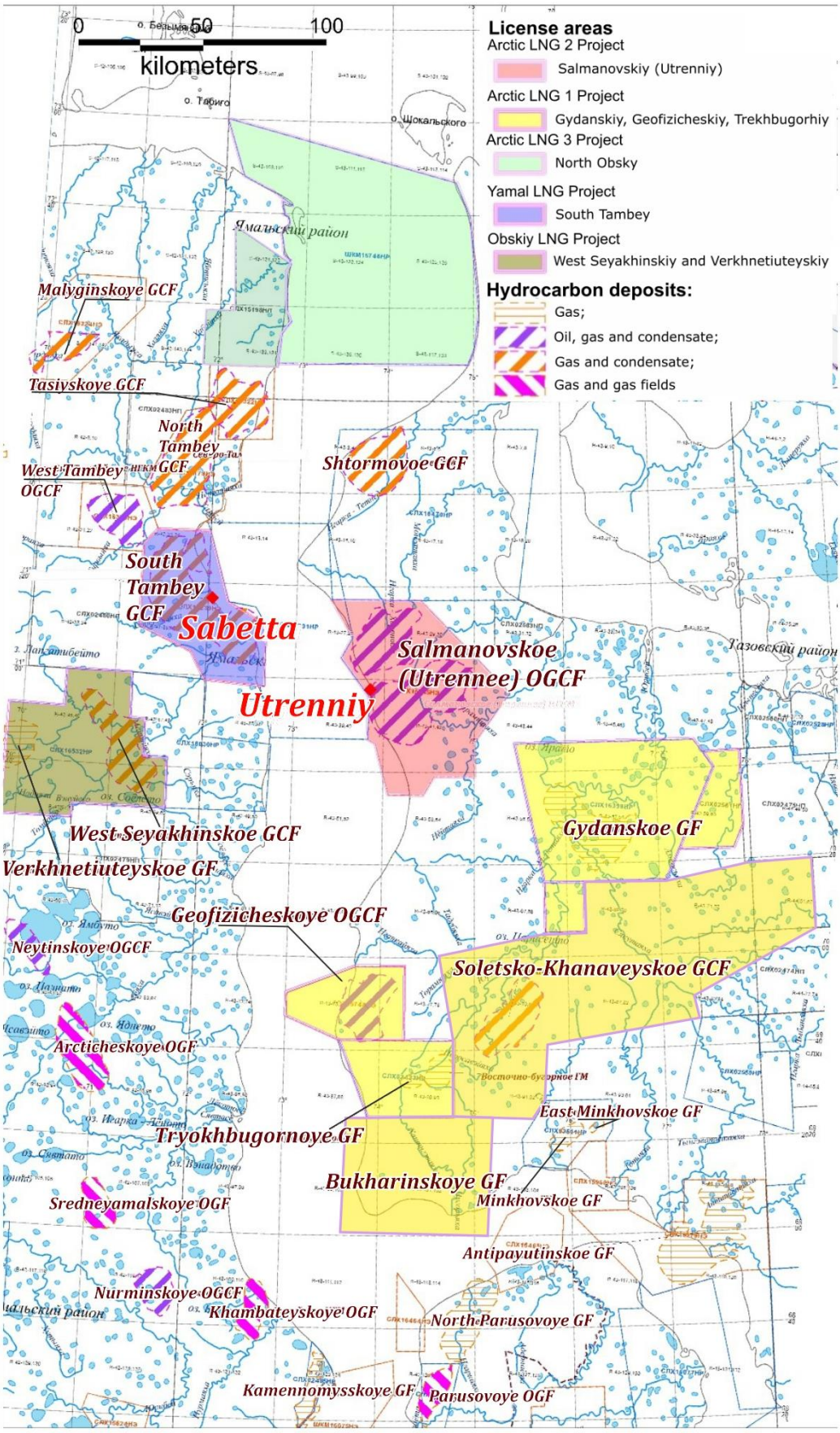


Figure 13.3: Mineral deposits and license areas in the Project area[19]

[19] Compiled by Ramboll, sources: Map information resource https://openmap.mineral.ru/

The nearest fields to the Project area with operations that might potentially cause cumulative effects are Shtormovoye (south of the license area has a boundary with the Salmanovskiy (Utrenniy) LA and Gydanskoye (located to the south-east of the Salmanovskiy (Utrenniy) LA). Distance to the Geofizicheskoye and Ladertoyskoye fields, Nyavuyakhinskiy, Zapadno-Salpatinskiy, Severo-Tanamskiy areas is somewhat longer.

Arctic LNG 1 Project

Geofizicheskoye, Soletsko-Khanaveyskoye, Trekhbugornoye and Gydanskoye fields, and Bukharinskiy area are considered as a resource base for the new LNG project (Arctic LNG 1), with a capacity of 19.8 mtpa to be gradually commissioned starting from 2027[20].

By present, the license areas are at various stages of geological exploration and prospecting. So far, among all potential resource base areas of the Arctic LNG 1 Project, the most accurate exploration data is available on the Geofizicheskoye Field. It is likely that the new LNG Plant will also use feedstock from the Gydanskoye (category C1+C2 reserves - 116 billion m^3, category C3 - 361.472 billion m^3), Soletsko-Khanaveyskoye field (154.7 billion m^3), and Trekhbugornoye field (category C1+C2 reserves - 6 billion m3, category C3 - 126 billion m^3). In late 2019, LLC "Arctic LNG 1" also acquired the rights for exploration and development of the Bukharinskiy area with gas reserves of 1.19 tn m^3.

In accordance with information published on the official website of NOVATEK, three gas liquefaction trains of the Arctic LNG 1 Project will be constructed near the LNG trains of the Arctic LNG 2 Project, within the Utrenniy Terminal[21] (Figure 5.4). Infrastructure of the Utrenniy Terminal is extendible to allow for the Arctic LNG 1 Project facilities. Tentative time of commissioning of the Utrenniy Terminal infrastructure for the Arctic LNG 2 Project is in 2022.

Implementation of the Arctic LNG 1 Project will require construction of linear infrastructure (gas pipelines, condensate pipelines, roads) between the above license areas and the Salmanovskiy (Utrenniy) LA / Utrenniy Terminal.

Fields in the Ob-Taz Region

According to the Concept for development of the Ob and Taz Estuary gas fields, gas production will start after 2025 at the Kamennomysskoye (offshore) field. The next field to be put into production is Severo-Kamennomysskoye, followed by other smaller fields, after 2025-2030.

In a longer term, other fields in vicinity of Yamburg (Kamennomysskoye (offshore), Severo-Kamennomysskoye, Semakovskoye, Tota-Yakhinskoye, Antipayutinskoye, Chugoryzkhinskoye, Obskoye, Parusovoye, Severo-Parusovoye) will be developed using interlinked industrial facilities, and gas will be transported via the available facilities at the Yamburgskoye field (Figure 13.4).

It is planned that the main gas treatment, logistics support and maintenance of the platforms, transportation of personnel and multiple other activities will be provided at the camp to be constructed on the shore of Parusny Cape. The camp facilities will comprise a complex gas treatment plant capacity 30 B m^3 per year, a booster compressor station, a system of gas transport pipelines, a port, and motor roads. Development of the new gas production centre on Parusny Cape will provide profitable development of the Parusovoye group and Semakovskoye fields, and prepare a firm base for the next step - across Taz Estuary to Tota-Yakhinskoye and Antipayutinskoye fields on Gydan Peninsula[22].

The pipelines (gas mains) construction plans[23] in the Ob Estuary and Taz Estuary provide for the following infrastructure:

- Gas main CGTP Kamennomysskoye-offshore GF - Yamburgskaya GCS, 2024-2025;
- Connection pipeline for Kamennomysskoye (offshore) field, underwater pipeline, 2021-2023, 90 km (single line);
- Connection pipelines for the fields in Parusovaya group and Taz Estuary of Kara Sea, underwater pipeline, 2024-2026, 160 km (single line);

[20] NOVATEK, April 2020, Unlocking Arctic Potential: Expanding Our Global LNG Footprint to 2030 Energy Affordability, Security & Sustainability http://www.novatek.ru/ru/investors/

[21] http://www.novatek.ru/common/tool/stat.php?doc=/common/upload/doc/3Q19_Transcr.pdf

[22] Source: Development Master Plan of Gazprom Dobycha Yamburg LLC http://yamburg-dobycha.gazprom.ru/about/prospects/).

[23] Territorial Planning Scheme of YNAO, 2020

- Gas transportation system from the fields in Ob Estuary and Taz Estuary of Kara Sea, underwater pipeline, 2021-2023, 170 km (single line).

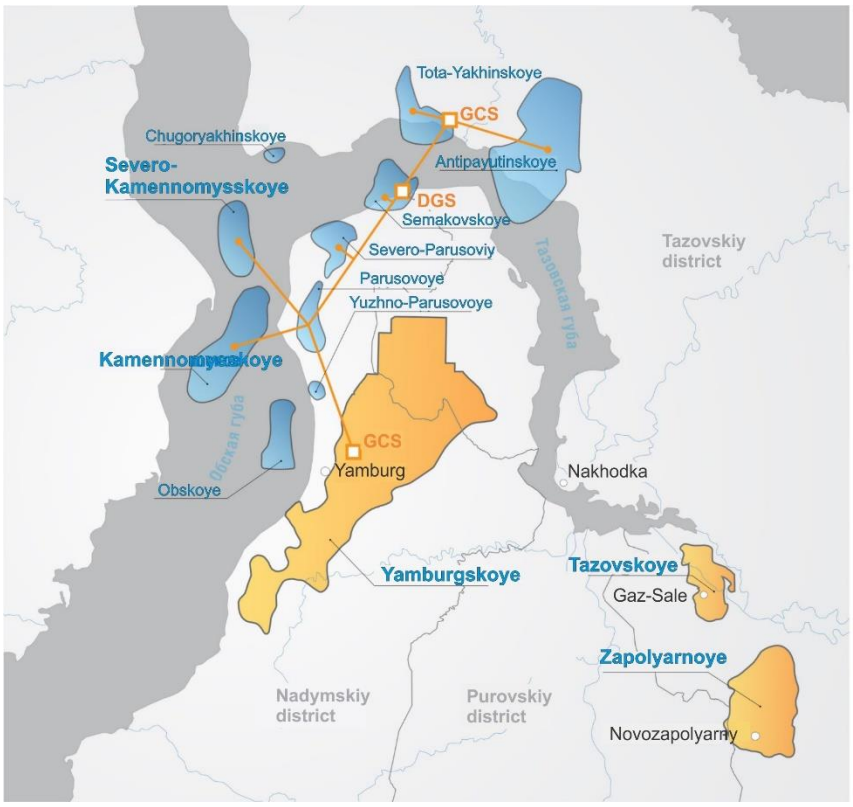


Figure 13.4: Fields in the Ob-Taz Area[24]

Development of transport infrastructure

Railway line Korotchayevo - Novozaployarny - north of the Gydan Peninsula

TPS of Tazovskiy Municipal District provides for construction of railway line Korotchayevo - Novozapolyarny - North of Gydan Peninsula with auxiliary infrastructure including railway station in Novozapolyarny village, and a station at the terminal point (estimated year of completion is 2035).

Motor roads

Development of road communications in Tazovskiy Municipal District is designed to provide communication between the district settlements and the administrative centre, and construct a backbone road network for further industrial development of the area, in particular construction of permanent paved roads Tazovskiy - Gyda, Tazovskiy - Nakhodka, Tazovskiy - Antipayuta after 2025.

Utrenniy Airport

The Utrenniy Airport (associated facility of the Project, refer to Section 5.7 for details) will be constructed and operated to provide transport services for multiple projects in the Gydan Peninsula including the Arctic LNG 2 Project. The airport will be operated by Sabetta International Airport LLC. LLC "Arctic LNG 2" acts as sublessor of the land plots and utility supplier for the airport. The planned time of commissioning is in 2022-2023 (test flights are scheduled for March-April 2021).

Development of light aviation

Due to scarcity of overland transport communications, light aviation is a priority direction of development intended to ensure the required level of transport services for remote areas.

The following infrastructure projects are conceived by the YNAO TPS for development of light aviation in Tazovskiy Municipal District:

- Construction of new hard-paved helicopter pads in Tazovskiy, Tibey-Sale, Tadebya-Yakha, Matiuy-Sale, Yuribey, Gyda (after 2025-2027);

[24] Source: Development Master Plan of Gazprom Dobycha Yamburg LLC http://yamburg-dobycha.gazprom.ru/about/prospects/).

- Reconstruction of helicopter pads in Gaz-Sale, Antipayuta;
- Upgrading Tazovskiy airport facilities.

Protected areas

Territorial planning documents at the District and Okrug level provide for arrangement of new protected areas – "Nyamboytinskiy" reserve of municipal significance and "Yuribey" protected natural landscape of municipal significance. Comprehensive environmental studies in the future protected areas' territories and local government decision making about establishing protected areas of local significance are included in the scope of Subprogramme "Conservation of ecological balance and good environment in the Yamal-Nenets Autonomous Okrug" under the YNAO State Programme "Environmental Protection 2014-2024" (with revisions as of 14.02.2020) (approved by YNAO Government Resolution of 25.12.2013 No. 1135-P). Territory of the future "Nyamboytinskiy" reserve of municipal significance is in the south of Tazovskiy Municipal District, remote from the Project area. The future protected natural landscape of municipal significance "Yuribey" is located 70 km to the southeast of the boundary of the Salmanovskiy (Utrenniy) LA; activities within the Salmanovskiy (Utrenniy) LA will not affect the catchment area of the Yuribey River. According to the information provided by the Tazovskiy Municipal District Administration on request from Ramboll, the process of establishing the protected area "Yuribey" has been stopped.

13.3.1.2 Yamal Municipal District

Licenses are issued for 17 areas within the Yamal Municipal District: Bovanenkovskoye, Kruzenshternskoye, Zapadno-Tambeyskoye, Malyginskoye, Severo-Tambeyskoye, Tasijskoye, Novoportovskoye, Yuzhno-Tambeyskoye, Kharasafeyskoye, Severo-Tasijskiy area, Ust-Yuribeyskoye, Malo-Yamalskoye, Kamennomysskoye, Syadorskoye, Kamennomysskoye sea, Malotambeyskiy area, Nilovoyskiy area, and Yuzhno-Kruzenshternskoye. The main oil and gas producers in the area are Gazprom (Gazprom Dobycha Nadym), NOVATEK (Yamal LNG) and Gazprom Neft (Gazpromneft-Yamal).

Development of Bovanenkovskiy Centre of Gas Production

The gas production centre that belongs to Gazprom comprises three major fields: Bovanenkovskoye, Kharasaveyskoye, Kruzenshternskoye.

Industrial development of the Yamal Peninsula commenced in 2012 at the Bovanenkovskoye oil, gas and condensate field Gas pipeline Bovanenkovo - Ukhta was commissioned in 2012, pipeline Bovanenkovo - Ukhta-2 was commissioned in 2017. A unique railway line Obskaya - Bovanenkovo with the total length of 572 km (525 km to Bovanenkovo) was constructed for transportation of materials and equipment for Bovanenkovskoye field facilities. An airport has been constructed as part of the field development, for heavy cargo and passenger aircraft (e.g. IL-76 and TU-154) to enable prompt transportation of goods and rotation shift personnel. Helidrome is also available. The design annual production of gas from Cenomanian-Aptian reserves of Bovanenkovo field is 115 B m^3 per year. In a long term (after year 2030), design gas production at the field is expected to increase to 140 B m^3 per year, considering the Neocomian-Jurassic gas condensate reserves.

The existing pipelines (gas mains) construction plans till 2030 (Gazprom, Territorial Planning Scheme of YNAO, 2020) also provide for the following communication lines:

- Bovanenkovo-Ukhta gas main. Line 3, 2021-2023;
- Bovanenkovo-Ukhta gas main. Line 4, 2025-2027;
- Bovanenkovo-Ukhta gas main. Line 5, 2029-2031;
- Bovanenkovo-Ukhta gas main. Line 6, 2030.

Full-scale development of the Kharasaveyskoye field located to the north of Bovanenkovo, mostly onshore, but partially offshore - in the Kara Sea water area, commenced in March 2019. The field is categorised "unique" for its gas deposits — 2 tn m^3 (aggregate of category C1 and C2). Auxiliary infrastructure facilities are already available in the field, including shift accommodation camp and site power plant. Cenomanian-Aptian deposits of the field will be the first target of the development. It is planned that production of gas will start in 2023. After that the deeper Neocomian-Jurassic reserves will be developed. A new pipeline of approximately 100 km will be constructed for the field connection to the third line of Bovanenkovo-Ukhta gas main. A 80 km product pipeline (for condensate and methanol) and motor road will be provided between the field sites.

Kruzenshternskoye field is in exploration. Its industrial development is planned after 2025 (onshore) and 2027-2030 (offshore).

Plans are in place for construction of integrated gas processing and gas chemical facilities for production of polymers on the resource base of Bovanenkovo cluster (with a tentative capacity of 3 MTPA of polyethylene and polypropylene).

Yamal LNG Project

The Yamal LNG Project (the Plant and Sabetta Port Terminal) is located on the opposite shore of the Ob Estuary, 72 km northwest of the Utrenniy Terminal of the Arctic LNG 2 Project. Estimated proven and probable reserves of the South Tambey field (the resource base for the Yamal LNG Project) are 926 B cu.m of gas and 30 M tons of liquid hydrocarbons, in accordance with PRMS classification. The design production is about 27 B cu.m of gas per year over a minimum period of 20 years.

The first line of the LNG plant with a capacity of 16.5 mtpa was commissioned in December 2017. The 3rd process train of the LNG plant was commissioned in the end of 2018 (the production facilities consist of three gas liquefaction process trains with design capacity of 5.5 mtpa, each. PT4 is under construction, and when commissioned the actual LNG capacity will reach 17.4 mtpa.

Marine operations via Sabetta port are integral part of the Yamal LNG Project. Special Arc7 ice class carriers (by Russian classification standards) have been built for the Yamal LNG Project, to support year-round navigation without any icebreaker assistance along westbound navigation routes, and during summer navigation season - eastbound via the Northern Sea Route.

Activities completed under the Yamal LNG Project include dredging for construction of Sabetta port and approach channel, and removal of sand banks in the area of the navigation channel in the north of the Ob Estuary. Considering the local conditions in the Ob Estuary (storms, extensive sediment accumulation), the future scope for maintenance dredging (tentatively every 2 years) is expected to be significant. The dredging activities are conducted during the short period of ice-free navigation (60-70 days per year).

An international airport has been constructed in the license area to serve the needs of the Yamal LNG Project. The airport is operated by subsidiary of Yamal LNG - Sabetta International Airport LLC. The first technical flight with aircraft landing was carried out on 4 December 2014, at present regular flights are provided for communication with Novy Urengoy, Moscow, Samara, Tyumen and Ufa.

The village has the necessary infrastructure for the accommodation of construction workforce. Auxiliary infrastructure facilities have been constructed including a POL store, a boiler house, power supply facilities, canteens, medical stations, a laundry, baths, sports facilities, an office and service building, a hotel, a fire station, water and wastewater treatment facilities, heated parking lot, food stores.

The infrastructure developed within the scope of the Yamal LNG Project (airport, access channel, sea port) is also used for the new projects in the Yamal and Tazovskiy Municipal Districts.

Obsky LNG Project

In 2019 NOVATEK disclosed its plants to implement the Obsky LNG Project within the area of influence of the Yamal LNG Project. The expected time of commissioning is in 2024 – 2025 [25][26].

Obsky LNG is an integrated project for natural gas production and liquefaction, LNG storage and supply. The Project provides for construction of production capacity for 5 MTPA of LNG (two process trains 2.5 MTPA of LNG each). The Obsky LNG Project will rely on feedstock from two gas and condensate fields - Verkhnetiuteyskoye and West-Seyakhinskoye - combined in one license area (Figure 13.3). Subsoil license for the Verkhnetiuteyskiy and West-Seyakhinskiy License Area belongs to LLC "Obsky LNG", Operator of the Obsky LNG Project.

The site of the Obsky LNG Plant adjoins the operational site of the Fourth Process Train of the Yamal LNG Plant. The LNG terminal is located in the area of Sabetta Port serving the sea transportation needs of the Yamal LNG Project. Construction of the Terminal will require bottom dredging, to ensure safe mooring and laying conditions for ships. Compared to the total volume of dredging for construction of Sabetta port (23.4 M m^3), dredging volume for the terminal construction is only 4%.

[25] NOVATEK, April 2020, Unlocking Arctic Potential: Expanding Our Global LNG Footprint to 2030 Energy Affordability, Security & Sustainability http://www.novatek.ru/ru/investors/

[26] OilCapital, 02.06.2020 "Construction of the Obsky LNG Terminal is Postponed" https://oilcapital.ru/news/companies/02-06-2020/stroitelstvo-terminala-obskiy-spg-otlozheno

Development of the Tambey group of fields

The group includes six fields: Severo-Tambeyskoye, Zapadno-Tambeyskoye, Tasijskoye, Malyginskoye (licenses held by the Gazprom Group), Yuzhno-Tambeyskoye and Syadorskoye. Its prospective resources are estimated as 7.7 tn m^3 of gas and 599 M t of condensate. Gradual development of the Tambeyskoye field is considered starting in 2026.

Novy Port Project

The project comprises Novoportovskoye OGCF and the Arctic Gates Terminal. Oil from Novoportovskoye field is transported by pipeline of over 100 km in length to the transfer facility in Mys Kamenniy village on the Ob Estuary shore, and further to the Arctic Gates Terminal that was put into operation in May 2016. The existing infrastructure in the field and on the Ob Estuary shore is sufficient to support offloading up to 8.5 mtpa of oil. Implementation of the Novy Port Project Phase 3 for development of oil and gas deposits in the northern area of the Novoportovskoye field is in progress. Planned time for putting into operation the Phase 3 facilities is in 2021.

Oil and gas export pipeline of 115 km from the Novoportovskoye OGCF via the Ob Estuary to Yamburg with transport capacity of 20.5 B m^3/year is under construction and will be put into operation in 2022.

Gas infrastructure of Novoportovskoye OGCF will be further enhanced with a new gas processing plant capacity 10 billion m^3 of gas per year (in a longer term up to 25-30 B m^3/year). The plant will process natural gas from the nearest fields to produce commercial-grade gas, stable natural gasoline, and propane-butane mixture. Liquid hydrocarbons produced from gas will be mixed with commercial crude oil and transported via the Arctic Terminal. Tentative time of commissioning is in 2022.[27]

Gazprom Neft is developing a major hydrocarbon production cluster in the area. The company has acquired licenses for geological prospecting at Yuzhno-Novoportovskoye and Surovo license blocks that possess sufficient resources to ensure optimum utilisation of the production and transport infrastructure developed at the Novoportovskoye field.

Furthermore, Gazprom Neft Shelf has won the licensing round for subsoil usage rights to the Yuzhno-Obsky license block, including geological prospecting, development and production of hydrocarbons. The Yuzhno-Obsky block neighbours with the Novy Port Project.

Given the remoteness of the Novoportovskoye field from the Project (350 km southwest of the Salmanovskiy (Utrenniy) LA), the main potential for cumulative impacts is associated with additional shipping activity in the Ob Estuary section between Kamenny Cape and the Northern Sea Route.

Bovanenkovo-Sabetta non-public railway line project (Northern Latitudinal Railway-2), length 171.35 km**.**

According to the TPS of the Yamal-Nenets Autonomous Okrug, the project implementation is planned by 2023. Besides the railway, the project also provides for development of associated infrastructure - receiving-departure and breakup yards, a railway junction, a motive-power depot, rotation camps, passenger platforms and a railway station at Sabetta. The railway line will connect the port of Sabetta with Obskaya - Bovanenkovo railway line and Severnaya Railway of the Russian Railways, to foster industrial development in Yamal and facilitate export and import of liquid hydrocarbons and other goods through Sabetta port.

13.3.1.3 Activities in the Ob Estuary Area

Oil transfer operations in the Ob Estuary

RITEK is running offshore oil transfer operations in the area of Kamenny Cape during summer navigation season (July-October), with a throughput of 100 to 300 thousand tons of crude oil per navigation season. Oil from the Sredne-Khalymskoye and Sandibinskoye fields is transported by local oil pipelines to the Andra and Numgi onshore oil-loading facilities on the Ob River where it is loaded to Lenaneft river-sea tankers (deadweight 3000 tons) of the Irtysh River Shipping Company. The oil is further transported to the Ob Estuary, berth facilities in the area of Kamenny Cape where it is transferred onto Astrakhan sea tankers with the deadweight of 20 thousand tons and shipped along the Northern Sea Route to the Belokamenka harbour transshipment centre in Kola Estuary[28].

[27] Official web-site of Gazprom Neft Razvitie LLC https://dvp.gazprom-neft.ru/projects/currents/expand-novy-port/

[28] Environmental impact assessment for the Oil Spill Prevention and Response Plan (OSPRP) of RITEK, 2015

Severo-Obskiy License Area (license held by LLC "Arctic LNG 3")

The site is located in the northern section of the Ob Estuary, and is remote from the Utrenniy Terminal. The results of drilling of the first exploration indicate that the new field reserves of natural gas can be estimated as at least 320 B m^3. If the estimation proves to be correct, the area is considered as a very promising resource base for one of the future LNG projects of JSC "NOVATEK", with a capacity of 6.6 M tons (some sources mention higher capacities - up to 19.8 M tons[29]) and tentative implementation period after 2030[30].

Reconstruction of the sea channel

The Northern Sea Route Infrastructure Development Plan for the period till 2035 provides for reconstruction of the Sabetta port sea channel in the northern section of the Ob Estuary, in order to ensure navigation safety for the increased shipping traffic.

At present, the sea channel is 295 m wide, and after the reconstruction its width will increase to 420 m (widening at the entrance and exit tu 573 m, and two pits in the channel); the length is 47.8 km, volume of excavated soil 65,904,000 m3.; the work period is from August 2020 to October 2022, annually[31]. Total dredged volume during the sea channel construction in 2013-2016 was 46.4 M m^3[32].

Water Transport Operations in the Ob Estuary

Estimated volume of goods transportation from the Ob Estuary area, considering fully developed terminals of Sabetta port, may exceed 80 mtpa (the assessment is based on the existing and planned capacities of the Yamal LNG, Obsky LNG, Novy Port, Arctic LNG 2, Arctic LNG1 and Arctic LNG 3 projects, using the data available by the time of reporting, without transportation of various general purpose cargoes) – see Table 13.2 and Figure 13.5.

Table 13.2: Shipping activity based on fully developed Sabetta port terminals

Terminal in Sabetta port	Project	Transported goods	Cargo turnover, M t	Number of vessel calls to terminals, calls/year	Number of journeys along sea channel, journeys/month (single)	Share in total journeys along sea channel, %
Section 1[33]	Yamal LNG (three existing process trains)	LNG	16.5	220	43	20
		GC	1.35	32		
	Yamal LNG PT4	LNG	1.0	13	2	1
	Obsky LNG	LNG	4.8	65	11	5

[29] A. Sobko. Transforming Global Market of LNG: not to miss the window of opportunity for Russia. April 2018. Neftegazovaya Vertikal 33-38, http://www.ngv.ru/upload/iblock/1fb/1fb0d7fc6a2db5f4f627b929f7e15b8f.pdf

[30] NOVATEK, April 2020, Unlocking Arctic Potential: Expanding Our Global LNG Footprint to 2030 Energy Affordability, Security & Sustainability http://www.novatek.ru/ru/investors/

[31] Sea Channel (navigation approach channel in the Ob Estuary of the Kara Sea). Design documentation. Section 8. List of Environmental Protection Measures. Book 1. 2030—4808-04-ПМООС-8.1. Vol. 8.1. – EcoSky LLC, 2020.

[32] Project Yamal LNG Environmental and Social Impact Assessment, ENVIRON, 2014. http://yamallng.ru/progress/disclosure-of-information/

[33] Adopted from: Investment application (declaration of intent): Obsky Liquefied Natural Gas Terminal. GT MORSTROY CJSC, 2019.

Terminal in Sabetta port	Project	Transported goods	Cargo turnover, M t	Number of vessel calls to terminals, calls/year	Number of journeys along sea channel, journeys/month (single)	Share in total journeys along sea channel, %
Section 2, Utrenniy Terminal[34] [35]	Arctic LNG 2	LNG	19.8	265[36]	53[19]	24.5
		GC	1.6-1.8[37]	47[19]		
	Arctic LNG 1	LNG / GC	19.8/ 1.6/-1.8	312	53	24.5
	Arctic LNG 3 *	LNG/ GC	From 6.6	-	From 15	7
Section 3, Mys Kamenny Terminal	Novy Port	Oil	8.5[38]	231[39]	39[21]	18
Total			**80.15**	**1185**	**216**	**100**

* Information of shipping activities during operation of the Arctic LNG 1 and Arctic LNG 3 projects is tentative, based on the assumed design output of LNG and SGC.

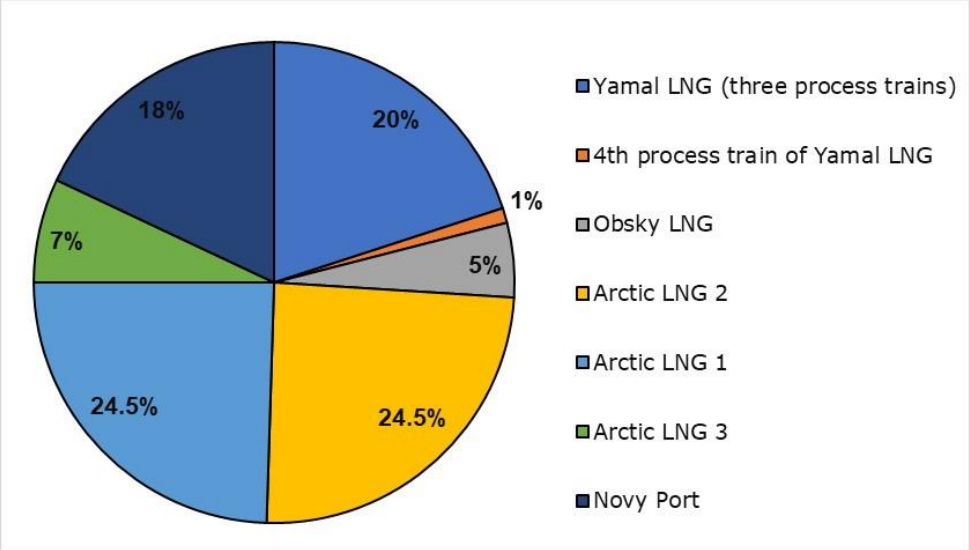


Figure 13.5: Contributions of major projects to the total number of vessel journeys in the sea channel within the Ob Estuary

[34] Amendments of 12.04.2020 in the RF Territorial Planning Scheme for the Federal Transport Sector (in terms of railway, air, marine, and inland water transport) and motor roads of federal significance provide for increasing capacity of the Utrenniy Terminal from 21.6 mtpa to 43.2 mtpa.

[35] A. Sobko. Transforming Global Market of LNG: not to miss the window of opportunity for Russia. April 2018 Neftegazovaya Vertikal 33-38, http://www.ngv.ru/upload/iblock/1fb/1fb0d7fc6a2db5f4f627b929f7e15b8f.pdf

[36] Adopted from: Investment application (declaration of intent): Complex for production, storage and offloading of liquefied natural gas and stabilised gas condensate at the Salmanovskoye (Utrenneye) oil, gas, and condensate field. Remote terminal Utrenniy at Sabetta Port. Justification of sea channel dimensions in the north of the Ob Estuary. GT MORSTROY CJSC, 2016.

Total number of vessel calls in the Utrenniy Terminal at the cargo turnover of 24.4 mtpa of LNG and 1.48 mtpa of SGC was tentatively assessed at 365, including 326 calls by vessels of NG-170 type and 39 calls by vessels of NO-41 type. Monthly number of vessel journeys (single) along the sea channel was estimated at 62, including 55 journeys of NG-170 vessels and 7 journeys of NO-41 vessels. With the Project parameters of respectively 19.8 mtpa and 1.8 mtpa, the proportionately reduced number of vessel calls is 312, and monthly number of vessel journeys is 53.

37 Maximum SGC capacity of the Plant mentioned in the Project Information Memorandum is 1.6 MTPA. According to the design documentation, the Plant will be capable to produce up to 98.6 tons of SGC per hour and offload up to 8000 m3 of SGC per hour. Maximum design SGC capacity of the Terminal to be achieved in 2026 is 1.8 MTPA.

[38] Capacity of the Arctic Gates oil terminal is 8.5 mtpa of oil https://www.gazprom-neft.ru/company/major-projects/new-port/

[39] Adopted from: Investment application (declaration of intent): Complex for production, storage and offloading of liquefied natural gas and stabilised gas condensate at the Salmanovskoye (Utrenneye) oil, gas, and condensate field. Remote terminal Utrenniy at Sabetta Port. Justification of sea channel dimensions in the north of the Ob Estuary. GT MORSTROY CJSC, 2016.

Total number of vessel calls in the Mys Kamenniy Terminal at the cargo turnover of 5.5 mtpa of oil was tentatively assessed at 150. Monthly number of vessel journeys (single) along the sea channel was estimated at 25. With the designed oil terminal capacity of 8.5 mtpa, the proportionately reduced number of vessel calls is 231, and monthly number of vessel journeys is 39.

Vessels may pass through the sea channel both individually and as a part of convoy. In terms of impact on shore ice, passage of a convoy (e.g. one convoy pass per day for exit or one convoy pass per day for entry) is considered as a single journey.

13.3.2 Other Man-caused Impacts

Reindeer Herding

Reindeer herding is the main economic activity on Gydan Peninsula which is not related to oil and gas sector (refer to Sections 8 and 10 for detailed information). One of the main environmental problems related to reindeer herding is potential overexploitation of pastures, which may affect future herding activities in the region, and also habitats for other fauna including birds. According to the TPS of Tazovskiy Municipal District, the number of tame reindeer in the district exceeds (by 39%) the recommended limit, based on the available pastures grazing capacity. The lichen pastures that represent a high grazing value are at the same time least resilient to anthropogenic load. In case of overgrazing, lichens give way to lichen-moss and then to moss assemblages.

Climate Change

Climate change is one of the external factors of anthropogenic activities with potential effects in the scale of the whole Gydan Peninsula (refer to Section 9.9 for details). Climate changes in the Arctic influence the extent and depth of permafrost and causes reduction of the area of the sea ice cover, which may in turn affect the geographic range of presence of migrating wildlife species.

Thawing of permafrost increases the risk of hazardous cryogenic processes, e.g. solifluction, thermokarst and land subsidence. Degradation of permafrost poses a high risk to structures in the Far North (roads, oil and gas pipelines, tanks, oil and gas producing sites, buildings, etc.). Thawing of permafrost is expected to open a new source of GHG emissions (CO_2 and methane) induced by the following processes: 1) thawing of Pleistocene organic matter preserved in permafrost and its consumption by microorganisms; 2) activation of microorganisms preserved in permafrost; 3) release of GHG locked in ice; 4) enhanced microbial activity in seasonally thawed layer. This additional source may act as an reverse link to enhance the process of warming even further[40].

Even though deep frozen strata are protected from thawing with ice-bearing layer and thermal insulation effect of the vegetation cover and organic matter of soil, the balance may be broken in case of further growth of seasonal thawing caused by warmer air temperatures. If this happens, flora and fauna species composition would change (and is in fact already changing), and the existing natural systems of tundra may diminish or even disappear.

Degradation of permafrost is expected to contribute to precipitation quantity, therefore, a significant increase of winter precipitation is projected by the middle of the century. The growth of precipitation is predicted to continue also in the second half of the century. Thicker layer snow will restrain freezing in winter.

Melting sea ice will have an impact on navigation conditions in the Arctic seas. The open water patches due to the warming process will facilitate navigation and industrial development of the Arctic region.

Thinner ice and smaller area of ice cover will significantly change characteristics of ecosystems dependent on sea ice. Arctic cod being a key element of such ecosystems is the main food for many marine mammals. Ringed seals need sea ice for reproduction, molting and rest, and feed on amphipods and Arctic cod that live under ice. Earlier erosion of ice may result in high mortality of young seals and cause behavioural changes in their populations. Polar bear being the closing link in the food chain is highly dependent on both sea ice and ringed seals. The loss of sea ice and its adverse consequences will be first felt on the southern boundary of the geographic area of presence of polar bear where early melting and late freezing of ice will extend the period when bears have to stay on shore with limited access to food.

Reduction of ice cover may also affect other Arctic sea animals, e.g. walruses that use ice surface for rest and live in a narrow range of environmental conditions with limited capacity for relocation. Early ice melting may badly mismatch seasonal patterns and reproduction cycles of the animals with severe adverse consequences for populations of marine mammals.[41] Studies also confirm the regional and global trends, such as northward extension of species' ranges due to global warming.

[40] Impact of climate change on Russian Arctic: Analysis and ways to solve the problem. WWF Russia. – M., 2008. – 28 p.

[41] O.A. Anisimov, D.G. Vaughan, T.V. Callaghan, C. Furgal, H. Marchant, T.D. Prowse, H. Vilhjalsson and J.E. Walsh, 2007: Polar regions (Arctic and Antarctic). *Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the*

However, there is a major uncertainty about magnitude and nature of such externally induced changes throughout the Project life cycle. Therefore, in the context of cumulative effects, only a high level qualitative assessment of climate change impacts.

Poaching

Among other man-caused impacts on fish fauna of the Ob Estuary is widely practiced poaching which negatively affects populations of rare and valuable commercial species of fish.

Quantities of whitefish produced by fishing enterprises in the region reportedly decline: from 14 thousand tons in 1980 to 4.2 thousand tons in 2011. Particular concerns are raised due to reduction of muksun population. Expert estimate illegal catch of muksun, nelma, round-nosed whitefish during winter season at 500 tons, minimum, whereas official quota for production of muksun in the YNAO was only 230 tons. Commercial production of muksun is prohibited in YNAO since 2014, however, Gosrybtsentr reports zero increase of reserves of this valuable fish due to poaching.

13.3.3 Discussion

Assessment of potential contribution of the planned activities to cumulative impacts is based on analysis of existing impacts and planned projects (using the available information). Table 13.3 provides a summary of the analysis of the planned projects which were covered by CIA or excluded from the assessment (not expected to cause any significant cumulative impact in combination with the Project and its associated facilities/ activities), and projects that have a high uncertainty factor or are not clearly defined, i.e. their potential cumulative impacts cannot be adequately assessed at this stage. Based on the analysis summarised in Table 13.3, the following projects/activities have been included into CIA:

- Arctic LNG 1 Project;
- Development of Shtormovoy LA;
- Development of Ob-Taz Area fields;
- Development, in the medium-term future, of other fields on the Gydan Peninsula within the Gyda and Antipayuta tundras;
- Yamal LNG Project (including PT4);
- Obsky LNG Project;
- Novy Port Project;
- Development of the Tambey group of fields;
- Arctic LNG 3 Project;
- Reconstruction of the sea channel;
- Oil transfer operations in the Ob Estuary.

Intergovernmental Panel on Climate Change, M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson, Eds., Cambridge University Press, Cambridge, 653-685.

Table 13.3: Analysis of activities/projects that may have potential cumulative impacts with the planned activities

Activity/ Potential development	Interrelation with planned activities	Included/ Not included in CIA
Tazovskiy Municipal District		
Producing fields on Gydan Peninsula (Zapolyarnoye, Yamburgskoye, Nakhodkinskoye, Vostochno-Messoyakhskoye, Pyakyakhinskoye, Tazovskoye);	Facilities located outside the influence area of the planned activities. Cumulative impact is unlikely.	Not included
Arctic LNG 1 Project	Will have spatial and temporal points of contact with the planned activities. Cumulative impacts are likely.	Included
Ob-Taz Area Fields	The facilities location in relation to the site of the planned activities is remote (170-250 km). Cumulative impact is possible if the same VECs are affected.	Included
Shtormovoy LA	The license area adjoins the Salmanovskiy (Utrenniy) LA. Cumulative impacts are possible. Geological exploration is planned in 2018-2022. Exact timeframe for development of Shtormovoye field in medium term is not known.	Included
Fields within the Gyda and Antipayuta tundras - development in the medium term (currently under exploration): Ladertoyskiy and Minkhovskiy areas	The sites are located outside the influence area of the planned activities (100-150 km from boundary of the Salmanovskiy (Utrenniy) LA). Geological exploration activities are currently conducted in the areas. Development of the fields is planned by 2025. Cumulative impact is possible if the same VECs are affected.	Included
Development of Gydan Peninsula fields in long-term future (currently under geological exploration): Yadayakhskiy, Nyavuyakhskiy, Zapadno-Solpatinskiy, Nyakhartinskiy, Yuzhno-Kustarnikoviy, Karkasniy, Severo-Tanamskiy, Tsentralno-Nadoyakhskiy, Palkurtoiskiy areas.	The facilities location in relation to the site of the planned activities is remote, outside the area of direct influence of the Project. Cumulative impacts are unlikely. The fields development plans have not been defined, implementation is expected to start after 2030, i.e. beyond the time horizon of the CIA.	Not included
Railway line Korotchayevo - Novozaployarny - north of the Gydan Peninsula (Salmanovskoye (Utrenneye) OGCF)	Construction of the railway line is not expected in medium term.	Not included
Construction of motor road Tazovskiy - Antipayuta - Gyda	Construction of the road is not expected in medium term.	Not included
Yamal Municipal District		
Bovanenkovo Gas Production Centre	The gas production centre is remote from the area of planned activities (across the Ob Estuary). No impact on common VECs is expected. However, infrastructure developed for the project including the linear facilities (railway line, roads, pipelines) and potential future development of the nearby fields on Yamal Peninsula facilitate further industrial development of the region in general. Therefore, it increases the chance that new development projects will be implemented in the future that may have potential cumulative effects with the planned activities (in a long term).	Not included
Yamal LNG Project (including PT4)	Cumulative impact is possible if the same VECs are affected.	Included
Yamal LNG Project	Cumulative impact is possible if the same VECs are affected.	Included

Activity/ Potential development	Interrelation with planned activities	Included/ Not included in CIA
Construction of new non-public railway line Bovanenkovo - Sabetta	The facilities location in relation to the site of the planned activities is remote, outside the area of influence of the Project. Nevertheless, it should be noted that extension of the railway line to the port of Sabetta will facilitate implementation of future projects / activities with potential products export via Sabetta port and the Northern Sea Route, which would enhance vessel traffic in the Ob Estuary and therefore increase likelihood of cumulative effect (in long term).	Not included
Novy Port Project	The facilities location in relation to the site of the planned activities is remote, outside the area of influence of the Project. Cumulative impact is possible only if the same VECs are affected. The main potential cumulative impacts are related to increase of navigation in Ob Estuary, from Kamenny Cape to the Northern Sea Route.	Included
Development of the Tambey group of fields	The fields are currently at various stages of geological exploration and development. Their location in relation to the site of the planned activities is remote, outside the area of influence of the Project. Cumulative effects are possible if the same VECs are affected. Sabetta port infrastructure will be used for construction of the field facilities setup. No specific development plans have been defined for the fields.	Included
Development of the southern group of fields on Yamal Peninsula	The facilities location in relation to the site of the planned activities is remote, outside the area of influence of the Project. Most fields are at an early stage of geological exploration / prospecting. Specific timeframes of the fields' development are not known.	Not included
Activities in the Ob Estuary Area		
Oil transfer operations in the Ob Estuary	The facilities location in relation to the site of the planned activities is remote, outside the area of influence of the Project. Cumulative impact is possible if the same VECs are affected (during the ice-free navigation period).	Included
Severo-Obskiy (Arctic LNG 3 Project)	The facility location in relation to the site of the planned activities is remote (150 km to the north), in the north of the Ob Estuary, outside the area of the Project's area of influence. Under exploration. If the reserves estimation proves to be correct, the area is considered as a very promising resource base for one of the Arctic LNG 3 Project with a tentative implementation period after 2030. Cumulative impact on the Ob Estuary is possible.	No specific plans. Included
Vostochno-Tambeyskiy LA	The area is within the Ob Estuary and has a boundary with the Salmanovskiy (Utrenniy) LA in the east. The field is under exploration, the development plans are not defined.	Not included
Reconstruction of the sea channel	Location in relation to the onshore and offshore sites of the planned activities is remote, outside the area of influence of the Project. Cumulative impacts are possible if the same VECs are affected.	Included
Supply of materials and finished products for the Arctic LNG 2 Project	Will have spatial and temporal points of contact with the planned activities. Cumulative impacts of shipping activities are likely.	Included

13.4 Cumulative Impact Assessment and Management

This section considers potential cumulative impact on valuable environmental and social components. Table 13.4 provides a summary of the analysis and indication of the future project activities that have been considered by CIA for VEC.

Table 13.4: Activities / projects included in VEC-specific CIA

VEC	Arctic LNG 1 Project	Ob-Taz Area Fields	Other prospective fields in the Gyda and Antipayuta tundras (under exploration)	Yamal LNG Project	Obsky LNG Project	Novy Port Project	Tambeyskaya group of fields	Oil transfer operations in the Ob Estuary and Navigation	Arctic LNG 3 Project	Reconstruction of the sea channel	Supplies of materials and finished products
Atmospheric air	v										
Marine environment and habitats	v	v		v	v	v		v	v	v	v
Ichthyofauna and fish resource	v	v	v	v	v	v		v	v	v	v
Marine mammals	v	v		v	v	v		v	v	v	v
Vegetation, natural tundra habitats	v		v								
Geological environment	v										
Wild reindeer	v		v								
Bird fauna	v		v	v	v	v	v	v	v	v	v
Land use and traditional activities of Indigenous People	v	v	v								
Health and safety of Indigenous People	v		v								
Cultural heritage	v	v	v								
Priority ecosystem services	v		v								

V - activities/projects included in the assessment

13.4.1 Atmospheric air

The Utrenniy Terminal is designed considering the planned increase of the number of GBS LNG&SGC process trains to 6 trains, through the Project extension or implementation of a new LNG project - Arctic LNG 1 to be launched after 2027. Composition and quality of pollutants will be similar to those in emissions from the Project (refer to Section 9.1). The main pollutants will be nitrogen oxides, carbon monoxide, methanol, methane, soot and mixed saturated hydrocarbons.

Based on the pollution dispersion modelling results for the plant and similar projects, it can be assumed that cumulative impact of pollution emissions from the 6 process trains in combination with other facilities of the Arctic LNG 2 Project will not increase pollution concentrations in air beyond the permissible limits for residential areas (TAC).

Given the remoteness from the nearest receptors (TAC is located more than 4 km to the east of the designed location of the three additional process trains) and the prevalence of northerly winds in summer and southerly winds in winter, the cumulative impact can be tentatively assessed as **low**[42]**.**

13.4.2 Marine environment and habitats

The main Project activities with a potential to produce notable cumulative effect on water quality in the Ob Estuary are dredging operations (residual impact of dredging is assessed as moderate, refer to Section 9.3). Potential residual impact of onshore wastewater discharges and vessel operations is assessed as not significant or low, therefore, it is not considered by CIA. All potential development projects in the Ob Estuary have a potential to increase vessels traffic, however, they are not expected to cause any cumulative impact of ships on sea water quality, if the prohibition on discharge of polluted wastewater from vessels to the Ob Estuary is respected. However, it should be noted that enhanced marine operations increase the risk of accidents with potential release of pollutants into the aquatic environment.

Dredging for construction of the Sabetta port and approach channel in relation to the Yamal LNG Project have been completed (the total of 23.4 M m^3 of soil have been dredged). In the future, regular maintenance dredging is planned (about 500,000 m^3) once every two years. Impacts of maintenance dredging are similar to those at the construction stage, however much smaller in magnitude. The Terminal construction for the Obsky LNG Terminal will involve dredging of about 850,000 m^3, during the period from late July to late October 2021.

As discussed in Section 9.3, hydrochemical impact of dredging in the area of the Utrenniy Terminal will be long-term but local. The total volume of soil to be dredged, including the access channel, manoeuvring and operating basin of the port, and GBS towage area, will roughly be 26.70 million m^3. Most dredging works will be implemented during ice-free periods in 2019-2021. Terms and scope of dredging for the future period of the Utrenniy Terminal construction - the approach channel (if needed) and water area for the gas carriers' access to the berth sections 4-6, and for installation of GBS process trains 4-6 - have not been defined by present. Regular maintenance dredging will be conducted afterwards.

The dispersion simulation for the Ob Estuary (refer to Section 9.3) demonstrate that turbidity plume will travel as far as 20-25 km downstream of the Ob River with the main plume zone deviating from the coast, and as far as 10-15 km upstream moving mostly along the coastline. Geographically, soil dumping and dredging sites in the area of the Utrenniy terminal are remote from the places affected by dredging for the Obsky LNG project terminal and maintenance dredging activities under the Yamal LNG Project. Considering the minor volumes of soil that will be produced during the maintenance dredging for the Yamal LNG Project and dredging for the Obsky LNG Project Terminal, their turbidity plumes are unlikely to overlap the turbidity plumes from the Arctic LNG 2 Project.

The works relating to additional extension of water area for the Arctic LNG 2 Project will be conducted after completion of the main dredging works in the approach channel and water area of the Utrenniy Terminal, mostly in the areas with bottom communities already disturbed by the previous operations. Given the constant load from regular maintenance dredging in the approach channel and water area of the Terminal, the additional dredging activity in a part of the adjacent water area is unlikely to cause any significant increase of the impact of dredging and soil dumping on all components of the marine ecosystem that was defined for the Arctic LNG 2 Project (Section 9.5, Figure 9.5.1).

In the northern section of the Ob Estuary, annual dredging and dumping activities are planned during ice-free periods of years 2020-2022, for reconstruction of the sea channel, the total of 65.9 M m^3 of soil will be dredged. No superimposition of turbidity plumes with the Arctic LNG 2, Arctic LNG 1, Yamal LNG and Obsky LNG projects is expected, due to the remote location of the Utrenniy Terminal.

Activities for reconstruction of the sea channel may influence water salinity by removing more sand banks that serve as a barrier for saline waters, with a potential effect on biological productivity in the fresh-water (more productive) part of the Ob Estuary. It should be noted here that simulation analysis[43] was based on a minimum width of 441 m, whereas actual width of the sea channel constructed for the Yamal LNG Project

[42] Before decision is made about construction of the three natural gas liquefaction trains in the Utrenniy Terminal, or about extension of the Arctic LNG 2 Project, it is recommended to prepare a pollution dispersion simulation (model) for all facilities of the Project(s).

[43] B. V. Arkhipov, Research and technical report of the Federal Research Centre for Computer Science and Control of RAS "Simulation model for estimation of influence of the shipping channel in the north of the Ob Estuary on hydrodynamic and thermohaline conditions in the Estuary", 2015 https://wwf.ru/upload/iblock/b74/2015_12_16_short_rep.pdf

is 295 m. Therefore, the planned widening of the channel (420 m) fits well into the simulated range, and the analysis prepared in 2015 is still valid.

The modelling results have demonstrated that integral increase of salinity influx to the inner areas of the Ob Estuary induced by construction of the channel will be 3-5%, maximum, and expected duration of the period when salinity levels may exceed the maximum background value is only about two weeks. In the period of river flow growth during floods, saline water will be pushed out to the bar's region (and behind the bar) whether there is the channel or not, hence, no saline water accumulation will occur in the southern part of the Ob Estuary.

A research (Arkhipov et al., 2018)[44] was also conducted to examine saline water intrusions in the Ob Estuary using a computer model. It has been shown that, even in the worst weather conditions, extension of the salinized water penetration into the Ob Estuary due to the channel construction and maintenance dredging to keep its geometry in line with the design will not be more than 10-12 km. However, increasing the channel width to 1380 m may push the boundary of saline water ingress (isohalines of 10 and 18 ‰) 57-58 km further to the south.

13.4.3 Ichthyofauna

Residual impact of the Project on ecosystems and habitats of the Ob Estuary are assessed as moderate, long-term, but reversible. It is highlighted that surveys and monitoring in the port areas for the Yamal LNG and Arctic LNG 2 projects identified no signs of notable degradation of aquatic ecosystems exposed to the impacts of dredging and dumping, which is attributed to the natural resilience to the dynamic conditions in the Ob Estuary that the local ichthyocoenoses developed through long-term evolution process. The effect of suspended solids on different groups of ichthyofauna, including commercial species of fish, is manifested in the form of reduction of marine ecosystems productivity in the feeding grounds, changes in migration routes and places of commercial fish concentration in the Ob Estuary water area adjacent to the dredging sites.

As was mentioned in Sections 7.6 and 9.5, there are no significant aggregations of fish in the northern and middle parts of the Ob Estuary. Feeding and fattening of fish generally takes place in August-September, when shoals of the Siberian cisco, Arctic smelt and Arctic cisco migrate along the coast line over the entire water area in the north of the Ob Estuary. Also, navaga is always present in the surveyed area. This species can form significant aggregations both in spawning and fattening periods. Wintering grounds of Coregonidae and Siberian sturgeon are located in the middle part of the Ob Estuary, approximately 120 km south of the Project sites. At the same time, negative consequences of the Project dredging and soil dumping activities can be expected for valuable commercial anadromous fish species such as the Arctic cisco and Arctic char migrating to the southern part of the Kara Sea for fattening.

Residual impact of the marine operations related to the planned activities on populations of rare and commercial fish species in the Ob Estuary is assessed as moderate/low, due to the reduction of marine ecosystems productivity in the feeding grounds (Section 9.5). Other activities with a potential to cause cumulative impact on fish in the marine environment include, first of all, past and future dredging in the Sabetta port area and the approach channel (including dredging for the Obsky LNG Project Terminal), and dumping of dredged soil. Even though turbidity plumes from underwater technical operations for the Arctic LNG 2, Yamal LNG and Obsky LNG projects are unlikely to overlap each other, areas affected by various dredging and short-term seasonal underwater operations may superimpose, with a potential adverse effect on fish resource recovery capability after the previous round of similar activities.

Other projects in the south of Ob Estuary (dredging activities in relation to the Novy Port Project operations, construction of underwater pipelines in the Ob-Taz area, etc.), may also affect habitats and migration areas of the same populations of valuable commercial species of fish (Figure 13.6). Furthermore, other industrial projects implemented onshore may have impact on semidiadromous fish in their fresh-water phase. For instance, in Yuribey River which upper and middle reaches may be affected by the development of the Gydanskoye, Trekhbugornoye and Soletsko-Khanaveyskoye fields, spawning grounds of muksun have been found in all sections[45].

[44] B.V. Arkhipov, A. M. Alabyan, A. A. Dmitrieva, V. V. Solbakov, D. A. Shapochkin, 2018. Modeling the influence of the Sabetta port sea channel on hydrodynamic conditions and salinity of the Ob Estuary. Georisk, Volume XII, No. 1, p. 46-58 https://istina.msu.ru/publications/article/117550769/

[45] Y. V. Gudovskikh, T. L. Yegorshina, L. S. Savintseva. 2016. The study of biota of the proposed Yuribey DCA (Gydan Peninsula). Geoscience. 2016. Vol. 26 Issue. 1, 15-28. https://www.elibrary.ru/download/elibrary_25903835_71052071.pdf

As stated in Section 9.5, it is not expected that a potential impact on salinity of the Ob Estuary due to the reconstruction of the sea channel will directly affect the ichthyofauna of the Project area. It is assumed that it is possible to influence the timing and nature of seasonal migrations of fish in the northern part of the Ob Estuary (for example, whitefish). It is not expected that the Project implementation may contribute to significant cumulative impacts on the whitefish population, given that the Project impacts will not affect fish wintering grounds and will be local in scale of impact. The Project's contribution to such impacts will not be determinative. However, as part of the Company's environmental monitoring of the Ob Estuary, it is recommended to study the potential impact of the Project on the timing and nature of seasonal fish migrations, taking into account third-party activities. Considering the scale of dredging activities, the damage that may be caused to the food resources, and presence of valuable commercial fish species, as well as potential presence of endangered species (refer to Sections 7.6 and 9.5), cumulative impact on salt-water fish and semidiadromous fish is assessed as **moderate.**

Furthermore, the increased traffic of gas carriers related to the Arctic LNG 2, Yamal LNG, Obsky LNG, Arctic LNG 1, and Arctic LNG 3 projects will increase the risk of accidental introduction of alien species into the Ob Estuary with ballast water from LNG carriers at the stage of operation, which can result in reduced productivity of ecosystems, variations in their species composition, and decrease in the volume of harvested commercial fish species. In view of climate change and ice melting, new species resistant to light conditions and temperatures, particularly, benthic organisms, are expected to invade actively.

Project-specific preventive and minimisation measures against the cumulative impact, in line with the Ballast Water Management Convention, will reduce the residual risk of introduction of invasive species to **negligible**.

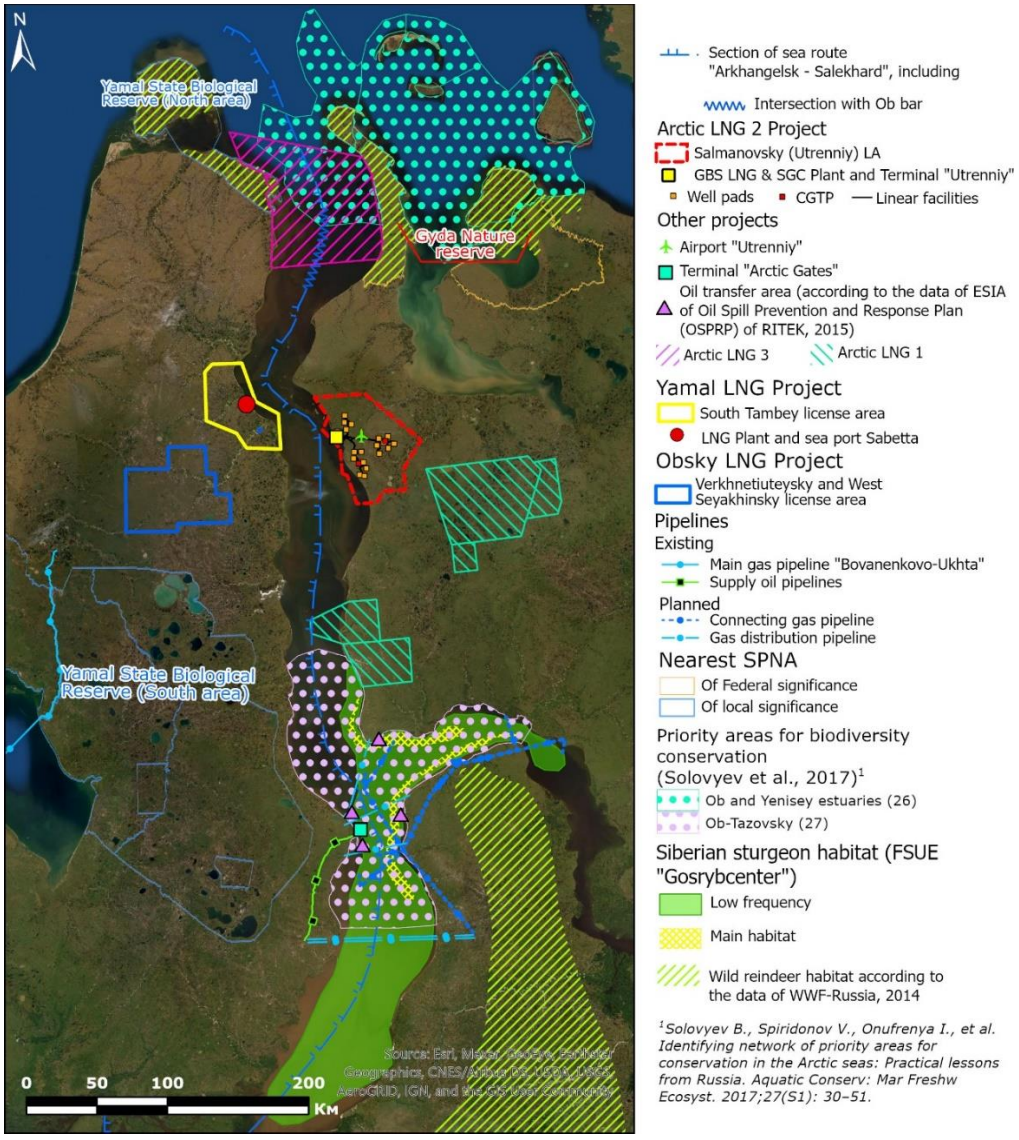


Figure 13.6: Schematic map of the Ob Estuary[46]

13.4.4 Marine mammals

Residual impact of the planned activities on marine mammals is assessed as low (Section 9.5) and is mainly related with noise from piling and dredging at the construction and operation of the terminal and port, shipping activities (in particular ice breakers traffic), and disturbance of ice-based habitats due to ice breaker operations. Cumulative impacts may be caused by the existing and planned marine operations of the Yamal LNG, Obsky LNG, Novy Port, Arctic LNG 1 projects, works for the reconstruction of the sea channel, seismic studies within the existing license areas in the Ob Estuary, including those for the future Arctic LNG 3 project.

Vessels traffic in relation to the Arctic LNG 2 Project will increase by more than 50% (the number of vessel journeys in the sea channel across the Ob Bar will increase by 53 journeys per month) compared to the traffic in relation to the existing projects - Yamal LNG and Novy Port. Based on the data available by the time of reporting, estimated volume of goods transportation from the Ob Estuary area, considering fully developed terminals of Sabetta port, and the future projects of NOVATEK (Obsky LNG, Arctic LNG 1 and Arctic LNG 3) is about 80 MTPA, 1185 vessel calls to terminals per year, or 216 vessel journeys (individual) along the sea channel per month. Transportation for the Yamal LNG Project will account for about 20% of the total shipping volume in the Ob Estuary. The share of the Obsky LNG project is 5%, Novy Port – 18%, Arctic LNG 2 and Arctic LNG 1 – 24.5% each. The share of the Arctic LNG 3 project may be 7% or larger (Table 13.2, Figure 13.5).

Implementation of the Obsky LNG, Arctic LNG 2 project and future LNG projects will intensify the existing impacts, due to the higher frequency and intensity of shipping activity. It is highly likely that the cumulative impact of factors such as physical presence of vessels, increased underwater noise, high turbidity of water, and food base degradation will make some individual animals or their groups leave this water area for other places, and search for alternative feeding grounds within the Ob Estuary. Appearance systematic noise impacts and intensification of vessel traffic in the Ob Estuary will enhance the factor of nuisance and may cause white whales to leave the natural habitat and feeding ground. The increased vessels traffic in the northern section of the Ob Estuary may potentially represent threat to the populations of ice-associated pinnipeds, due to potential death of babies of ice-based seals during ice-breaker escorting of vessels during the animals' breeding period (IEPI, 2020).

In 2019-2020 OJSC "Yamal LNG" and LLC "Arctic LNG 2" conducted a survey within the scope of the Comprehensive Environmental Monitoring Programme of the Ob Estuary which also included the studies of marine mammals in the area of influence of both projects. Aerial counts of numbers and distribution of seals (ringed seal and sea hare) on ice within the Ob Estuary were conducted by OJSC "Yamal LNG" in spring periods of years 2017-2019. From the perspective of marine mammals fauna, development of the navigation channels and larger areas with newly-formed ice in winter extend the area of presence of seal further to the south. Seal is found to be highly resilient to variable ice conditions. Seals prefer young and nilas ice with easy access to water, provided that a clearing is present. Habitats concentrate around clearing in ice. As fast ice develops, habitats are distributed more evenly, however with higher concentrations near breaks in ice that can be natural (cracks, fractures) or man-caused (navigation channels). It is tentatively suggested that the increased concentration of ringed seal may be related to the shipping activity in the Ob Estuary section between Sabetta village and Salmanovskoye (Utrenneye) field. However, according to the reported results, the collected actual data does not provide sufficient basis to assess the projects' impact on this species; therefore, systematic and comprehensive monitoring of marine mammals in the area of actual and potential influence of the projects is needed.

According to the marine mammals survey report 2018 of the Marine Mammals Scientific Expedition Center NEZ "Morskiye Mlekopitajushchiye", ringed seals tend to use the traditional hatching habitats on fast ice, but, whenever possible, choose areas with unobstructed access to water away from the vessels traffic routes. Direct impact of icebreakers will affect only the area within the vessels traffic corridor.

The resulting cumulative impact on marine mammals from all existing and planned activities within the Ob Estuary can be assessed as **moderate**. The Project's contribution to the cumulative impacts is expected to be moderate; a more significant impact is possible in the navigation route section between the approach channels to the Sabetta and Utrenniy terminals, where impact of the Project shipping activity will differ from the existing impacts due to the significant - from 60 to 75 % - increase of the number, dimensions

[46] Priority areas for biodiversity conservation in the Russian Arctic seas, identified by a team of leading Russian experts with a support from the RF MNR under a project initiated by the World Wildlife Fund (WWF) (Solovyev B. et al., 2017).

and capacity of icebreaker vessels. Ice-breaking operations during the breeding season of ice-based species of seals may result in loss of cubs by their parents, death of newly born cubs due to ice breaking and collisions with vessels.

13.4.5 Vegetation and natural tundra habitats

The main impact of the Project and other potential operations on the natural tundra habitats is related to long-term physical loss of habitats due to land acquisition, as well as indirect impacts including potential changes in vegetation along the linear facilities, due to changes in surface runoff conditions, thermokarst, changes in distribution of snow cover, dust from roads, sand quarries and construction sites

This section considers general issues of tundra habitats, whereas specific aspects relating to habitats of nesting birds and reindeer pastures are discussed in dedicated thematic sections.

Broad overview of the region's vegetation is shown in Figure 13.7. The regional vegetation map shows that habitats in the potential development areas on Gydan Peninsula – Shtormovoye, Gydanskoye, Ladertoyskoye, Trekhbugornoye fields, are similar to those in the Salmanovskiy (Utrenniy) license area and adjacent territories, namely type G3, G2, W1.

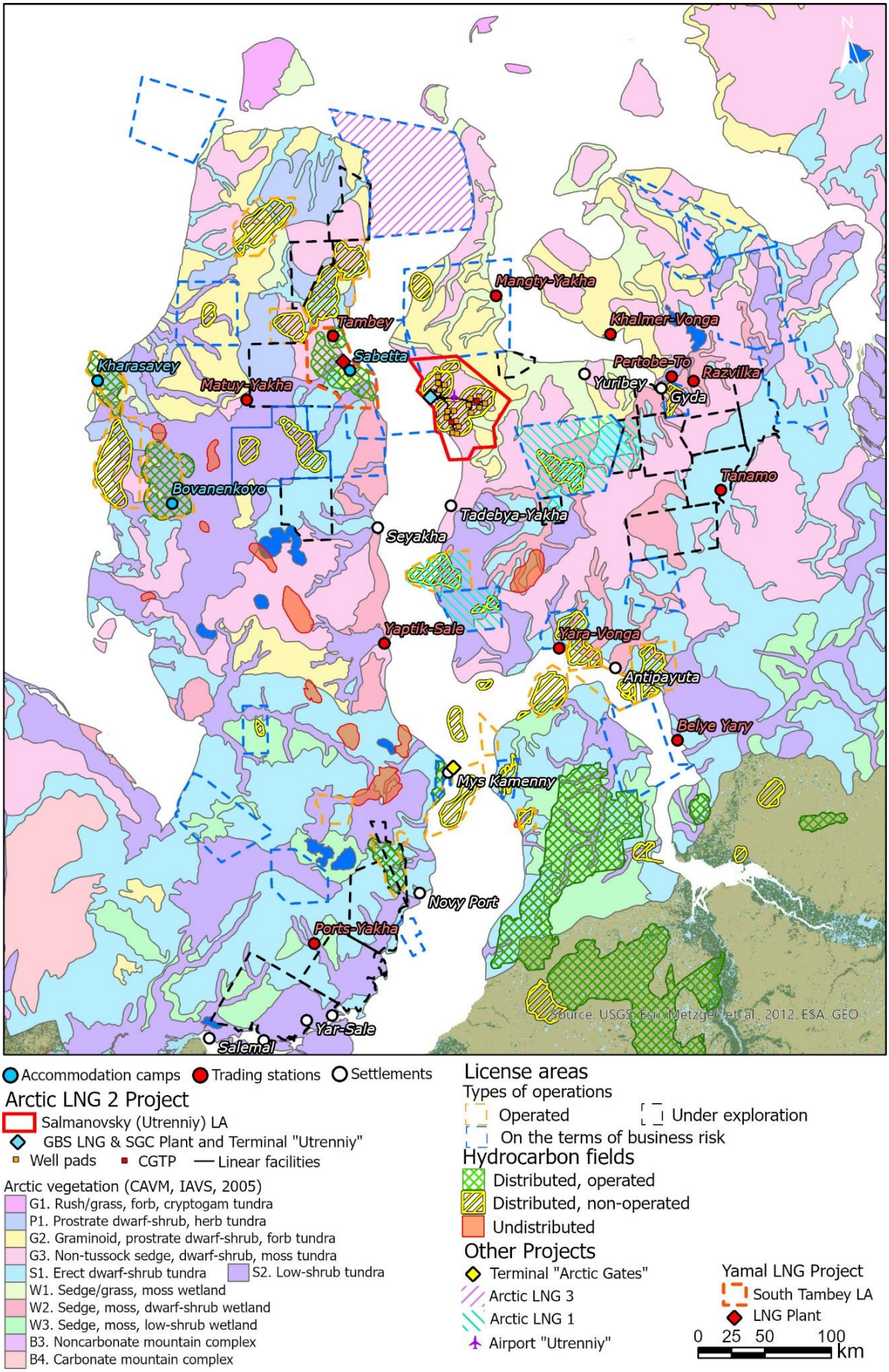


Figure 13.7: Vegetation map of the northern area of YNAO [47]

Residual impact of the planned activities on vegetation is assessed in Section 9.5 as low or moderate. The land acquisition is relatively small, in the general context of existing habitats in the region. However, considering sensitivity and low regenerative capability of the habitats, and total duration of the impacts, the cumulative impact is tentatively assessed as **moderate**. Contribution of the planned activities into this impact can be low or moderate.

Climate change is likely to produce a significant impact on vegetation during the century, which may also be felt during the projects' life. Thawing of ground may trigger drying out in some areas and waterlogging and bogging in other areas, in which case vegetation will change accordingly. The warming trend may support potential spread of invasive plants.

13.4.6 Geological environment

Overall impact of the planned activities on geological environment is assessed as low or moderate (Section 9.4). In terms of cumulative impacts with the Project on the geological environment, the most significant effects are related to the inevitable and irreversible degradation of permafrost soil, gradual erosion of ice-bearing frozen soil with melt water, and activation of dangerous exogenous geological processes and geological phenomena (DEGP&HP). Temperature of soil and ground water increase due to direct contact with surfaces of above-ground and underground buildings and structures which are warmer than containing geological environment, or are exposed to influence of warm air at the sites of flaring and ventilation systems. Thermal regime of soil is further transformed in the areas of snow clearing, excavations and other activities that damage vegetation and soil cover. This in turn affects thermal characteristics of soil, intensifies erosion and activates water logging and thawing processes.

The local cumulative effect of the Project construction is also possible in case location of the future Arctic LNG 1 project is selected within the Utrenniy Terminal, and/or development of the new fields (Gydanskoye, Shtormovoye) is also targeted on the Arctic LNG 2 Project. The cumulative effect will result from the larger area of permafrost exposed to the impact (particularly along the communication corridors between the licence areas), and long-term indirect effects of secondary transformation of the ground thermal conditions, and consequential influences on ecosystems, particularly along the linear facilities, which are difficult to predict and which may extend beyond the facilities' sites.

The increasing industrial development of the Gydan Peninsula in the long term, including development of the fields and construction of multiple linear facilities (roads, railways, pipelines) increases the risk of more extensive thawing of permafrost. Contribution of the industrial development into these risks will be minor compared to the effects of climate change which are already manifested in the change of extent and depth of permafrost layer. Nevertheless, it is recommended to adopt specific measures for mitigation of the effects and adaptation to the climate change (refer to Section 9.9 for details).

13.4.7 Avifauna

As mentioned in Sections 7.6 and 9.5, the Project area is the crossing point of three global migration routes of aquatic, semi-aquatic and flocking birds. The Project area does not include any major nesting sites. Its use by birds is limited and tied to specific seasons, therefore, significance of residual impact of the planned activities is assessed as low.

On the other hand, considering the fact that certain bird species may gather in temporary flocks in the Ob Estuary or nearby inland water bodies during migration periods, there is a relatively high potential for cumulative effects. Such effects may result from all project activities on the Gydan Peninsula and in the Ob Estuary that cause deterioration of food supply, disturbance and fragmentation of coastal tundra habitats and wetlands in the region. Significant effect on semi-aquatic and waterfowl birds are possible in relation to development of the Gydanskoye, Trekhbugornoye and Soletsko-Khanaveyskoye fields that may affect the floodplain areas in the upper and middle reaches of the Yuribey River and its tributaries. These areas are known to provide suitable habitats for living and nesting of waterfowl (Yuribey River valley is on one of the most important migration routes - the East-Atlantic flyway of waterfowl and semi-aquatic birds migrating along the northern coast of Eurasia)[48].

It is expected that direct transformation will affect a relatively small part of the habitats, however, the indirect impacts may cover somewhat larger areas. The indirect impacts on bird habitats in the neighbour

[47] CAVM Team. 2003. *Circumpolar Arctic Vegetation Map*. (1:7,500,000 scale), Conservation of Arctic Flora and Fauna (CAFF) Map No. 1. U.S. Fish and Wildlife Service, Anchorage, Alaska. ISBN: 0-9767525-0-6, ISBN-13: 978-0-9767525-0-9 https://www.geobotany.uaf.edu/cavm/

[48] Y. V. Gudovskikh, T. L. Yegorshina, L. S. Savintseva. 2016. The study of biota of the proposed Yuribey DCA (Gydan Peninsula). Geoscience. 2016. Vol. 26 Issue. 1, 15-28. https://www.elibrary.ru/download/elibrary_25903835_71052071.pdf

territories may be related to sand quarrying and stockpiling, dust emissions from the work sites and roads, changes in surface runoff and drainage conditions, development of thermokarst processes, and with changes in composition of the plant assemblages. Waterlogging along roads and other embankments may produce a beneficial effect by providing new habitats for waterfowl and semi-aquatic birds.

Besides the loss of habitats, other potential negative factors may be related to human presence, construction activity, vehicle traffic, noise from helicopter operations. During the operation phase of the Arctic LNG 2 Project, nuisance and possible disorientation of migratory bird species are expected in connection with operation of the plant, port, power supply facilities, and airport (electromagnetic radiation, noise, lighting and other factors). Construction of the Utrenniy Airport will improve the conditions for further industrial development of the peninsula, and for extraction of its deposits. Therefore, additional impacts of increased air traffic (including helicopters) over the Salmanovskoye (Utrenneye) OGCF are likely in relation to development of nearby fields.

The numbers of migrating birds and terms of their migration may be further affected by a range of natural and man-caused factors related to environmental conditions in their breeding and wintering grounds, and the whole way along the seasonal migration routes. Considering the geographic extent of migration routes of some bird species, and the uncertainty about potential impact of other development projects in the long term, the cumulative impacts can be tentatively assessed as **moderate**, while the Project's contribution to the impact is assessed as low.

13.4.8 Protected terrestrial mammals

Currently, the one population of reindeer inhabits the Gydan Peninsula, which is autochthonous for the peninsula and is classified as Yamalo-Gydan by the Red Book of the Yamalo-Nenets Autonomous Okrug. The fawning pastures of the Yavai group of reindeer are currently located mainly on Shokalskogo Island, a small part of fawning grounds is located in Yavai Peninsula and Neupokoeva Islands. Winter pastures are located on the Yavai Peninsula in the northern part of the Yuribey Ridge (Gorchakovsky, 2007[49]).

As noted in Section 7.1.3.7, wild reindeer was not registered in the territory of the the Salmanovskiy (Utrenniy) LA neither in winter nor in summer, and given the active use of the area for grazing of domestic reindeer, the presence of wild population of the animal is extremely unlikely, and only occasional visits of single individuals may be expected. Therefore, the Project may indirectly influence on the wild reindeer population only in a cumulative context together with other third-party activities (reindeer herding is the key anthropogenic factor) by reducing suitable and safe pastures, which could potentially lead to further displacement of wild reindeer due to active grazing of domestic reindeers. The Project contribution to this cumulative impact will be insignificant.

13.4.9 Land use and traditional activities of indigenous people

Overview of the pastures use and main herds migration routes in the area of influence of the planned activities and on Gydan Peninsula in general is provided in Chapter 8. Pastures in the Salmanovskiy (Utrenniy) LA are mainly used by private herders - Nenets people from Gyda (including Yavaisalinskaya) tundra.

Most winter camping grounds of Gyda Nenets are located on Yartoyakha River, however many private herders drive their herds across Tanama River to the area of Krasnoyarsk Krai. There they migrate along tributaries of Tanama - Bolshaya Pyakoyakha, Yarayakha, Labuyakha rivers, etc. Wintr camping grounds of Gyda herders are arranged along rivers. Frozen rivers and streams serve as good smooth roads. Osier-bed (willow shrubs) that grow along are used as fuel by Nenets people. As reported by Gyda village administration, some Gyda herders with large reindeer herds migrate as far as Tazovskiy settlement locality (they stop few dozens kilometres to the north of Tazovskiy) and Messoyakhskinskoye and Soleninskoye fields (in Krasnoyarsk Krai).

In spring, herds from both Gydan and Krasnoyarsk sides move in two directions: to the north-west across Yuribey River to Yevay Peninsula, and to Mammoth Peninsula in the north. Fawning grounds are located on the other side of Yuribey River, close by the estuary. In July and first half of August Nenets graze their herds in blow areas of tundra, often in the vicinity of Ob Estuary, where insect activity is suppressed by cold winds. The breeders follow a common meridional direction of annual migration - from south to north (or from south-east to north-west) and back. In the past, large reindeer farms could cover the distance of 1000 km every year and used 40-60 camp sites on the way. Nowadays these values have reduced by 1.5-

[49] A.A. Gorchakovsky 2007. Wild reindeer of Gydan peninsular. Vestnik Okhotovedeniya, 2007, volume4, № 3, pp. 325-332.

2 times. The annual migrations of reindeer herders in Yavai-Sale mainly follow a common direction from north to south or from north-west to south-east and range 200-300 km[50].

As mentioned in Sections 8 and 10, Antipayuta Nenets normally use migration routes within so called Antipayuta Tundra, i.e. to the south of the Salmanovskiy (Utrenniy) LA. However, one migration route of reindeer herds of State Farm Antipayutinskiy runs across the Salmanovskiy (Utrenniy) LA (the route is also used by the State Farm personnel for their private herds and until recent time it was managed by GydaAgro).

Winter pastures used by Antipayuta herders are mostly located on the opposite side of Taz Estuary, on Aderpayuta, Khalmeryakha, Poylovoyakha rivers, and on tributaries of the latter - Ngarka-Lymbarase, Ngarka-Kharvutta, etc. Some of them migrate further to the west, in Nadym Municipal District, on Krugly Cape and in Nenyanglapte Plain - at the upper reaches of Ngarkayakha, Khaypayetayakha and Layakha rivers[51]. In March Antipayuta herders start moving toward their territory. Fawning grounds of Antipayuta reindeer herds are located in the south of Gydan Peninsula, therefore, most herders cross Taz Estuary by May.

[50] PurGeoCom LLC. Scientific Research Studies Report: Ethnographic Survey in Tazovsky District of Tyumen Region, territory of the Utrenneye Field. Volume 2. Tyumen, 2015.

[51] Y. N. Kvashnin. Reindeer herding practices of Siberian tundra Nenets, Y. N. Kvashnin. Nenets reindeer herding in 20th - early 21st century. The Koleso PR and Publishing Company. Salekhard-Tyumen, 2009.

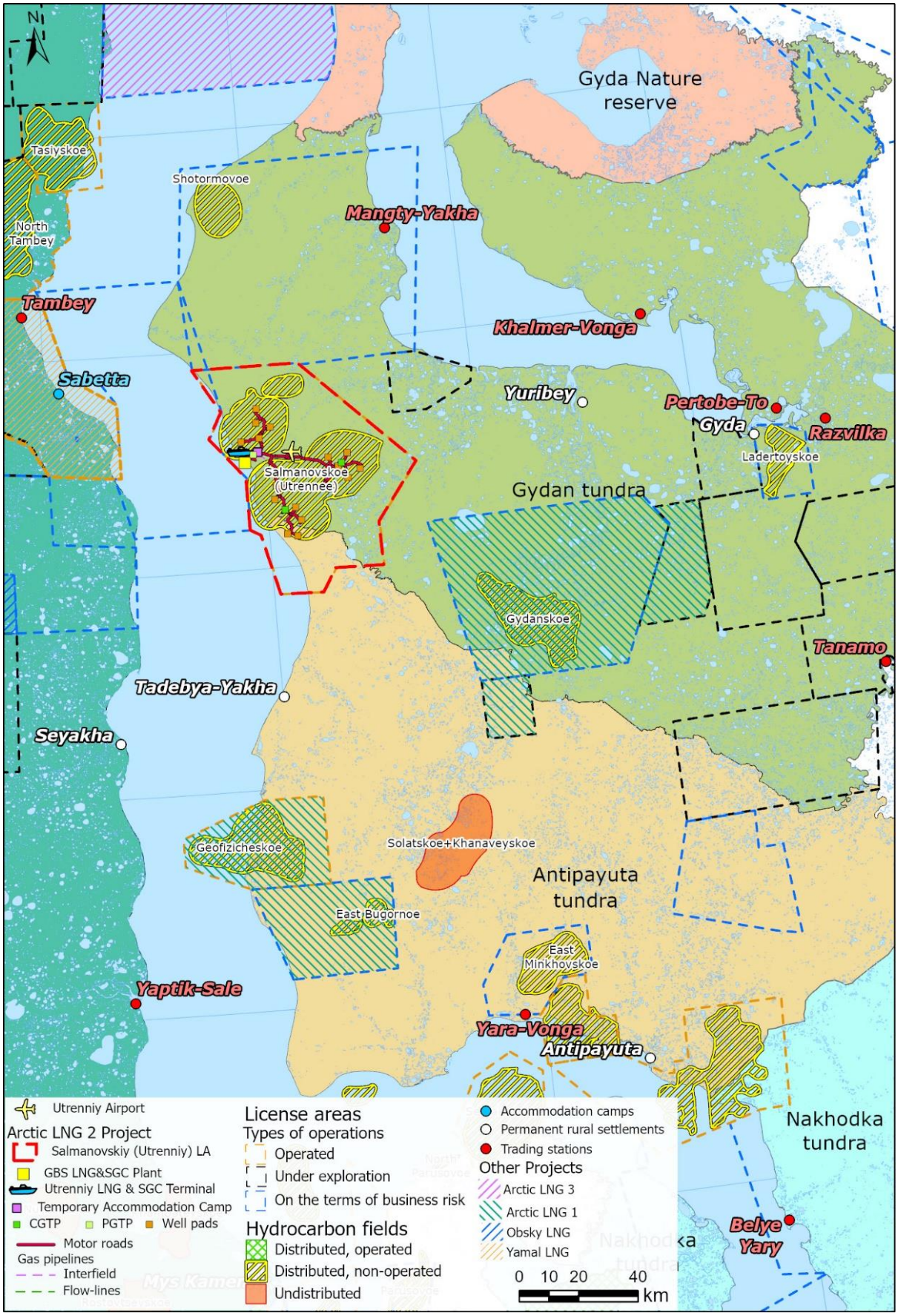


Figure 13.8: Fields and license areas within the Gyda and Antipayuta tundras

As mentioned in Section 10.7, impact on reindeer is possible due to physical acquisition of land, as well as disturbance of annual migration routes and limitation of access to pastures.

Land Acquisition

All fields development projects have a potential to cause physical withdrawal of grazing land. However, land take for the respective facilities will be relatively small compared to the size of concerned pastures and overall pasture resources of Gydan Peninsula. Specific mitigation measures should be taken by each project to avoid occupation of lichen pastures (by adjusting positions of the facilities) and minimize the facilities footprint by applying the optimum design solutions. However, some residual loss of pastures is still unavoidable. The risks to reindeer pastures posed by further development of hydrocarbon deposits of the District in the medium and long term are not at the top of the priority list, however, they may contribute to the problem of overgrazing as the area of unoccupied and safe pastures continues to diminish.

Furthermore, considering that different pastures have different value for the herders, even small loss of pasture land may have cumulative effects. Given the position of Shtormovoye and Geofizicheskoye fields in the coastal areas of the Ob Estuary (similarly to Salmanovskoye (Utrenneye) field), coastal pastures which provide a backup source of food in case of glaze frost are of great nomadic herding value [52].

Disturbance of annual herds migration routes and limitation of access to pastures

Cumulative effects may be expected if specific migration routes are exposed to impacts of development activities for several different fields. It is likely that some of the migration routes that run across the Salmanovskiy (Utrenniy) LA may be affected by exploration and prospecting activities in the neighbour license areas within the Gyda Tundra, particularly the Gydanskiy and Shtormovoy areas, and to a lesser extent Ladertoyskiy and other license areas where geological exploration activities are conducted or planned. The strongest impact may be expected in a long term, in relation to construction of the field facilities for the Gydanskoye and Shtormovoye fields and potential construction of associated linear communication lines (roads and pipelines) to the Utrenniy Terminal.

In the medium term, the Project may have cumulative effects with the development of Geofizicheskoye, Soletsko-Khanaveyskoye, Trekhbugornoye fields (under the Arctic LNG 1 project). The herders migrating in and near the Salmanovskoye (Utrenneye) field may also travel through the immediate works area in the Geofizicheskiy LA. As reported by Gyda village administration, Gyda Nenets migrate with small reindeer herds to the south of Tadebya-Yakha. Linear facilities related to development of Geofizicheskoye field, in combination with the Project activities, may cause significant cumulative impact on pastures and migration routes of reindeer herders. This risk can be minimised by providing adequate crossings/ installing pipelines underground, so that the pipelines will not create impassable barrier for movement of reindeer herds. Getting across a pipeline installed on supports is an impossible task for the animals which cannot go under the pipeline (even if clearance appears to be high enough, one should consider that reindeer have large antlers and are not capable of stooping their heads to pass under a barrier) or above it (pipes would not be covered with snow). The existing pipelines in the south of Tazovskiy Municipal District have created such impassable barriers for domestic and wild reindeer[53].

In the long term, impacts of all development projects in the north of the Peninsula may produce a cumulative effect on specific groups / communities of reindeer herders if development of various fields results in construction of facilities that act as barriers obstructing direct access to certain grazing areas. They may also have indirect effects if certain herder groups / communities are exposed to excessive pressure in terms of access to their customary grazing areas and are forced to leave their traditional pastures /migration routes and trench on the territories used by neighbour communities.

In a broader regional perspective, various herder groups who use pastures near other fields within Antipayuta Tundra away from the area of the planned activities may be exposed to similar impacts related to development and exploitation of such other fields. Even though such impacts will directly influence only specific groups of herders, they may have a cumulative effect on indigenous peoples in Tazovskiy Municipal District in general, if the impacts gain significant magnitude and produce adverse effect on numbers of reindeer and herders, size of herds or customary life style.

Assessment of probability and significance of potential cumulative effects related to the long-term industrial development of the Peninsula is difficult at this stage. However, considering the scale of the expected

[52] Glaze ice events (solid freezing of snow cover after a thaw) are reported in tundra approximately every fourth year, at the end of winter / early spring. Such events have severe consequences for local communities, resulting in loss of dozens and sometimes even thousands of reindeer which cannot break the ice crust to get the food. In such situations herders head to the coastal area of the Ob Estuary where local microclimate does not support ice crusting of surface (PurGeoCom LLC, 2015).

[53] V. A. Tishkov, O. P. Kolomiyets, Ye. P. Martynova, N. I. Novikova, Ye. A. Pivneva, A. N. Terekhina 2016. Russian Arctic: Indigenous peoples and industrial development. N.N. Miklukho-Maklai Institute of Ethnology and Anthropology, RAS. — M.; StPb: Nestor-History.

development of oil and gas deposits of the Gydan Peninsula, and the threat of overgrazing in the north of the Peninsula, overall cumulative impact can be assessed as **moderate** or, in absence of project-specific mitigation measures - as high. Contribution of the Arctic LNG 2 Project to the impacts is assessed as moderate and, by the experience of the Yamal LNG Project, mitigation measures adopted at the project level (refer to Chapter 10) can reduce the Project contribution to low. During development of the neighbour fields, it is recommended to clarify the herders migration routes that can be potentially affected by impacts of the Project and development of the nearby fields, to determine/ clarify potential additional/ cumulative impact on specific families of herders.

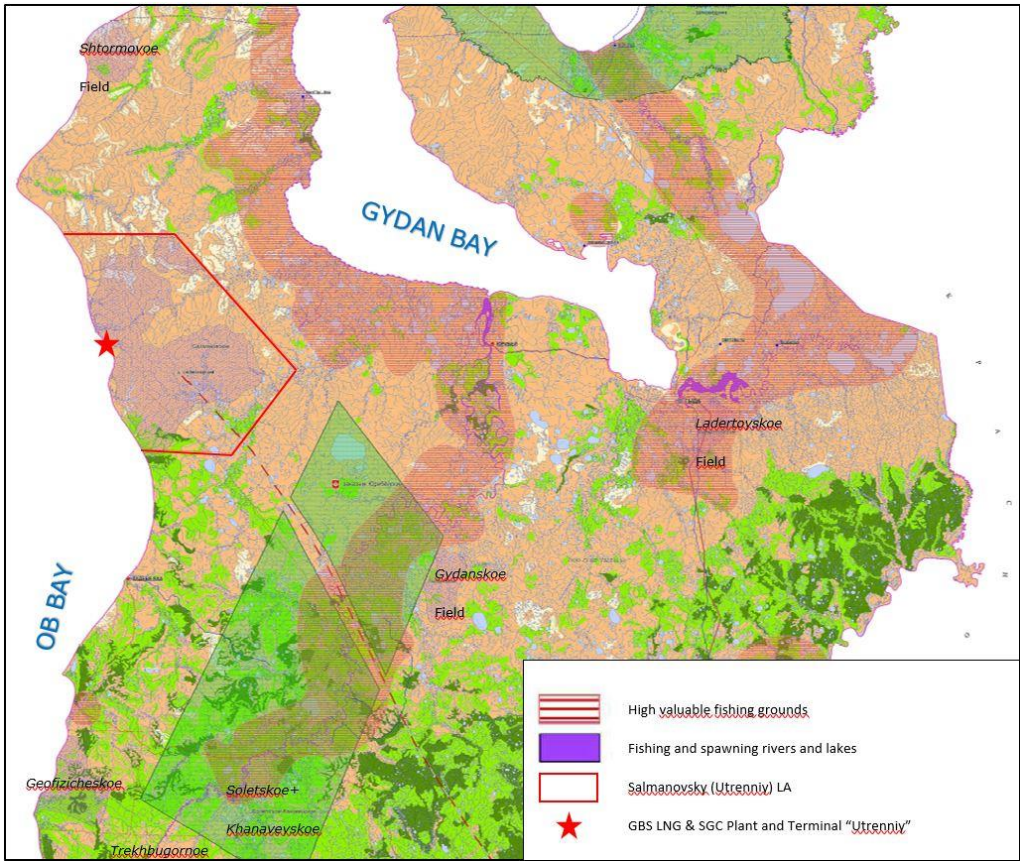


Figure 13.9: Map of customary economic activities in the north of Tazovskiy Municipal District[54]

13.4.10 *Community health and safety.*

As discussed in Section 10, the planned activities may have a negative effect on health and safety of indigenous communities, due to the following factors (low or moderate residual impact):

- Infection diseases, including COVID-19, due to immigration of workforce;
- Impacts related to influx of migrant workforce from other regions (psychological health and stress; tensions and conflicts; alcohol and drugs);
- Community health impacts caused by noise, vibration and emissions to air;
- Impact of construction/operation site activities and linear facilities on safety of local communities.

All existing and potential future development projects considered by the CIA have a potential to produce impact on health and safety of local communities. All considered development projects are remote from major settlements, therefore, potential receptors of their impacts are nomadic herders who use pastures in the north of Gydan Peninsula.

Infection diseases

Influx of workforce from other regions creates a risk of development of infection diseases in local communities, particularly diseases against which local peoples have low or non-existent immune resistance or to which they are particularly sensitive. The number of personnel to be engaged for operation of potential future oil and gas production sites will be relatively small. Further migrant workforce will be engaged for

[54] Source: TPS of Tazovskiy Municipal District https://tasu.ru/gradostroitelnaya-deyatelnost/dokumenty-territorialnogo-planirovaniya/skhema-territorialnogo-planirovaniya/

exploration drilling in Shtormovoye, Gydanskoye, Geofizicheskoye, Trekhbugornoye, Soletsko-Khanaveyskoye and other fields. However, the largest number of workers will be engaged at the construction phase of the future development projects in the above fields. All those projects may produce impacts on various groups / communities of reindeer herders through direct contacts between certain herder groups / communities and the Project personnel, and of other projects (e.g. herders using pastures in the nearby fields or migrating through the Salmanovskiy (Utrenniy) LA), and also through indirect contacts when various herder groups / communities meet (e.g. at trading stations).

Specific numbers of workers to be engaged for each project are not known at this stage, however it may of the same magnitude as the workforce number employed for the Arctic LNG 2 Project. Timing and duration of construction of the potential future development projects is not yet identified, but it is likely to take many years, and several projects may be implemented in parallel. Potential duration of period when such risks may be present is from several years to several dozen years. The primary management tools for local control of such risks on a project level include arrangement of shift camps with restricted access, and medical examination of workers.

Such measures will be implemented within the scope of the planned activities. Considering the remote location and harsh climate of the peninsula, it is expected that similar measures will also be applied at implementation of other field development projects. After mitigation, cumulative risk of development of infection diseases is assessed as **low**, and contribution of the Project to the overall level of risks will be minor.

Stress and psychological impacts, tensions and conflicts, drugs and alcohol

The influx of workforce from other regions, particularly at the construction phase, will also create a risk of impacts related to stress / psychological health of herders. For instance, such risks may be present in case of contacts between reindeer herders and immigrants who are unaware of or fail to respect local culture and customs. In this context, contacts with security service personnel may represent particular risk. As the fields' sites will be guarded throughout the project life cycle, such risks will be present also in long term.

Cumulative impact is also expected in terms of potential tensions and conflicts due to influx of migrant workforce. Such conflicts may be intensified due to cultural differences between labour migrants and indigenous communities. Outbreak of conflicts may be provoked by consumption of alcohol or narcotics. The risk of conflicts is higher at the construction phase, due to larger number of workforce, however, conflicts are also possible at operation.

There is also a risk that the influx of migrant workforce will also introduce supply of drugs and alcohol for local communities. This risk is related to the shift camps to be constructed in relation to the potential fields development projects. The problems of prevention of alcohol and drugs abuse should be addressed at the level of individual projects/sites. Therefore, the level of cumulative risks related to potential enhanced availability of drugs and alcohol is assessed as **low**.

The impacts may be cumulative, in case of direct contacts between private reindeer herders / herder communities with personnel of the Project, and of other potential projects (e.g. herders using pastures in the area of other fields in Gyda Tundra, or annually migrating through the Salmanovskiy (Utrenniy) LA).

The best way to ensure high standard of behaviour and respectful attitude of workers (including security personnel) is to adopt adequate measures at the project level. The Project has established high standards of personnel behaviour, therefore, residual impact of the planned activities on psychological health is expected to be moderate (at the construction phase) and low (at operation). However, if similar measures are not applied by development projects at other fields, the cumulative impact may be **moderate**, even though contribution of the Project will still be minor.

Impact of construction/operation site activities and linear facilities on safety of local communities

All construction and operation activities on Gydan Peninsula have a potential to pose risk to safety of reindeer herders. The potential risks are particularly related to potential migration of herders in the vicinity of industrial sites or crossing of linear facilities (roads, pipelines). The risks may be higher at early stages of industrial development in the region, as local people may be not fully aware of the risks.

Residual impact of the Project is assessed as low. The safety risks related development projects at other oil and gas fields will depend on the nature of specific projects, although it is expected that adequate mitigation measures will be applied. Nevertheless, residual risk and total cumulative risk to safety of local communities can be assessed as **moderate,** considering the duration of the fields development activities,

potential scale of the projects, and magnitude of consequences of potential safety incidents (despite their low likelihood).

13.4.11 Cultural Heritage

Potential impacts on cultural heritage include:

- Impact of damage to tangible heritage (known or newly identified);
- Loss of access to heritage sites as a result of construction of linear facilities;
- Disturbance of customary life style due to potential contacts with migrant workforce (including security personnel) who may be unaware of traditions and customs of local indigenous communities.

All identified development projects in Tazovskiy Municipal District have a potential to destruct cultural heritage, if not adequately managed. The risks are exacerbated due to poor knowledge of the heritage sites in the district. Therefore, companies involved in the fields development activities should take adequate measures including:

- Detailed survey of heritage sites (including consultations with herders representing indigenous communities) in work areas related to development of the fields;
- Development and implementation of chance finds procedures, to minimise the risk of damage of previously unknown heritage objects.

Without the above mitigation measures at the level of individual projects, the cumulate impacts / risk of damage of tangible heritage may be **moderate.** After implementation of mitigation measures to prevent / reduce the impact, residual risk of heritage damage at implementation of the planned activities is assessed as **negligible**. Therefore, potential contribution of the Project to the total cumulative impact is minor.

Construction of the linear facilities may result in long-term loss or limitation of access to tangible heritage sites which may be of great importance for indigenous communities. The Project considered alone may have a **moderate** impact on access to tangible heritage (refer to Section 10.8). Considering the impact of development of other fields in the region, cumulative impact on indigenous people's access to their important heritage sites can be assessed as **moderate.**

Potential contacts of local communities with migrant workers (including security personnel) unaware of behaviour traditions and customs of indigenous peoples may have a negative effect on customary intangible culture. At the Project level, residual impact after implementation of the planned mitigations (refer to Section 10.8) is assessed as low. In combination with other industrial projects, potential cumulative impact may be **low** or **moderate**. Therefore, adequate measures should be adopted by each industrial development project (including induction training on cultural heritage issues, enforcement of the Personnel Code of Conduct, etc.).

13.4.12 Priority ecosystem services

Feed resources and reindeer herding

Cumulative impact on land use conditions and customary activities of indigenous people is assessed in Sub-section 13.4.9 as low/ moderate (after the planned mitigation measures). Implementation of the Arctic LNG 2 Project is not expected to result in blocking access to pastures with linear facilities, and is unlikely to affect the migration routes or use of other pasture lands.

Cumulative impact on the natural tundra vegetation are examined in Sub-section 13.4.5 as moderate. Physical loss or limited availability of summer and winter pastures, due to the areal facilities that will be developed in or near the pastures will be relatively small, compared to the size of pasture lands available within the license areas. However, fragmentation of pastures within the license areas will limit availability of pasture lands in a slightly larger territory, as some of the pastures fall within the area of influence of "noisy" industrial facilities that deter deer, while other will be affected by poor access conditions due to the linear facilities as well as potential indirect impacts.

The most valuable winter pastures are lichen tundra, mainly confined to river valleys. As noted in Section 7.6, these pastures occupy small areas within the Salmanovsky (Utrenny) LA. As shown in Figure 7.1.75 structures and facilities are mainly located outside valuable winter pastures. According to the map of customary economic activities no valuable winter pastures are located within the territory of the Gydan and Shtormovoye gas fields, the development of which may affect the migration routes of the same families of reindeer herders (Figure 13.9).

The cumulative impact on feed resources and reindeer herding, considering increasing threat of overgrazing, leading subsequently to the degradation of the vegetation cover and a decrease of its productivity on remaining pastures, can be assessed as moderate.

Fishing

Nowadays, herders practice net fishing in estuaries of rivers discharging to Ob Estuary, and also in deep-tundra lakes and rivers. Only few herders have access to summer fishing resources, and only for the short periods of migration near fishery water bodies. The catch mainly consists of valuable species (round-nosed whitefish, omul and grayling), however its volume just enough for current consumption, therefore, not much surplus is left to be preserved for the future. Catch is small because of repeated fishing in local water bodies each year, whereas in the areas with more abundant fish resource Nenets people regularly let water bodies "have a rest", to restore their fish population. The most active fishing is practiced in the middle of autumn in Neita-Yakha River, its tributaries and floodplain lakes, in Yuribey River and other water bodies to the east of the field area[55].

As mentioned in Section 10, access to Neita-Yakha River may be obstructed by the linear facilities of the Salmanovskoye (Utrenneye) OGCF Facilities Setup. Also, impact is possible on the fishery sections of Khaltsyney-Yakha River (and the floodplain lake) and Nyaday-Pynche River (residual impact of the Project is assessed as moderate).

Potential cumulative effects may be related to impacts on waterbodies outside the Salmanovskiy (Utrenniy) LA that are used for commercial fishing by the herders whose migration routes are exposed to impact of development projects of several fields (including development of the Salmanovskiy (Utrenniy) LA). E.g. cumulative impacts are possible in connection with development of the Geofizicheskoye field which includes estuarian sections of small rivers discharging to the Ob Estuary, and, to a larger extent, development of Gydanskoye and Trekhgornoye fields in a longer term which may affect/ limit access to fishery resources in the upper and middle reaches of Yuribey River and its tributaries (Figure 13.9). Construction of linear facilities (pipelines) from Geofizicheskiy LA to the Utrenniy Terminal (if the Arctic LNG 1 Project is implemented in the Utrenniy Terminal) may affect fishery activities of nomadic herders. The cumulative impact is tentatively assessed as moderate. Contribution of the Project to the above impacts can be assessed as low or moderate, provided that adequate mitigation measures are adopted to minimise impact on the waterbodies and provide unimpeded access to the traditional fishing grounds on Neita-Yakha River.

Hunting and wild crop gathering

As discussed in the report of LLC PurGeoCom (2015), waterfowl are traditionally hunted by the Nenets during spring migrations. According to the estimates given in Section 9.5, the most important habitats suitable for stops during migrations are in valleys of large rivers within the LA are located outside the zones of concentration of industrial facilities. The cumulative impact on avifauna is assessed in Section 13.4.6 as moderate, given that the development of other gas fields of the Gydan Peninsula and in the Ob Estuary can cause deterioration of food supply, disturbance and fragmentation of coastal tundra habitats and wetlands in the region.

Considering that direct transformation will affect a relatively small part of such habitats available in the region, no significant cumulative impacts are expected on hunting opportunities by individual families of indigenous peoples, whose customary economic activities may be exposed to impacts of several development projects and on waterfowl and hunting opportunities by indigenous people on a scale of the northern part of the Gydan Peninsula. The cumulative impact is assessed as low.

Quality of surface water bodies

Potential cumulative impacts on the quality of water bodies (as pure drinking water for the local population and reindeer) are possible due to third-party activities within the same catchment area, and in the case of impacts on water bodies in other catchment areas when used by the same families of reindeer herders during their migrations.

Impacts on the same water bodies (mainly, on the catchment area of the Khaltsyney-Yakha and Nyaday-Pynche rivers) are likely in case of the Arctic LNG 1 project implementation within the Utrenniy terminal

[55] PurGeoCom LLC, 2015

with the construction of the corresponding linear infrastructure (and crossings through water bodies) to the respective gas field. Considering the measures adopted by each project to prevent pollution of water bodies, during normal operation, the risk of water bodies' pollution with a potentially significant cumulative effect on the same rivers can be assessed as low, with the exception of some lakes, which will be used for extraction of construction materials. Thus, the implementation of the Project will not have a significant impact on access to pure drinking water for the ISPN families potentially affected by activities of other projects.

Therefore, overall cumulative impact on ecosystem services can be assessed as low/ moderate.

13.5 Management of Cumulative Impacts

Mitigation of cumulative impacts should be provided on a project specific basis, with responsibility vested in the project operator, and in terms of VEC management - at the regional level.

The main mechanism of regional management of VEC shall be based on strategic assessment of the regional development and planning, which is normally the function of competent government authorities. Operator of specific project has no tools to oblige other parties to adopt mitigation measures, as long as it has no power or authority to directly control them, and is not responsible for their activities.

LLC "Arctic LNG 2" is proactive in managing the impacts by implementing mitigation measures within the scope of the planned activities, and also through continuous engagement and consultation with local communities (refer to Section 10 and the Stakeholder Engagement Plan).

In accordance with guidance note 1 to the IFC Performance Standards, LLC "Arctic LNG 2" will use commercially reasonable efforts to engage relevant government authorities, other industries, affected communities, and, where appropriate, with other relevant stakeholders, in the design and implementation of coordinated mitigation measures to manage the potential cumulative impacts identified in Section 13.4.

In addition to the impacts control at the level of individual projects, the Company will, as far as feasible and appropriate, adopt a proactive approach and contribute to control of cumulative impacts on a wider district / regional level. Further recommendations for reduction of potential cumulative impacts are provided below.

Atmospheric air

- Before decision is made about construction of the three natural gas liquefaction trains in the Utrenniy Terminal, or about extension of the Arctic LNG 2 Project, it is recommended to prepare a pollution dispersion simulation (model) for all facilities of the Project(s).

Marine Environment, Marine Habitats and Fish Fauna

- Further monitoring activities under the Comprehensive Monitoring Programme of the Ob Estuary (including water quality, status of aquatic organisms and fish, studies of impact of icebreakers on marine mammals).
- Development/support of regional initiatives aimed at identification of/establishing the conservation status to particular areas in the Ob Estuary, reducing human-induced load, and increasing the productivity of water ecosystems.
- Support of regional initiatives aimed at rehabilitation of populations of commercial and rare fish species (particularly Siberian sturgeon).
- Maximum efforts should be applied for liaison with other operators and local authorities, and also with other development projects within the company, to coordinate planning and implementation of potentially noisy activities in the Ob Estuary.

Vegetation, Natural Tundra Habitats, Bird Fauna, Protected Terrestrial Mammals

- Support of the regional, national and international initiatives for research and conservation of migrating bird species, particularly rare and protected anseriformes.
- Support of regional initiatives for research and conservation of Gydan population of wild reindeer.
- A Project-specific Biodiversity Conservation Action Plan will be developed (the title and format of document are subject to further refinement) to exclude the net loss and, where possible, to improve the biodiversity state (refer to Section 9.5). The company cooperates with local authorities and other companies/ operators in the Tazovskiy Municipal District and the Ob Estuary, and applies its best efforts to disseminate good practices in the activities of local authorities and other companies/ operators by:

- Providing information on good environmental practices adopted by the Project (as described in Chapter 9), including lessons learnt;
- Disclosing results of environmental monitoring.

Permafrost

- Minimisation of land acquisition for temporary and permanent facilities, installation of new linear facilities within the existing/common corridor (whenever possible).
- Timely reclamation of disturbed land (using suitable methods and resources for working in tundra, and making sure that no invasive species are imported).

Indigenous people and ecosystem services

- Continuous engagement and consultations with indigenous peoples and other stakeholders on the issues of reindeer herding, fishing, health, minimisation of impact of the planned Utrenniy Airport, etc., on the basis of the Stakeholder Engagement Plan (SEP);
- Preparation of Indigenous People Development Plan (IPDP) and application of maximum endeavours to engage local authorities, other companies / operators in Tazovskiy Municipal District and other stakeholders into implementation of the planned initiatives;
- Liaison with local authorities and other operators / companies within the scope of IPDP and implementation of dedicated mechanism for information exchange, sharing of good practices, understanding of reindeer herding activities in the district, as well as identification of potential joint initiatives to support reindeer herders at the district level.

14. ENVIRONMENTAL AND SOCIAL MANAGEMENT

LLC "Arctic LNG 2" is a modern dynamic company that manages its environmental and social processes using best practices of its parent companies (NOVATEK, Total, Mitsui, subsidiaries of CNPC, etc.), as well as most advanced approaches specified by the international standards of management systems.

Since its foundation, the Company has paid great attention to occupational health and safety, industrial safety, environmental protection and social responsibility. Currently, the management system for these issues continues to improve. By the end of 3rd quarter 2021, it is planned to integrate the environmental management and health and safety management systems and certify the integrated management system for compliance with the requirements of ISO 14001:2015 and ISO 45001:2018. This integrated management system (IMS) will apply to all Project activities of the Company, and all its business units.

14.1 Environmental and Social Management Structure

Responsibility for the occupational health and safety, industrial safety, environmental and social (HSSE) management at LLC "Arctic LNG 2" rests with the top management - the General Director, therefore, efficient and effective management of the above issues is ensured.

The HSSE personnel are located at all main sites of the Project: in Moscow, Murmansk, Belokamenka (Murmansk Region), and directly at the Salmanovskoye (Utrenneye) field in the Tazovskiy Municipal District of YNAO.

Functional management of occupational health and safety, industrial safety and environmental protection (HSE) is carried out by the HSE Department which structure includes the following units:

- in Moscow: Industrial Safety and Occupational Health and Safety (OHS) Unit; Fire Safety, Civil Defence and Emergency Response Unit; Nature Use and Conservation Unit; Sustainable Development Unit;
- in Murmansk - OHS, Industrial and Fire Safety, and Environmental Protection Unit;
- in YNAO - Industrial Safety Section, OHS Section, and Emergency Fire Response Service under the Salmanovskiy Gas Condensate Production Business unit.

The HSE Department employs 69 persons, of which 34 belong to the Fire Station and the Accident Rescue Group.

The divisions involved in social management are the Sustainable Development Unit (in terms of stakeholder engagement on environmental and social issues) and the Human Resources Department (in terms of employment and working conditions) with its Labour, Wages and Social Policy Unit, Staff Office, and Personnel Recruitment and Development Unit.

The roles, responsibilities and authorities of personnel in managing environmental, social and other issues are defined in the job descriptions of employees, divisional regulations, procedures and other corporate organisational and administrative documents.

Given the pace of the Project implementation, LLC "Arctic LNG 2" has developed an organisational structure for the future period until 2023, which is regularly reviewed to ensure timely response to changes and flexibility of the structure. As the Project develops, more personnel with relevant skills will be hired to ensure effective management of the Company's activities and contractors.

14.2 HSSE Management System

The HSSE management system is built on the following principles:

- Preservation of human life and health, prevention of any accidents and minimisation of negative impact on the environment;
- Rational use of natural resources and materials;
- Compliance with legal standards and requirements applicable to the Company's activities;
- Carrying out activities in ways that ensure safe working conditions for all personnel of the Company;
- Engagement with local communities and representatives of the indigenous small-numbered peoples within the work area;

- Extension of the Company's philosophy and requirements to cover activities of contractors and subcontractors.

The Company has a HSSE Policy approved by LLC "Arctic LNG 2" Order dated May 24, 2019 No. 109-PR.

This Policy describes the strategic directions for the development of the Company's activities, declares the Company's commitments in the sphere of environmental protection, occupational health and safety, and protection of health of personnel and local communities. The Policy provides the basis for planning and implementation of any activities, is considered at development of respective targets and objectives, covers all divisions of the Company, and is brought to the attention of all contractors. By introducing this Policy, the Company assumed the following commitments:

- Provide safe and healthy working conditions for the prevention of occupational injuries and damage to health of all workers at the Company's sites;
- Conduct a dialogue with all stakeholders, make HSSE performance information available to all interested parties;
- Minimize negative impact on the environment and compensate for potential damage;
- Take proactive measures to prevent potential accidents, injuries, occupational diseases and poor health, pollution of the environment;
- Openly disclose information on the Company's HSSE performance;
- Continuously raise HSE awareness and competence of personnel;
- Respect the interests and rights of indigenous peoples to maintain their traditional lifestyle and original living environment;
- Manage and control contractors' activities for HSSE compliance.

In this context, the priority task for LLC "Arctic LNG 2" is to integrate the Company's existing management systems in the sphere of environmental protection, occupational health and safety, and industrial safety, into a single integrated management system, and get this system certified for compliance with ISO 14001:2015 and ISO 45001:2018. The IMS of LLC "Arctic LNG 2" will cover all activities under the Arctic LNG 2 Project and all sites of the Company. The document describing the basic principles, scope and interaction of the elements of the IMS will be the Integrated Management System Manual. The Company will also adopt other management documents that take into account the specific requirements of international lenders (refer to Section 14.5).

By the time of reporting, the key documents regulating the HSSE management process include (without limitation):

- HSSE Policy;
- HSSE Targets 2020;
- Regulation on the OHS Management System;
- Regulation on the Industrial Safety Management System;
- Contractor Management Standard;
- HSE Training Standard.

The requirements of these documents apply to all divisions within LLC "Arctic LNG 2", as well as contractors and subcontractors, as appropriate for their respective scope. As far as possible, reasonable and practical, these requirements cover the activities of any companies / persons working at the sites of LLC "Arctic LNG 2", taking into account the existing and potential limitations of direct control over contractors, subcontractors and partners of associated facilities.

The requirements for planning and reporting in the Company are established by NOVATEK Order dated 04.25.2016 No. 046 as part of the Integrated Management System (IMS) procedures of the managing company PJSC "NOVATEK" developed in compliance with international standards ISO 14001:2015 and OHSAS 18001:2007.

The issues of personnel management, hiring and working conditions are regulated, in particular, by the following documents:

- Collective Agreement;
- Corporate Code of Labour Conduct;
- Guideline on the principles applicable to staffing, hiring and dismissal of personnel, etc.

These documents regulate, inter alia, the procedures for recruitment, retrenchment or dismissal, main rights, duties and responsibilities of employee and employer, work and rest hours, motivation, penalties, etc. The issues of organizing management and control in the sphere of compliance with applicable labour requirements and ensuring appropriate working conditions are discussed in more detail in Section 10.6.

General staff development is carried out in accordance with the Employees Training and Knowledge Testing Standard of LLC "Arctic LNG 2". The Standard establishes a uniform procedure for organizing briefings, training (preparation) and testing (attestation) of knowledge of HSE requirements. All training results are recorded in personal files of employees, briefing logs, certificates, diplomas and other similar documents.

14.3 HSE Requirements for Contractors

LLC "Arctic LNG 2" is actively working with contractors to establish and enforce HSE requirements.

LLC "Arctic LNG 2 adopted a Contractor Management Standard which establishes general requirements for HSE management of contractors working at the Company's sites, starting from the early stage of tendering for contracts. Different HSE requirements are applied, depending on the nature of the prospective contractor's works, including:

- Availability of an industrial and environmental, health and safety policy document;
- Guarantees for the implementation of HSE requirements, including those adopted by LLC "Arctic LNG 2";
- Availability of emergency containment and response action plans;
- Guarantee of participation in HSE system audits conducted by the client's representatives, before and/or after conclusion of contracts;
- Guarantees for the availability of HSE officers on site during the works on the Salmanovskoye (Utrenneye) OGCF;
- Availability of the Substance Control Policy in the Contractor's organisation;
- Contractor's traffic management and transportation plan, ability to manage wastes generated during the works included in the Contractor's scope, and to remove the wastes to the disposal facilities specified by the Client, independently and at Contractor's own expense.

At the tendering stage, the Company analyses the HSE Risk Registers prepared by bidders. Successful tenderer prepares an HSE Plan and gets it approved by LLC "Arctic LNG 2". Implementation of this Plan is included into the contract agreement as a mandatory requirement.

Also, contractors appointed through a competitive bidding process assume the following obligations (without limitation):

- Comply with and ensure compliance with all applicable Russian and international legal and regulatory requirements as well as the principles and requirements of the Company's HSSE Policy;
- Conduct the works in strict compliance with the design documentation, agree with the Company upon any deviations from the designed technological processes;
- Carry on activities in accordance with HSE instructions and guidelines;
- Promote high level of safety and have in place appropriate systems for planning, implementing, maintaining and improving HSE activities;
- Be responsible for taking, using their own resource and at their own expense, the necessary measures and methods aimed at safe performance of the work and prevention of any accidents or incidents that may compromise the safety of personnel or create the risk of damage to assets and/or the environment;
- Provide competent HSE personnel and resources for risk management;
- Ensure continuous process of awareness raising of personnel about HSE requirements, conduct regular HSE meetings and drills to review and refine the HSE rules and instructions and their performance;
- Apply appropriate management tools and techniques, working methods to reduce the environmental impact of Contractor's activities (for example, waste generation, noise, air emissions, water discharge, etc.), and prevent accidents and injuries. Encourage and support the conservation of natural resources (such as water, electricity, etc.);
- Cooperate fully with the HSE personnel of the Company;
- Provide regular reports to the Company in the agreed format.

The contractors' commitments are documented in contracts and in contract addenda, as appropriate. LLC "Arctic LNG 2" developed a standard article which is included in contract agreements, with a description of HSE requirements to contractor, or references to other documents describing the requirements. The article can be amended to match specific nature of each contractor's works.

14.4 Audit, Supervision and Operational Monitoring

The Company audits HSE activities on a regular basis, and monitors HSE performance. The procedure for organising and conducting the audits and inspections is defined in the following documents: Regulation on the industrial control of compliance with industrial safety requirements at operation of hazardous facilities of LLC "Arctic LNG 2", Regulation on the industrial control of health and safety at LLC "Arctic LNG 2". A three-tier system is established for inspection of OHS and industrial safety compliance.

The local environmental monitoring and operational environmental control are carried out by independent specialized organizations that employ qualified experts, in accordance with the approved programs and methods. In the course of monitoring in the vicinity of production facilities and within the Company's license area, the state of environmental components is studied, samples of soil, ground, surface water, snow cover are taken, terrestrial fauna monitoring is conducted, and the level of air pollution is assessed. In the near-shore water areas, the state of ichthyofauna populations and their forage base is studied, and hydrological and hydrochemical indicators are analysed as well. The monitoring results are recorded and analysed and used as a basis for development target-oriented programs and environmental protection action plans. These programs are aimed at preventing the negative impact on the environment, control of waste disposal and water conservation activities, and ensuring sustainable land use.

As part of the ESHIA, recommendations have been prepared on setting up the Project operational monitoring and control activities as specified in Chapters 9 and 10.

The procedures of auditing contractor's HSE practices are regulated by the Contractors HSE Management Standard, and the Regulation of LLC "Arctic LNG 2" on Inspecting Contractor's HSE Practices.

The audits include (without limitation) the inspection of the following:

- Compliance with HSE provisions of the contract agreement and implementation of the HSE Plan;
- Availability of contractor's internal system for HSE control;
- Involvement of contractor's managing personnel in HSE activities;
- Qualification and experience of contractor's managing personnel;
- Inspection of compliance with HSE requirements applicable to the contractor's activities;
- Implementation of health safety measures, such as conducting initial, regular, pre-trip (post-trip), and other health checks, first aid provisions in compliance with requirements of applicable law and corporate regulations;
- Training of contractor's personnel as appropriate for the nature of works, including training required by the Russian regulations;
- Toolbox talks and scheduled HSE meetings;
- Emergency drills to practice emergency response actions;
- Compliance with requirements for accidents reporting, investigations of incidents, and implementation of corrective and preventive measures.

Contractors are subject to operational, comprehensive and targeted audits and inspections. The audits are based on measurable indicators agreed before start of the works. Any identified violations or inconsistencies are recorded in acts, and corrective measures are developed and implemented. Meetings for review of contractor's HSE compliance are conducted on a regular basis during the works and are attended by managers of the Company and Contractor. Results of the meetings are recorded in protocols.

14.5 Ensuring Compliance with International Lenders' Requirements

The corporate management procedures of NOVATEK and the planned development of the integrated management system of the Company will ensure sufficient level of control over the environmental and social, health and safety impacts and risks. In addition, the development of management and monitoring procedures for the Project will take into account both the features of the Project area identified by the ESHIA and the previously received recommendations of the Lenders' Independent Environmental and Social Consultant.

To this end, LLC "Arctic LNG 2" will develop and implement special management programs that include measures and actions aimed at improving the efficiency of environmental and social activities and reducing potential environmental and social risks and impacts. The programs will include procedures and plans intended to provide systematic and comprehensive management of environmental and social aspects of the Project. They will be adopted for the whole life cycle of the Project and cover both the Project Operator and his contractors.

In particular, special plans to be developed for the Arctic LNG 2 Project will serve as the main management and monitoring documents:

- Stakeholder Engagement Plan (SEP, a separate document developed by the Consultant; discussed in Chapter 4);
- Environmental and Social Action Plan (ESAP, sub-section 14.5.1);
- Environmental and Social Management Plan (ESMP, sub-section 14.5.2);

14.5.1 Environmental and Social Action Plan (ESAP)

Following review of the Project ESHIA, the Lenders' Independent Environmental and Social Consultant will establish compliance of the existing and planned Project activities with requirements of international lenders and, if needed, prepare an Environmental and Social Action Plan. ESAP being an integral part of the loan agreement is intended to define the key target measures, their performance criteria and responsibility for addressing the most sensitive environmental and social issues in the course of the Project implementation. The action plan is subject to regular review and updating in the course of the Project implementation.

14.5.2 Environmental and Social Management Plan (ESMP)

The Environmental and Social Management Plan (ESMP) is a framework guidance document formulating environmental and social management and monitoring approach and procedures. Thematic plans and procedures for environmental and social management, especially in large-scale projects such as the Arctic LNG 2 Project, will be additionally developed for the areas of activity that are the most significant and that require special attention, for example, in relation to waste management or biodiversity, management of temporary accommodation facilities, and so on.

Systematic environmental and social requirements for the Project, as well as the measures and methods to ensure compliance with these requirements during the Project implementation will be highlighted in the ESMP. In particular, ESMP will include a description of:

- Structure of environmental and social management and interaction, including the identification of the necessary resources and the distribution of functions and responsibilities;
- Applicable environmental and social standards;
- Measures in the field of management, mitigation and monitoring of impacts on the natural and social environment to be implemented.

Recommendations concerning approaches to monitoring the Project during the construction and operation phases are presented in Chapters 9 and 10 herein.

In view of the natural, man-caused and socio-economic baseline characteristics, potential environmental and social impacts discussed above, and the recommendations of the Lenders' Consultant, development and implementation of a range of management documents for the construction and operation phase would be required (or updated, if existing) in the future, in the following topic areas (without limitation):

- Stakeholder engagement;
- Indigenous people development;
- Conservation of cultural heritage (including chance finds procedures);
- Community health, safety and security;
- Traffic flows;
- Temporary accommodation camps;
- Labour and working conditions (including employment and general occupational safety);
- Biodiversity conservation;
- Restoration of disturbed ecosystems;
- Hazardous materials and waste management;
- Air emissions (including GHG);
- Water management;

- Impact on soil and geology.

Management plans should be reviewed regularly and updated as necessary. Taking into account the quick development pace of the Project, the environmental and social management plan(s) will provide the ability of quick respond to changing circumstances and to consideration of the monitoring results.

15. CONCLUSION

The ESHIA materials have been prepared for the purpose of identification and assessment of all types of potential environmental and social impacts of the Arctic LNG 2 Project, development of measures to prevent the negative impacts of the planned activity or minimise them to the acceptable level in line with the Russian Law, international best practice, and the applicable requirements of the Equator Principles Financial Institutions.

Earlier (in 2018) the Consultant conducted the assessment for the GBS LNG & SGC Plant as one of the possible options for the development of the Salmanovskoye (Utrenneye) oil, gas and condensate field as opposed to pipeline transportation of the produced hydrocarbons to Sabetta, or their transportation to the elements of the gas transmission system of GAZPROM.

In this document, the focus of the impact assessment is the Arctic LNG 2 Project which, besides the Plant and Utrenniy Terminal, also includes the Salmanovskoye (Utrenneye) OGCF Facilities Setup, as well as several other facilities and activities that meet the association criteria set by IFC – the Utrenniy Airport on the Gydan Peninsula, and hydraulic structures and marine operations in the Ob Estuary of the Kara Sea.

The impact assessment that the Consultant prepared in 2018 can be considered as a preliminary ESHIA for the Project, and the respective stakeholder consultations – as a stage of disclosure and discussion of the Project impact assessment, to be continued during the current ESHIA 2020.

The first stage of this ESHIA is scoping and preliminary consultations with stakeholders which were held in May 2020. As a result of those activities, two documents have been prepared and approved by the Company and other stakeholders – the Scoping Report (SR) and the Stakeholder Engagement Plan (SEP) – which formed the basis for development of the impact assessment presented herein.

This Section provides a summary of the detailed assessment of the Project impacts in Chapters 9 through 13, with thematic subsections on the Project's area of influence, results of the assessment of impacts of environmental and social importance, transboundary and cumulative impacts, and assessment of the Project implementation in the context of global climate change.

15.1 Identification of the planned activity's influence area

In the context of IFC approach, the planned activities' area of environmental and social influence includes the following :

1) Land plots and water areas immediately used for implementation of the planned activity;
2) Other territories and water areas that the project operator and its subcontractors use or control;
3) Territories and water areas occupied by associated facilities;
4) Land and water areas that may be subject to the cumulative impacts of the planned activity;
5) Territories and water areas potentially affected by impacts from unplanned but predictable developments caused by the project that may occur later or at a different location.

The IFC performance standard PS1 further highlights that the area of influence should include the territories and water areas potentially impacted by cumulative impacts of the project and associated activities. On the other hand, the area of influence should not include the areas of impacts that would occur without or independently of the planned activity.

In the context of the Arctic LNG 2 Project, the main specific attributes to be considered in determination of the area of influence are:

- Partial overlapping with the offshore part of the area of influence of the Yamal LNG project, which since 2015 is covered by the impact management and monitoring practices in line with the requirements of the international finance institutions;
- Uncertainty about some cumulative impacts[56] involving the Project activity, which entails the need for enhanced area of environmental monitoring and coordination of monitoring programs with third parties;
- Project's social impacts connection to receptors rather than territories, as the most vulnerable receptors are nomadic communities migrating within the Tazovskiy Municipal District.

[56] Refer to Chapter 13 for details

15.1.1 Land plots and water areas immediately used for implementation of the planned activity

Central part of the area of influence of the planned activity is the land and adjacent water area allocated for construction of the future facilities as shown in the maps in Chapter 5 of this document (Figures 5.4, 5.5, 5.6).

The total area size of land acquisition for the Project is assessed at 3627 ha (just over 1% of the license area), which is distributed between the Field and the onshore facilities of the Plant and Port as 3501 ha (96.5 %), 56 ha (1.5 %) and 70 ha (1.9 %), respectively. Together with the land acquisition for the Utrenniy Airport (446 ha, leased by the Company and sub-leased to Sabetta International Airport LLC), the total of 4073 ha of land will be used within the license area.

Within the total of 6000 ha of water areas used by the Project, the internal basin confined by the ice barrier structures will occupy about 400 ha (6.7%), of which 24.1 ha are intended for the artificial land plots and 35 ha for the hydraulic structures.

15.1.2 Other territories and water areas that the project operator and its subcontractors use or control

Boundaries of the Salmanovskiy (Utrenniy) subsoil area of federal significance (the license area, LA) that are shown on the ESHIA maps describe the borders within which any subsoil use activity of third parties in the LA territory and water areas is subject to consent of LLC "Arctic LNG 2". Therefore, the whole license area (having the status of "mining allotment") must be included in the Project's area of influence, even though its boundaries only delineate the subsoil use authorization.

All land plots established for the Project and the Utrenniy Airport are located within the Salmanovskiy (Utrenniy) subsoil area, whereas a part of the Port's external water area and bottom soil dumping sites extend 5-10 km beyond its boundary.

Besides the immediate land acquisition and water areas immediately occupied by the facilities, responsibility of the Company and operators of associated facilities also applies in the extended area. In particular, Article 104 of the RF Land Code (as of 18.03.2020) provides for restrictions on use of adjacent territories and water areas identified as use-restricted zones (URZ), in order to ensure:

- Protection of human life and health;
- Safe operation of transport, communication, power and homeland security facilities;
- Conservation of cultural heritage;
- Environmental protection, particularly protection and conservation of natural medicinal resources, prevention of pollution, contamination, silting of waterbodies and depletion of water resources, conservation of aquatic life habitats and other wildlife resources;
- Ensuring homeland defence and security.

Therefore, standard URZs are established around the Project facilities. Such areas are not designated as dedicated land plots and not acquired from the existing owners (RF represented by the Administration of the Tazovskiy Municipal District) and land users (ISPN families), but are subject to restrictions on economic and other activities as appropriate to fulfil the requirements listed above.

The most common and characteristic type of URZ for the Project is the sanitary protection zone (SPZ) - territory or water area outside which and also its outer boundary air quality meets the applicable standards for urban and rural settlements air quality, and harmful physical impacts are within the permissible limits (in the context of current version of SanPiN 2.2.1/2.1.1.1200-03, p.2.3). SPZ functions as a buffer zone for dispersion of pollution in air and attenuation of noise, vibrations, electromagnetic fields and other physical impacts to the levels permitted in regulated areas.

According to the sanitary classification of industrial sites in SanPiN 2.2.1/2.1.1.1200-03, the Plant, well pads, gas treatment plants, methanol storage and some other Field facilities are Class I facilities requiring a standard SPZ of 1000. m. The dispersion and acoustic impact analysis in the design documentation for the above facilities demonstrate adequacy of standard SPZ or possibility of establishing a smaller SPZ (e.g. for the well pads GWP-11 and GWP-16) (Table 15.1).

Total area of all sanitary protection zones, less the land take of the facilities and considering the overlaps of some of them and SPZ of the ground-based facilities of the airport, is assessed at approximately 12,000 ha of land within the Tazovskiy Municipal District, i.e. not more than 5% of the license area. Pollution levels above these territories may exceed the applicable quality standards, therefore, restrictions on agricultural activity and picking wild crops are applied.

The range of acoustic impact of the Project is comparable to or even exceeds the range of pollution dispersion. In particular, the defining factors for the Plant SPZ are both noise (45 dBA isoline) and air pollutants (0.71 MAC for NO_2 at SPZ boundary); at the SMCIW DS, the MAC limits will be met already on site, and the SPZ boundary is designed solely for attenuation of the acoustic impact (the limit of 45 dBA is reached at a distance of 440 m from the site of the waste disposal facility). Air transport will be dominating source of acoustic impact in the LA: the zone of acoustic discomfort due to aircraft landing and take-offs is estimated at 4900 ha around the Utrenniy Airport (also refer to Figure 9.1.1).

Besides SPZ, other URZs will be also established (mainly within the SPZ area), in order to ensure safe operation of the future facilities[57]. Most of the use-restricted zones will be established in agricultural land: before allocation of the land plots for the Plant, Port and Field facilities, all local areas belonged to the category of agricultural land, and was not divided into cadastral blocks.

[57] According to p. 4 Art. 1 of the RF Urban Development Code, URS, besides SPZ, include protected zones (in the context of industrial and fire safety – *Consultant's comment*), cultural heritage protection zones, water protection zones, flooding zones, drowning zones, protective sanitary zones of sources of drinking water and household water supply, exclusion zones (in the context of the Federal Law On the State Protection No.57-FZ of 27.05.1996), restricted development areas, and other zones established in accordance with the Law of the Russian Federation.

Table 15.1: Sanitary protection zones and sanitary clear zones of the Project components and the Utrenniy Terminal (information in the design documentation)

Facility/site	Standard SPZ, ha (rounded)		Main factor for defining the SPZ size and geometry
	Total	Less the land take of the facilities	
Gas and condensate well pads (GWP)			Pollution dispersion in air
GWP-1	*Refer to the dimensions of SPZ for CGTP-1*		*Designed SPZ - combined zone for GWP-1, CGTP-1, ERIS-1, HP-1 with a variable width of 500 to 1000 m*
GWP-2	*486*	*470*	*Dispersion analysis confirmed sufficiency of standard zone of 1000 m*
GWP-3	*536*	*500*	
GWP-4	*461*	*440*	
GWP-5	*446*	*430*	
GWP-6	*456*	*435*	
GWP-7	*439*	*425*	
GWP-8	*446*	*430*	
GWP-9	*475*	*450*	
GWP-10	*448*	*430*	
GWP-11	*479*	*455*	*Dispersion analysis demonstrated sufficiency of SPZ with a variable depth of 700 to 1000 m*
GWP-12	*476*	*455*	*Dispersion analysis confirmed sufficiency of standard zone of 1000 m*
GWP-13	*461*	*40*	
GWP-14	*443*	*430*	
GWP-15	*441*	*430*	
GWP-16	*454*	*440*	*Dispersion analysis demonstrated sufficiency of SPZ with a variable depth of 700 to 1000 m*
GWP-17	*449*	*435*	*Dispersion analysis confirmed sufficiency of standard zone of 1000 m*
GWP-18	*447*	*430*	
GWP-19	*419*	*400*	
Gas treatment facilities			Pollution dispersion in air
CGTP-1 (Central dome)	*1000*	*800*	*Designed SPZ - combined zone for CGTP-1, GWP-1, ERIS-1, HP-1 with a variable width of 500 to 1000 m*
CGTP-2 (Southern dome)	*550*	*520*	*Designed SPZ - combined zone for CGTP-2, ERIS-2, HP-2 with a variable width of 300 to 1000 m*
PGTP-3 (Northern dome)	*1460*	*1300*	*Designed SPZ - combined zone for PGTP-3, temporary Power Supply Complex No.2 (307 ha overlap), GTPP, STF-3, ERIS-3, fuel depot, methanol storage, data processing / telecommunication center site, administrative area, field camp (FC), Emergency Rescue Centre (ERC), transfer WWPS site, SMCIW DS with a variable width of 500 to 1140 m. The boundaries are based on the outputs of the emissions dispersion analysis. For the waste disposal facility, MAC limits will be met already on site, and the SPZ boundary is designed solely for attenuation of the acoustic impact (the limit of 45 dBA is reached at a distance of 440 m).*
Power supply complex No.2			
Methanol storage			
Solid municipal, construction and industrial waste disposal site			
Plant	*904 (including 513 ha - Ob Estuary water area)*	*800*	*Designed SPZ with a varying length of 690 to 1900 m. Overlapping (60 ha) with the combined SPZ of PGTP-3 and other Field facilities. The determining factors are both noise attenuation (45 dBA isoline) and emissions dispersion (0.71 MAC NO_2 at the SPZ boundary)*
Terminal (Port)	*1584 (including 802 ha - Ob Estuary water area)*	*1500*	*SPZ includes more than 90% of SPZ of the Plant. Overlapping (350 ha) with the combined SPZ of PGTP-3 and other Field facilities. For the operating phase facilities, SPZ of 1000-1050 m in width is established based on the chemical factor (pollution dispersion)*
Utrenniy Airport			For the ground-based facilities - pollution dispersion in air, for the air transport - acoustic impact
Ground-based facilities	*578*	*320*	*Pollution dispersion in air*
Aircraft traffic	*5125*	*4900*	*Sanitary clear zone based on aircraft noise (to attenuate the level of sand to the permissible level of 45 dBA). SPZs of ground-based facilities are included*
Total use restricted areas outside the Project sites *(rounded)*		**17675**	
Including areas with restrictions due to elevated levels of air pollution		*12775*	*Territories (excluding the Ob Estuary areas of about 12,000 ha) and water areas over which air pollution may exceed the permissible standards of the RF*

Notes: 1) Adequacy of standard sanitary protection zone width of 100 m is validated by pollution dispersion analysis and acoustic impact calculations for the dry-excavation and hydraulic jetting quarries. Given the short duration of sand production activity in each of quarry and small size of the SPZ, their size is not included in the calculation of the URZ area.
2) In this case, only dimensions of SPZ established based on the air quality and physical impacts are taken into account. Other statutory restrictions during the Project construction and operation will include establishing restricted development areas, protection sanitary zones of water supply sources, protected zones, etc.

For the next level of assessment of the outer contour line of the influence area with the central part comprising the allocated land plot, water area used for the Project, sanitary protection zones and other URZs, the respective criteria of MRR-2017 will be used – isometric line of 0.05 of the value of the maximum permissible concentration (MPC) of the most common pollutant emitted by the sources, without background (Table 15.2).

Table 15.2: Air quality impact of the Project components and the Utrenniy Terminal

Project component	Substances with the highest designed dispersion in atmosphere	Distance from site boundary to isoline 0.05*MAC_{20}, km	Source (reference code of the design documentation)	Note
Plant	Nitrogen dioxide (NO_2)	21	2017-423-M-02-OOC1 (3000-P-NE-PDO-08.01.00.00.00-00)	Example of influence area for the operation period is given. During the construction, the predicted dispersion of nitrogen is 28 km to isoline 0.05*MAC
Terminal (Port)	Nitrogen dioxide (NO_2)	10	018-ЮР/2018(4742)-ООС1.1	Example of influence area for the operation period is given
Field: GWP sites	Nitrogen dioxide (NO_2)	2	346-1-319/18/П-346-ООС	Example of GWP No.16 (operation phase)
Field: Power supply complex No.2	Nitrogen dioxide (NO_2)	6.2	2017-423-M-02-PP1 120.ЮР.2017-2010-02-ООС	Example of influence area for the operation period is given
Field: Sites of CGTP-1, CGTP-2, PGTP-3 + GTPP + STF-3	Nitrogen dioxide (NO_2)	9.5	120.ЮР.2017-2020-02-ООС	
Field: Solid municipal, construction and industrial waste disposal site	Integral assessment for all components of emissions	4	120.ЮР.2017-2020-02-ООС	
Soil-based construction materials quarries	Nitrogen dioxide (NO_2)	1.5	340-23-СП	Dimensions are exemplified by quarry No.5n (hydraulic jetting). Duration of the quarries development is defined in the design documentation as 2-5 years
Airport	Nitrogen dioxide (NO_2)	4.7	375-юр/2018-ООС	Example of influence area for the operation period is given

According to the dispersion analysis in the design documentation, nitrogen dioxide will migrate to the greatest distance: the respective area of influence of the Plant is about 20 km, of the Terminal (Port) and natural gas treatment facilities - about 10 km, of other Field facilities – from 1.5 to 6.0-6.5 km.

The total size of all areas of influence meeting the MRR-2017 criteria is tentatively assessed at 190 000 ha, i.e. about a half of the license area (Figure 15.1). Onshore, the air quality impacts of the Project and Airport will not extend beyond the boundaries of the LA, however, considering the location of the Plant and Port in the western periphery of the license area, it will affect 10-20 km of the water area outside the license area boundary.

The forecast impact on air quality in this zone may also affect the components which contact with air – the soil/vegetation and snow cover, as well as surface water. The impact will be mainly delivered by precipitation and, to a lesser extent – through certain substances which will be present in air in concentrations higher than background.

The planned activity are not expected to produce any other impact on local ecosystems that would be felt beyond the identified boundaries. In particular, physical and potential pyrogenous effects on soil and vegetation cover will also fit into the Project sites and immediately adjacent territories within a 100 m band (this conclusion is proven by the results of local environmental monitoring 2018-2019). On the other hand,

the area of indirect chemical contamination of soil, vegetation and snow cover will affect the whole influence area determined above based on the 0.05 MPC criterion, with SPZ in its centre (Figure 9.1.1 in Chapter 9).

As described in Chapter 9, the main impacts of the Project on geological environment, exogenous processes and inland waterbodies are predicted to take place within the license area. The planned activities in the Ob Estuary will affect territories outside the LA and their resultant effects described in p.5.1.3.

The impacts of the planned activity on biodiversity will include transformation of habitats – i.e. vegetation and soil cover, condition of the water and air environment, bottom deposits, level of physical impacts (noise, vibration, light and heat radiation), as well as direct impacts on aquatic and terrestrial fauna.– In the first case, the boundary of the area of influence will coincide with the transport and diffusion of the corresponding factor – pollution of the air or water environment, physical and mechanical disturbances of the soil and vegetation cover, etc. – and, therefore, they can be defined in accordance with the above designated boundary of the area of influence. The extent of effects on populations is least predictable and cannot be presented on map, due to the distinct variations of abundance or activity of most local species: for many of them habitats in the Gydan tundra and the Ob Estuary are only a small part of their migration routes that vary between years under the influence of multiple factors including the global climate changes.

15.1.3 Onshore and offshore areas of associated facilities and extent of their impacts

Most part of impacts of the Utrenniy Airport (the largest ground-based facility that meets the association criteria of IFC PS1) will be confined within the LA territory[58].

Other associated facilities and activities of the Project are located in the Ob Estuary: hydraulic structures, underwater technical operations, navigation in the approach channel between the navigation fairway in the Ob Estuary and the Port.

The Plant's impact in the Ob Estuary is inseparable from that of the Port and associated marine operations (shipping, underwater technical operations) within the area of influence, and its contribution to the combined impact is relatively small. Boundaries of the joint area of influence of the Plant and Port will be defined by propagation of polluting substances and physical impacts (warming effect, turbulence, suspension of sediments, underwater noise, transformation of the thermohaline structure, etc.) along the prevailing directions of flows - i.e. river flows, sea-water penetration, tidal and wind-induced flows.

[58] The Utrenniy Airport does not feature its own aircraft refuelling facilities and will operate as a combined system with the existing Sabetta Airport. Therefore, it is likely that both air traffic and load on the ground-based facilities of the Sabetta Airport (a part of the Yamal LNG project) will increase when it becomes operational. No details are available by present as to the number of take-off/landing cycles, cargo tonnage, passenger flows, routes and terms of air traffic.

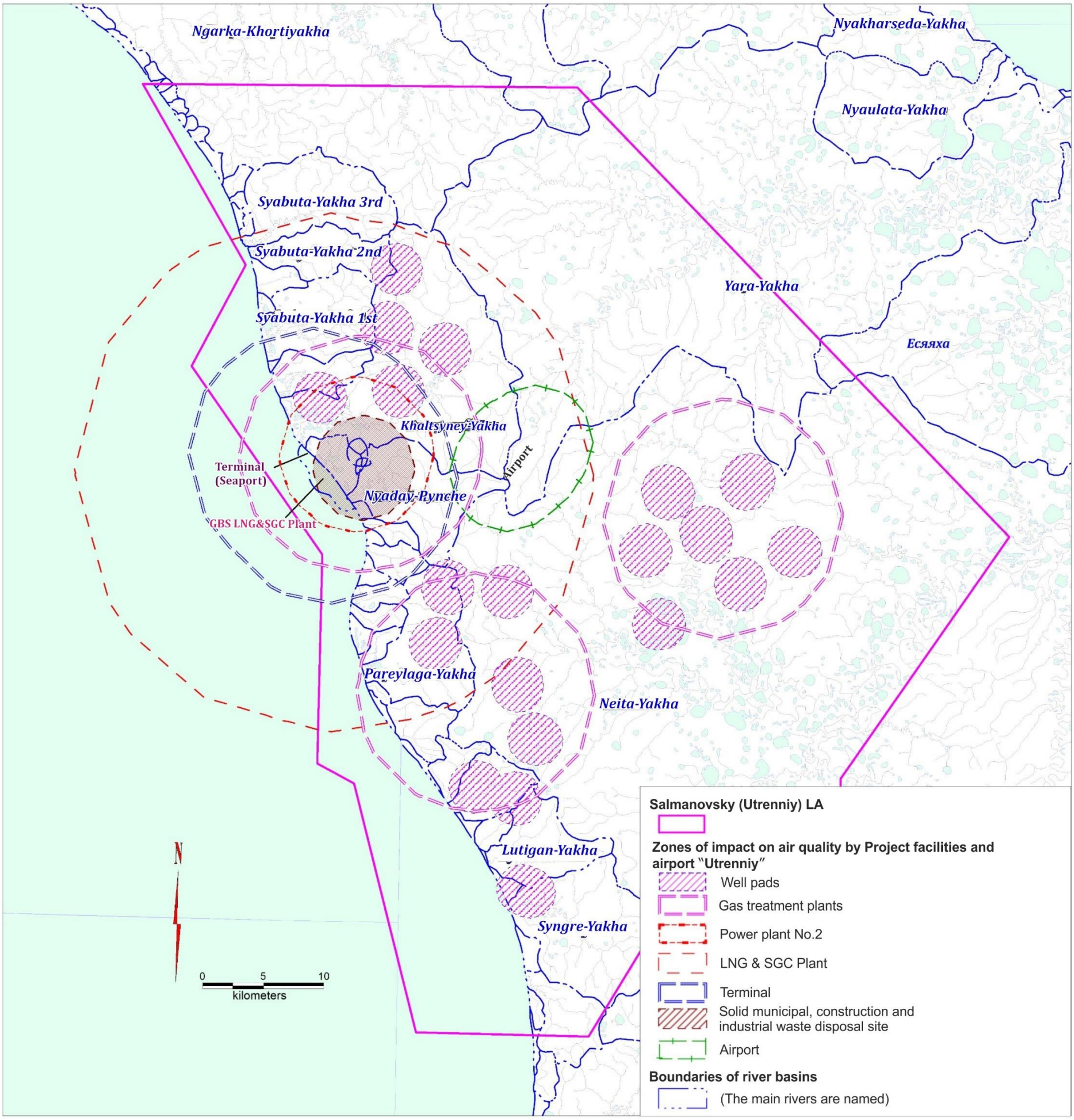


Figure 15.1: Air quality impact of the Project components and the Utrenniy Terminal

Some effects will be felt both downstream and upstream the future operation sites – secondary transformation of erosion and accumulation processes, changes in ice conditions and water circulation patterns. Understanding of the above effects and their propagation in the water environment of the Ob Bay is achieved by the appropriate modelling exercise using two different models:

- 2018 - a 3D thermo-hydrodynamic model of the Princeton University, US;
- 2019 - model of the Marchiuk Institute of Numerical Mathematics, RAS[59].

Both models were first adapted by EcoExpressService (2018) and IEPI (2019) for the conditions of the Ob Estuary and implemented in two versions: for the natural hydro-thermodynamic conditions in the examined water area, and for simulation of hydro-thermodynamic conditions considering the hydraulic structures of the Project and changes of underwater terrain due to dredging and dumping of bottom soil. The models have been verified to check adequacy of simulation of the structure of currents and other parameters of the examined water area.

The model produced similar predictions that indicate that the longest transport of suspended solids during the dredging activity is expected in relation to underwater dumping of soil. In this case, suspended solids with concentrations above 0.25 mg/l (threshold considering the negative effects of increased input of suspended matter on water quality and aquatic life[60]) may occur within a distance of 25 km to the north and south of the dump site.

The parameters of the associated activities area of influence on biological diversity and social environment display the greatest levels of uncertainty as the respective recipients in their movements are not limited to the land and water area outlined in Figure 15.2. Therefore, the ESHIA documentation provides a detailed description of the dispersion of the respective impacts in the natural (Section 9.5) and social environment (Chapter 10).

15.1.4 Land and water areas that may be subject to the cumulative impacts of the planned activity

Among the cumulative effects of the planned activity and third party activities, at this stage of the Project development it is possible to predict and map the impacts on quality of atmospheric air and water in the Ob Estuary.

In terms of air quality, the impact will be significantly enhanced by combined action of impact of the Plant and Port (as determined using the MRR-2017 criteria) and influence of the nearest third-party facilities - three additional process trains that the Arctic LNG 1 project may implement in the future in the nearby onshore and offshore areas.

Configuration of the Port, including dimensions of its inner basin confined by the ice barriers, allows for enhancing of the LNG and SGC production, storage and offloading capacities by increasing the number of process trains (Arctic LNG 2 Project) to six (Arctic LNG 2 and Arctic LNG 1 projects)[61]. Therefore, the impacts of the plants and vessels traffic are expected to increase approximately twofold, and be supplemented with the impacts of construction and operation of the utility corridors to connect the Plant and Utrenniy Terminal with the future resource base of the Arctic LNG 1 project located south and south-east of the Salmanovskiy (Utrenniy) LA (refer to Chapter 13 for details).

Another group of cumulative effects is related to potential combined impact of underwater technical operations of the Project and those conducted by third parties. Outputs of the turbidity modelling in relation to dredging and dumping at Sabetta (Yamal LNG Project)[62] and Utrenniy (Arctic LNG 2, refer to Chapter 9) indicate that turbidity plumes may propagate in the opposite directions to a distance of several dozens kilometres from the respective sites of underwater technical operations. The combination of the simulation

[59]The international designations of the two models are: POM (The Princeton Ocean Model) and INMOM (The Institute of Numerical Mathematics Ocean Model)

[60]Considering potential coincidence of the Project's dumping effects and impacts of third party activities resulting in increased turbidity of water in the Ob Estuary, this threshold is selected with a certain margin: first, the annual average concentrations of suspended solids in the estuarian water vary between 6.5 mg/l and 9.0 mg/l (refer to the survey reports by Fertoing, 2017); second, the minimum threshold concentration of suspension at which the first signs of adverse effects can be observed (usually in the form of reduced photosynthesis in algae and deterioration of filter-feeding in invertebrates) is 10 mg/l; third, there is multiple evidence to demonstrate that suspended solids concentration below 10 mg/l (Russian MPC standard for the top category fishery waters) does not cause any negative effect on planktonic communities

[61]The preliminary ESHIA (2018) assumed potential future extension of the Plant by increasing the number of its process trains (PT) from three to five under the same project - Arctic LNG 2. Later on, the Project number of PT was limited to three, and potential capacity increase is considered in relation to a project of a third party - LLC "Arctic LNG 1".

[62] South Tambey Gas Condensate Field Development. Construction of sea Port's facilities in the area of the village of Sabetta on the Yamal Peninsula, including the establishment of a navigable approach channel in the Ob Estuary. Design documentation. Section 8. List of Environmental Protection Measures. Part 6. Assessment of impact on aquatic biological resources. Book 1. Simulation analysis for determination of geometric parameters of the turbidity plume in the water area during underwater operations. Vol. 8.6.1. - StPb: EcoExpressService, 2015

results for the Sabetta and Utrenniy terminals (Figure 15.2) performed by the Consultant shows that if dumping operations are carried out in parallel or very close to each other, the concentration of such suspended solids in the overlapping zones will not exceed the sensitivity threshold of 10 mg/l. Since a certain part of the suspended solids settle on the sea bed, the attendant impacts may be cumulative and the model outputs are subject to validation with the environmental monitoring data. The monitoring data available so far on the marine environment of the Ob Estuary that is examined in Sections 7.3 and 7.6 of Chapter 7 and Sections 9.3 and 9.5 of Chapter 9 generally validate the Project impacts within the predicted levels. The monitoring activity in 2020 is of a special importance: for the first time it will be conducted under a joint programme for the whole area of influence of the Yamal LNG project and Arctic LNG 2 Project; also, wetness in 2020 is expected to match the long-term average value, therefore, most typical conditions will be observed in the Ob Estuary in terms of river and sea water proportions and mixing conditions.

Sea transport will be used during construction and operation of the Project facilities[63], and the resulting increase of load on the navigation routes and port infrastructure can be considered as a source of cumulative impacts.

The year-round navigation through the Ob Estuary fairway is conducted between its northernmost point (crossing with the NSR) and the Arctic Gates Terminal since 2015, to supply oil from the Novoportovskoye field to consumers in Europe. According to different sources, 150 to 200 tankers of category NO-38 follow this route annually, in addition to the fairly high background navigation intensity in the Kara Sea shelf zone, and vessels traffic in virtually all sections of the Ob Estuary during the summer navigation period (Figure 15.3).

Icebreaker escourting services on this route are better managed and provided by two icebreakers ICEBREAKER-8 and six tankers of ice class ARC-7. Tentative contribution of the Arctic LNG 2 Project to the cargo traffic in the northern section of the Ob Estuary (including the sea channel across the Ob Bar) up to Sabetta is estimated at 25 % (Table 13.2 in Chapter 13), and if enhanced twofold - 50%, assuming the vessel parameters similar to those used by the Yamal LNG project.

In the area located south of Sabetta, navigation conditions will be defined by the existing Arctic Gates project of Gazpromneft-Yamal (approximately 230 calls of NO-38 tankers annually) and the planned Arctic LNG 2 Project (312 calls of tankers and gas carriers of categories NG-170, NO-44 and NO-41 per year - for three process trains, and double the number when all six process trains are implemented[64]).

Therefore, in the area located south of Sabetta down to the Utrenniy area, the Terminal's share in the tanker fleet traffic will range between 60% (Arctic LNG 2 Project) and 70-75% (Arctic LNG 2 Project and Arctic LNG 1 project taken together), i.e. with three and six process trains, respectively. Therefore, the Arctic LNG 2 Project will account for about 60% of the traffic of tankers and gas carriers in the Ob Estuary to the south of Sabetta before commissioning of the process trains of the Arctic LNG 1 project, and for 35-40% - when the PTs are commissioned.

Furthermore, vessels used by the Arctic LNG 2 Project (even though their requirements for icebreaker escourting and support vessels are similar) will differ from those of the Arctic Gates project in terms of dimensions (width of 50 m against 34 m width of the tankers transporting oil from the Novoportovskoye field) and draft (11.8 against 9)[65], and other parameters.

[63] Supplying products to consumers in Europe and Asia-Pacific region; removal of solid wastes of hazard classes I, II and (partially) III to remote recycling, treatment and disposal facilities; transportation of various cargoes from the sea ports (Murmansk, Arkhangelsk) and river ports (Sergino, Salekhard, Urengoy) to the Salmanovskiy (Utrenniy) LA

[64] The extension is expected within the scope of alternative project - Arctic LNG 1

[65] Complex for LNG and SGC production, storage and offloading at Salmanovskoye (Utrenneye) OGCF. Remote terminal Utrenniy at Sabetta Port. Investment application (declaration of intent). Justification of sea channel dimensions in the north of the Ob Estuary. - StPb: GT MORSTROY CJSC, 2016.

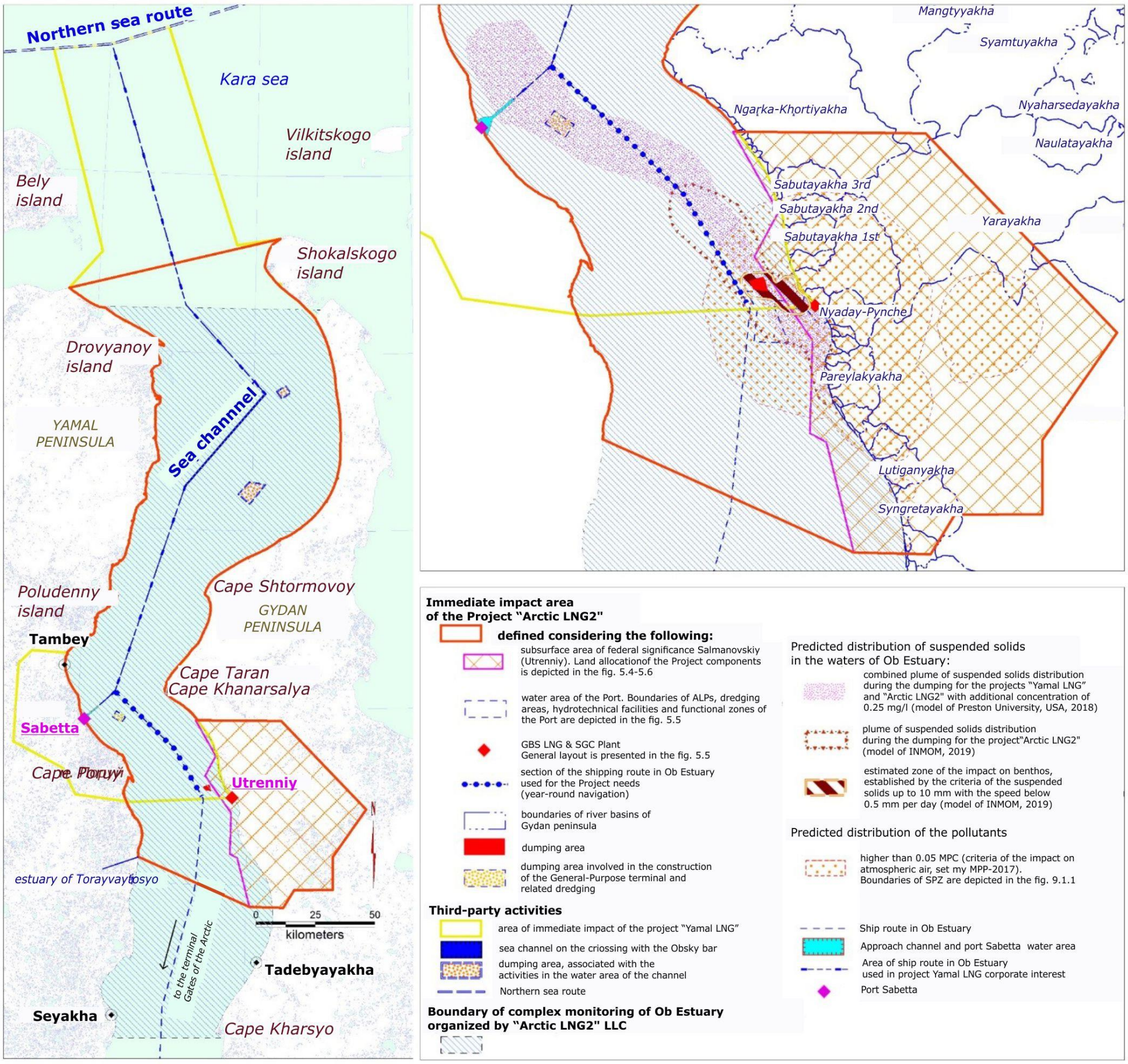


Figure 15.2: Area of environmental influence of the Project

Therefore, the Consultant believes that the area of influence of the Arctic LNG 2 Project should include, besides the approach channel between the main fairway in the Ob Estuary and the Utrenniy Terminal, also **a section of the main navigation route between the approach channels of the Terminals of Sabetta and Utrenniy**, where impact of the Project shipping activity will differ from the existing impacts due to the significant - from 35 to 75 % - increase of the number, dimensions and capacity of the vessels.

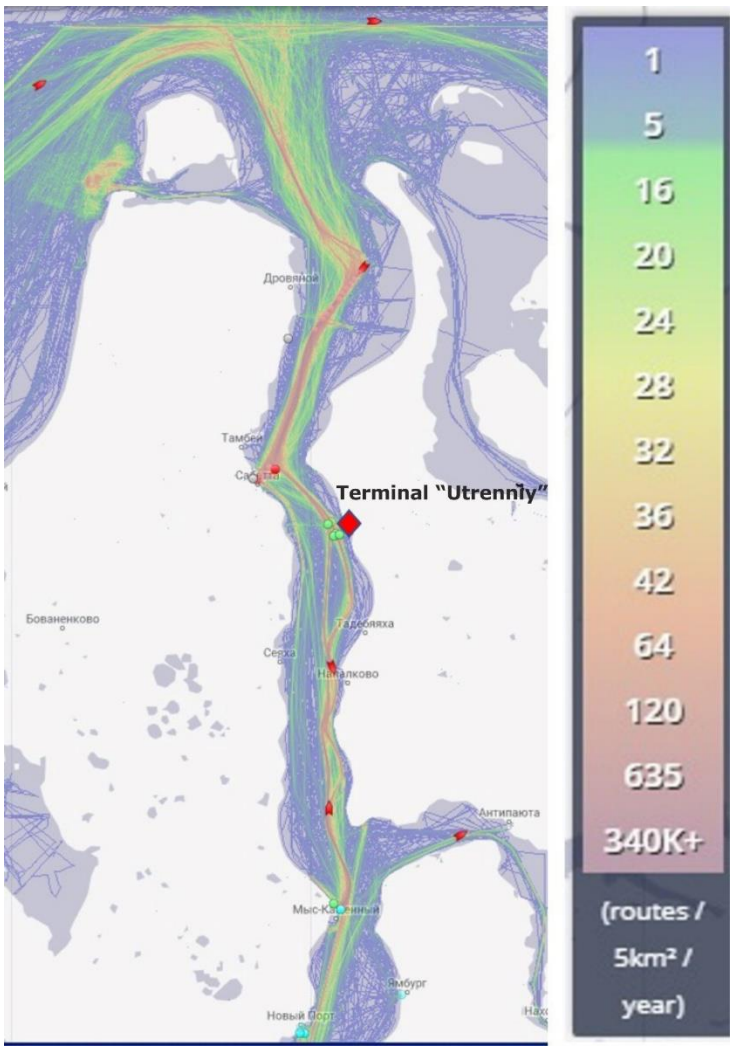


Figure 15.3: Traffic density assessment of the water ways in the coastal area of the Kara Sea including the Ob Estuary

Based on data of open portal MarineTraffic (https://www.marinetraffic.com/en)

Further impact of the Project navigation traffic will extend beyond the two areas above and affect virtually the whole Northern Sea Route, the approaches to the two transshipment complexes being created, as well as water ways between the complexes and remote re-gasification facilities in Europa and Asia-Pacific region.

In terms of environmental impacts, the most significant section of the water ways is the channel across the Ob Bar - so called sea channel. Its dimensioning requirements are dictated by geometry of vessels used by the Yamal LNG Project, therefore, the channel is considered as an associated facility of the project, and the area affected by the channel extension and regular maintenance dredging activities is included into the area of influence of the Yamal LNG project (Figure 15.2).

The channel is actually used by several operators of which the largest are Gazpromneft-Yamal (since 2015) and Yamal LNG (since 2017). The increasing traffic of large vessels for which the channel is intended means a need for its local reconstruction - widening of entrance sections from 385 m to 573 m, and arrangement of two dredged bays along the main channel route while maintaining the existing dumping arrangements. The respective dredging activities are planned for ice-free periods during 2020-2022.

Operation and reconstruction of this facility are not solely linked to the Arctic LNG 2 Project (due to the lack of grounds for such attribution), however, the Consultant included the sea channel and adjacent water areas affected by the reconstruction and maintenance activity into the Project's area of influence (Figure 15.2), as the sea channel is seen by the scientific community as a significant factor of transformation of thermohaline structure and aquatic ecosystems in the Ob Estuary.

Similarly to the underwater technical operations for the Port water area, impact of the sea channel activities that spreads to the longest distance is the turbidity plumes from dredging and dumping operations. The northern boundary of the Project's area of influence is defined as the boundary of respective impacts. Furthermore, it approximates the northern boundary of the planned area of comprehensive marine environmental monitoring in 2020 (Figure 15.2). This way, the monitoring activities will serve two projects – Arctic LNG 2 and Yamal LNG – and cover most part of the areas of influence of both projects[66].

[66] In addition, area on the northern side of the sea channel is identified by a WWF research project as a southern boundary of a prospective sea conservation area - Outer area of the Ob-Yenisei estuarial system (refer to Section 9.5 in Chapter 9 for details) that partially falls within the area of influence and monitoring shown in Figure 15.2

To the south of the Utrenniy Termial, the Project will also increase the impact of navigation, due to the water ways for transportation of general purpose cargoes (for construction and operation) connecting the Terminal with the river ports in the lower reaches of the Ob River (Sergino, Salekhard) and Pur River (Urengoy). On the other hand, the Project impact cannot be classified as cumulative in the context of IFC Performance Standards, for the following reasons:

- The impacts will short-term (during the summer navigation), mainly during the period of construction, and the activity will rely on the vessels that have been long used on the same routes;
- The Project will not require any alteration in the established navigation, cargo handling, passenger transportation schedules, dimensions of water areas and other parameters of the existing water transport system in the Lower Ob, Taz Estuary and navigable section of the Pur River;
- No information is in the Consultant's possession to suggest that scientific community and stakeholders consider the concerned river navigation routes as a source of significant negative environmental and social impact.

In view of the above, the southern boundary of the Project's area of influence within the Ob Estuary is defined considering the following factors:

- Boundaries of the offshore part of the license area;
- Natural asymmetry of hydrochemical (including thermohaline) structure of water, bottom relief and flow field in the examined section of the Ob Estuary, which results in transport of impacts in water along the shore line;
- Configuration of drainage basins of rivers on the Gydan Peninsula that are affected by the Project;
- Specific features of the western shoreline of the Ob Estuary: shore sections protruding far into the water will be most affected by the Project.

Considering the above, southern boundary of the Project's area of influence has been identified as shown in Figure 15.3. The Consultant does not see any valid grounds for moving the boundary further to the south. On the other hand, the area of comprehensive marine environmental monitoring being conducted in the Ob Estuary by LLC "Arctic LNG 2" since 2019 extends outside the Project's area of influence and reaches to the sections of Seyakha village and the Khasrio cape approaching the northern boundary of the prospective fisheries protection zone (69° 46' N, approximately 40 km south of the Khasrio cape) and prospective Ob-Taz sea conservation area (further to the south, refer to Section 9.5 in Chapter 9).

15.1.5 Territories and water areas potentially affected by impacts from unplanned but predictable developments caused by the project that may occur later or at a different location

In 2018, the influence area for the assessment of the environmental impact of the Plant included the additional onshore and offshore plots to be acquired for construction of two additional process trains and related onshore facilities of the Plant. At present, design documentation for the Utrenniy Terminal that has passed the State Environmental Expert Review and the Main State Expert Review of the RF allows for ultimate extension of the LNG and SGC production, storage and offloading capacities from three process trains (Arctic LNG 2 Project) to six (prospective project of third party - LLC "Arctic LNG 1").

According to the Company, the reserves of natural gas and condensate in the Salmanovskoye (Utrenneye) OGCF are sufficient to maintain hydrocarbons feed for the Project through its whole life; therefore, future development of other fields in the Gydan Petroleum Region is considered by the Consultant solely in the context of third party projects (Chapter 13).

Activities that are not designed at this stage but will be required in the future for the Project success, include development of additional capacity to manage solid wastes: The solid municipal, construction and industrial waste disposal site (SMCIW DS) being developed as part of the Field facilities lacks capacity even for disposal of all Project wastes, not to mention the wastes from demolition of the Project buildings and installations after decommissioning (refer to Section 9.7 in Chapter 9 for details). The Consultant is not aware of the location and technical parameters of the future waste management facilities, however it is likely that such facilities will be developed in areas with a better transport access within the Salmanovskiy (Utrenniy) LA. Furthermore, in case of simultaneous implementation of the Arctic LNG 2 and Arctic LNG 1 projects, the new landfill will serve as a shared facility for the two projects, similarly to the Utrenniy Airport being constructed.

Based on the above, it is concluded that construction and operation for new Project waste management facilities, without reference to their location, will not influence the boundary of the Project's area of influence identified for other factors (Figure 15.2).

15.1.6 Conclusions

Based on the above discussion, proposed contours of the Project area of influence are shown in Figure 15.2. Onshore, they coincide with contours of the Salmanovskiy (Utrenniy) LA, as none of the predicted significant impacts is expected to extend beyond this boundary. In the offshore areas, the Project impact will not not be confined within the Ob Estuary and will also cover a relatively small area in the outer shelf zone of the Kara Sea - the Ob-Yenisei shallow waters - near the Shokalskogo island.

About 80% of the offshore part of the contour overlaps with the area of influence of the Yamal LNG Project - the region's largest integrated project for production, liquefaction and offloading natural gas comprising the South Tambey gas and condensate field, LNG Plant, Sabetta sea port and airport, as well as associated facilities - the sea channel across the Ob Bar and sea vessels (tankers and icebreakers) for which the channel is dimensioned.

Boundaries of the Project's impacts that defined the contours of its area of influence correspond to the result of numerical (mathematic) modelling of pollution dispersion and attenuation of physical effects in air and water. The model outputs will be validated by the monitoring data from the onshore territories within the license area, and offshore areas extending south beyond the designated zone, considering the locations of receptors of the potential impact.

15.2 Environmental Impact Assessment

The impact assessment methodology described in Section 3 uses a set of qualitative scales to be applied for assessment of impact significance and intensity, and the risk of potential adverse effects. The summary assessment of the environmental and social impacts of the planned activities is based on four ranks (Table 15.3) which are interpreted in accordance with the international ESHIA practice and the corporate methodology of Ramboll.

Table 15.3: Project impacts ranking by significance and applicable terminology

Impact significance	Description
Negligible low	Any impacts that, according to the evaluation of the Consultant, will be invisible to the receptor with due regard to the initial condition or are within natural fluctuations. These impacts do not require mitigation and are not a concern of the decision-making process.
Low	Impacts of "low" (*syn.*: "minor") significance may lead to changes as compared to the baseline conditions, which will be noticeable against the background of natural fluctuations, but, according to the Consultant's forecast, will be significantly lower than the levels established by the relevant standards (for example, environmental components quality standards) and will not cause complications, deterioration or impairment of function or value (significance) of the receptor. These impacts warrant the attention of decision-makers, and should be avoided or mitigated where practicable.
Moderate	Impacts of "moderate" (*syn.*: "medium", "intermediate") significance can result in noticeable consequences and lead to a long-term change, as compared to the baseline state, complicating or worsening the condition of the receptor, although in general its function and value (significance) will be at the same (before the exposure) level. These impacts must be mitigated to avoid or reduce the impact.
High	Impacts of "high" significance can disrupt the function and reduce the value (significance) of the receptor and can also cause consequences at the system-wide level (for example, for the ecosystem or social welfare) and may also be associated with the situation when the impacts grow beyond the limits of acceptable regulatory levels. Such impacts must be addressed as a priority by corrective measures aimed at their prevention or mitigation

15.2.1 Impact on Air

Pollution emissions will occur during the construction, operation, decommissioning and dismantling of the Project buildings and installations and associated facilities. Among the Project components, the dominant source of the air impacts with the greatest spatial extent (refer to Figure 15.1) is the LNG & SCG Plant, and the highest concentration of emission sources will be located at the onshore facilities of the Plant and Port, and the Field facilities located within 2-3 km from the Plant and Port - PGTP-3, Power Supply Complex No.2 (temporary), gas turbine power plant, solid municipal, construction and industrial waste disposal site, methanol storage and fuel depot, some other Field facilities and their interconnecting utility corridors.

Technologically and regionally similar LNG plants and terminals in Canada, Norway and the Yamal region of the Yamal-Nenets Autonomous Okrug (Russia) demonstrate low or, locally and in individual components, a moderate level of ambient air quality impacts that are in compliance with national and internationally recognized standards in this area. As a whole, this confirms the general concept of LNG plants as facilities

with a relatively low potential for air pollution (as far as the oil and gas industry is concerned) mostly caused by high power consumption and attendant emissions of greenhouse gases.

The Arctic LNG 2 Project design is based on the best solutions from the point of view of minimizing air emissions of pollutants in the sensitive areas of the Gydan Peninsula and Ob Estuary. Firstly, at the construction stage, the contribution of the sources is minimized by carrying out most of the construction and installation work at remote technical sites, including foreign ones. Secondly, the power gas needs of the Plant's gas turbine generators will be met by collecting and using the boil-off gas (90% of gas consumption will be in a standby mode, that is, without loading a tanker or gas carrier). The remaining 10 percent will be supplied by getting gas from the mercury adsorbers. Feed gas will only be used at the start-up stage of the Plant, when the above-mentioned secondary hydrocarbon streams are not available. Thirdly, there will be no permanent flares at the Plant: gas mixtures will only be cold or warm flared for the start-up and commissioning of the main equipment, in case of the equipment malfunction, maintenance or shutdown of the Plant.

The analysis of emissions from the Plant indicates a conventional (for LNG plants) prevalence of nitrogen and carbon oxides, molecular nitrogen and methane hydrocarbons, with concentrations in air within the national MPC outside the regulatory sanitary protection zone of 1 km. Concentration of multiple major sources of pollution emissions that belong to the Plant and Port, and also to the energy supply and waste management, methanol and fuel storage facilities, dictated the need to design for a combined sanitary protection zone for the multiple facilities, where the nearest receptor is temporary accommodation camp (TAC).

Given the location of the Project facilities at a significant (dozens and hundreds of kilometres to the nearest permanent residential units in the Tazovskiy Municipal District), the Project will have no influence on air quality in permanent residential areas. Dispersion modelling for the Project's permanent and temporary sources of emissions using the MRR-2017 methodology demonstrated that pollution levels in air at the TAC site in the territory of the Salmanovskiy (Utrenniy) LA will not exceed the limits established for residential area quality in the RF, therefore, no restrictions are applied as to duration of personnel living in the temporary accommodation camp.

The Project's air quality area of influence with the boundaries defined in accordance with the MRR-2017 criterion – isoline of 0.05 MAC of the pollutant with the highest estimated dispersion from emission sources (excluding the baseline values) will not extend beyond the boundaries of the license area (Figure 15.1). Records of the local environmental monitoring available so far (commenced in 2017) demonstrate that regulated parameters of air quality within the Project's area of influence match the background values; in the future, the LEM data will facilitate validation of the model outputs used for designing the sanitary protection zones of the Project facilities.

Considering the above, and after the planned air protection activities, the integral significance of the Project impact on air quality is assessed by the Consultant as **low**.

15.2.2 Physical Impacts

Harmful physical impacts may occur at any stage of the Project lifecycle and differ in duration, extent and severity. Noise and vibration will be the most significant factors, while the effects of electromagnetic fields and radioactivity are disregarded in this ESIA as being **negligibly low**.

The highest intensity and largest extent of noise and vibrations are commonly associated with construction activities, due to high concentration of machinery and vehicles, operation of drilling and piling rig, portable generators and other equipment with significantly higher levels of noise, compared to stationary equipment with similar functions.

As applied to the Plant, the various construction stage associated impacts on the sensitive recipients of the Ob Estuary and the Gydan Peninsula are minimized by carrying out most of the work at remote sites. On the other hand, the associated construction activities with regard to the Port and Field facilities, as well as associated marine operations, are recognized as the most significant factor on physical impacts on the land and water area adjacent to their sources.

According to the calculations provided in the design documentation, during the construction phase the integral aboveground zone of acoustic discomfort with a noise level of over 45 dB will not expand to the residential facilities at the TAC site. Sources of the most intense acoustic effects of the construction will include piling, loading and unloading operations, most of which are limited in time to the construction phase, as well as air traffic in the form of infrequent one-off sonic events.

Due to the considerable remoteness of the majority of receptors, including the most sensitive ones (nomadic population and permanent residents, terrestrial vertebrates), the significance of this impact is generally assessed as **low**.

A special category of physical impacts is underwater noise affecting sensitive marine fauna. Its main source are offshore activities using various floating craft, and underwater technical operations - dredging, dumping, and other offshore and onshore construction activities.

In general, the adverse physical impact of the offshore operations contemplated under the Project on the fish fauna and marine mammals can be assessed as **moderate**. The significance of hydroacoustic impact of underwater operations is estimated as **low** due to the absence of any immediate threat to the prevalence/abundance of marine mammals, the low likelihood of them suffering damage or changing their behaviour, the relatively short duration of the construction phase, the recorded absence of marine mammals foraging grounds near the Plant and the Terminal, and the many years of operation of the berth structures in that area.

15.2.3 Impact on Surface Water

Considering the nature of the planned activities and characteristics of surface waters exposed to their potential impact, a separate assessment of the effects on the Ob Estuary of the Kara Sea and on water bodies of the Gydan Peninsula is appropriate.

15.2.3.1 Ob Estuary of Kara Sea

Construction and operation of the offshore and onshore facilities of the Port and Plant will produce the following impacts on the Ob Estuary:

- Acquisition of certain water area to be used for the hydraulic structures;
- Dredging and other underwater technical operations in the area of the Port and the approach channel;
- Discharge of warm water to prevent freezing of inner areas of the Port;
- Abstraction of a small quantity of water resource to fill the ballast compartments and make-up the GBS fire water system;
- Local transformation of water circulation patterns under the influence of the hydraulic structures and vessels traffic;
- Pollution of sea water due to uncontrolled discharge of wastewater and accidental spills of petroleum products in the Port area.

Detailed assessment of the impacts of underwater technical operations, changes in water circulation patterns, prevention of Port inner area freezing, and potential accidents is provided below.

Dredging in the Port basin Construction of the Plant and the Port in the coastal area of the Ob Estuary will require dredging in the access channel to the sea port, as well as preparation of the internal basin of the Port. Those will be the main impacts on the marine environment, as resuspended sediments will affect water quality in the areas of excavation and disposal (dumping) of soil, and new deposits will develop on the seabed.

Dredging operations will generate a cloud of resuspended sediments which will drift with the prevailing currents and with the respective speed. Direction of the turbidity plume movement will depend on reversing tidal current directions at the tide rising/falling stage, and also on the constant and wind-drift currents. The dumping activities are expected to produce the longest plume of suspended solids: according to the outputs of hydrodynamic model, the area with technogenic turbidity of 10 mg/l[67] can be 25 km long downstream and 20-25 km upstream the Ob water main flow.

Timewise, this impact is assessed as long-term, considering the need for repetitive maintenance dredging. In terms of the contaminated plume size and dredging duration, and considering that the northern part of the Ob Estuary is not used by other water users for domestic water supply, the impact of dredging operations on seawater is assessed as **moderate**.

[67] 10 mg/l is the minimum threshold concentration of suspension at which the first signs of adverse effects can be observed (usually in the form of reduced photosynthesis in algae and deterioration of filter-feeding in invertebrates). There is multiple evidence to demonstrate that suspended solids concentration below 10 mg/l (MPC for the top category fishery waters) does not cause any negative effect on planktonic communities (refer to ESHIA Report for more details).

Transformation of thermohaline conditions under the influence of the hydraulic structures. The impact of construction of the Port's hydraulic structures, first of all the ice barriers and approach channel, on the Ob Estuary water environment is related to transformation of its thermohaline structure.

The model outputs (Section 9.3) show that perturbations of sea water temperature due to the presence of the Project hydraulic structures and functioning brash ice management system (BIMS) will be local and short-term, and will be hardly noticeable against the background of the natural course of seasonal temperatures, inter-annual variations and long-term development trends.

Slightly more significant changes are expected in the water salinity, both in amplitude and spatial extent. The model demonstrated that surface layer of water in the Port's inner basin and along the approach channel will become by 13-15% more diluted than in the baseline situation, i.e. without the hydraulic structures. It is likely that this negative salinity anomaly, due to the influx and local stagnation of river water, will be present in all seasons. In the bottom water layer in the same area, salinity will higher than in natural conditions (an increase by 30-35% against the baseline situation), due to the influx and stagnation of saline water from the Kara Sea, especially in winter.

Further to the aforementioned salinity anomalies which are related to the hydraulic structures and therefore relatively stable, more dynamic anomalies will develop along the coastline, depending on the tidal circulation, downsurge/upsurge effects, main flow capacity, influx of inland waters, as well as other rapidly changing natural factors. In particular, the model showed that increased salinity zone may develop to the south of the Project hydraulic structures and extend southwards along the coast to a distance of 15-20 km. In this zone, the expected range of relative increase in salinity is between 1-4% in the surface layer and 25-30% at the bottom.

On the Consultant's opinion (refer to Section 9.5 in Chapter 9), considering the established natural variations of the respective parameters of marine habitats, hydrobionts will hardly "notice" the changes in the thermohaline structure of the Ob Estuary under impact of the Project. The negative effects of warming due to the Port operations, and relatively weak anomalies of salinity due to the hydraulic structures will have a minor significance compared to the physical impacts of the Project - such as acquisition of a part of water area and sea bed, fragmentation of habitats by ice barriers, development of artificial elements of bottom relief and a technogenic "peninsula" consisting of the artificial land plots and GBSs attached to them.

Wastewater and Effluent Discharges in the Ob Estuary The "zero discharge" concept being one of the basic concepts for the project design development prohibits discharge of any effluent waters to the Ob Estuary in the normal course of operation. The same approach is also adopted in design of the Utrenniy Terminal. During the construction and commissioning activities, this principle will be materialised by provision of tight tanks, both onshore and on floating craft, for collection of wastewater. When filled, the tanks will be transferred to licensed contractors for wastewater treatment. After commissioning of the Plant and Port, all wastewater flows from the site (including domestic, process, storm, drainage and melt water) will be transported by pipelines to the wastewater treatment plant at the Salmanovskoye (Utrenneye) OGCF. Storm water and domestic wastewater will be treated to MPC standard for fishery water and discharged to the Nyaday-Pynche River. Treated industrial wastewater and storm runoff will be injected to formation.

The solid wastes management system is also designed to prevent direct contact of wastes with various components of the environment: all wastes will be collected and accumulated at dedicated sites, and handed over to specialized contractors for treatment and disposal. The least hazardous wastes will be buried at the landfill site to be developed as part of the Salmanovskoye (Utrenneye) OGCF Facilities Setup.

Subject to the legal requirements and conditions for the accumulation and disposal of wastewater and solid wastes on vessels and Process Trains (PT), the potential negative impact of pollution discharges from vessels and PTs on the marine environment of the Ob Estuary can be assessed as **negligibly low** or **low** in significance.

Brash ice management system. The Brash Ice Management System (BIMS) is intended to ensure safe and efficient vessels manoeuvring during cold season by discharging heated sea water to the Port inner area, to prevent development of drifting ice and shore ice. Subject to the applicable standards for the quality of discharged warm water (temperature, mineral content, pH, BOD, etc.), and considering the local and intermittent functioning of BIMS (during the ice season), the impact of warm water discharge in the Port area can be assessed as **low** in significance.

Accidental spills of liquid hydrocarbons. Storage, handling and transportation of hydrocarbons, including LNG, gas condensate, diesel fuel and kerosene, at the Plant, in the Port and on ships are associated with

the highest potential risk of spills at sea. According to the design documentation, maximum spill of 7000 m^3 is possible in case of a failure of an SGC tank at the Plant. The spill response strategy adopted for the Project considers the physical properties of spilled liquid, particularly rapid evaporation of gas condensate in early stages of a spill, as well as weather conditions (speed and direction of wind, wave conditions) that influence migration and dispersion of hydrocarbon plume in water.

In general, response strategy in case of emergency spill of hydrocarbons in the Port water area includes several tiers of protection, including a system of spill prevention activities, measures to contain spilled material at the source and prevent its migration outside the Port area, elimination of spill in sea, protection and cleaning of shores against pollution with hydrocarbons. The proposed approaches will be incorporated in the spill prevention and response plans for the Utrenniy Terminal and the Plant. A special spill response unit equipped with necessary cleanup and protection aids for the Port basin and shoreline will be established for the hydrocarbon spill detection, prevention, control and response in the Ob Estuary.

Overall impact of the planned activities on water of the Ob Estuary will have a **moderate** significance (considering the "zero discharge" concept and the Process Trains positioning selected to minimize the damage and risk to water environment). As the greatest extent of impacts on the marine environment is expected to be caused by dredging and dumping activities, the project works plans should provide for optimum planning of time and duration of underwater technical operations and application of technologies and equipment with the least sediments suspension effect.

15.2.3.2 Surface Waters of the Gydan Peninsula

Implementation of the planned activities will cause the following negative effects on surface waterbodies:

- Abstraction of water for the Project. The water intake is planned at a meander lake in the Khaltsyney-Yakha River valley (Northern dome), and from the hydraulic jetting quarries (Central and Southern domes);
- Development of soil-based construction materials quarries in the valley lakes;
- Partial blockage of minor water streams by the Plant onshore facilities, and consequential changes in configuration of flows;
- Disturbance of hydrological and morphological conditions of river channels, activation of hazardous channel and slope scouring and erosion processes during water crossings construction (more than 30 crossings are planned);
- Discharge of storm water treated to MPC standard for fishery waters (Nyaday-Pynche River);
- Emergency releases of wastewater and effluents.

The Company's design is focused to minimize and in respect of wastewater and effluent discharges - to prevent the impacts. All wastewater streams from operation of the Project and associated facilities will be treated at the Sewage Treatment Facilities at the Salmanovskoye (Utrenneye) OGCF and either injected to formation (industrial wastewater and storm runoff from industrial sites) or discharged into Nyaday-Pynche River (domestic and stormwater). Quality of water disposed into the river will meet the quality standards for fishery waterbodies.

The volume of water abstraction from surface sources for the Project water supply will make up only a small portion of the permitted abstraction volume in the water management section, according to the Integrated Water Management Scheme (IWMS) for the Taz River basin.

After the proposed management and technical measures for protection of the environment, and subject to treatment of wastewater before discharge to the Nyaday-Pynche River to a standard applicable for fishery waterbodies, the impact on surface water resources of the Gydan Peninsula can be assessed as **low**.

15.2.4 Impact on Soils and Subsoil

Due to compact footprint of the Field, Plant and Port facilities, their impact on geo-environment and soils will be limited and will not rich beyond the allocated land plots and adjacent territories (also water areas – for exogenous processes).

Subsoil resources and conditions for their use. The Project effects in the geological environment will mainly result from a combination of local physical-mechanical (both static and dynamic) and thermal loads with a **low** integral significance.

Under the Arctic LNG 2 Project, extraction of hydrocarbons, gravel and earth construction materials will irreversibly change the state of the subsoil, while the conditions for subsequent subsoil use in this land and water area will get more complicated with the appearance of numerous engineering facilities in the geological environment. Despite the fact that the license area is not classified as an earthquake-prone area

– the field development can lead to the activation of local geodynamics, the most common variant of which is a slow stable subsidence of the land surface and sea bottom over the subject subsoil zone.

By experience of similar projects, over the whole period of field development, subsidence may develop to several dozens centimetres or even few meters (which is less likely), which may cause local incidents at the Project facilities, changes in the direction and intensity of exogenous processes in the adjacent areas, but will not have a significant impact on the land use conditions in the Tazovskiy Municipal District, and also at the level of its established elements - Gydan and Antipayuta tundras. The areas of greatest geodynamic risk will be intersections of fractures, especially those near the well pads' sites. No strong earthquakes due to induced seismicity are expected. Deformations of surface and individual structures at the Project sites will be subject to geotechnical monitoring.

Exogenous Geological Processes. The area of the Field, Plant and Port is characterized by a variety of intensive exogenous geological processes, with an average area prevalence over 75% in natural conditions. The terrain stability decreases from the interstream areas to the bottom surfaces of the Ob Estuary, and on the eastern macroslope of the Gydan Peninsula - compared to the western macroslope. In the coastal zone, which geomorphologically is the most complex one, there are relatively stable Laida lake-marsh assemblages, which may primarily be exposed to the risk of their shores destruction and changes of water conditions under the influence of construction. By contrast, the slopes of the second marine terrace, which are prone to gravitational, erosion and deflation, cryogenic and other exogenous processes, are very sensitive to technological impacts. The stability of the shoreface, foreshore and valley network is recognized to be low too, but unlike the stable equilibrium that is characteristic for the undisturbed slopes of the Gydan Peninsula marine terraces, here the terrain features are being continuously altered by ice gouging, downcutting and lateral erosion, and by water accumulation.

Onshore, the Planned activity will mostly have direct physical and mechanical impacts on the geological environment contributing to the secondary activation of DEGP&HP, the most dangerous of which include cryogenesis, underflooding and waterlogging (with development of hydrogenous taliks), erosion-accumulative processes, thermoabrasion in river valleys and on shores of lakes, deflation and eolian accumulation. Locally developed processes will also include settling of slopes, suffusion, and other engineering processes within the contour of earth structures to be established and excavations.

Unlike the neighbour Yamal District, permafrost in the territory of Gydan Peninsula is less prone to the processes that result in development of frost heave mounds. These specific topographic forms are often associated with the engineering risk of explosion gas occurrences which is still fairly high also in the territory of the Salmanovskiy (Utrenniy) license area.

Along with this, the construction and subsequent operation of the designed facilities will have an impact on the thermal regime of the soil, and since the subject area is associated with the cryolithozone, the thermal effect will inevitably change not only the conditions of seasonal freezing and thawing of the soil, but will also contribute to the degradation of the permafrost and is likely to provoke activation of DEGP&HP outside the land allocation area. The implementation of the measures included in the design and proposed by the Consultant will minimize the negative processes listed above.

The underwater technical works and artificial structures to be established in the water area of the Ob Estuary and the coastal zone will redistribute ice and wave loads, transform the circulation of water and the balance of sediments, which will cause the inevitable reorganization of the underwater terrain.

In general, the impacts associated with the intensification of dangerous exogenous geological processes are assessed by the Consultant as being of high significance, but the measures proposed in the ESIA will reduce their significance to **moderate** for the coastal zone and **low** for the continental area. In particular, adequate preparation of the coastal area will prevent or minimize the impact of associated processes - flooding and icing, thermal abrasion and other forms of shore erosion, water logging. Adequate monitoring of morphological and lithological conditions is required to track their development trends and ensure early prevention of potential accidents, in accordance with the proposals of the Consultant.

Soils. The most important ecological functions of soils in the area of the Field, Plant and Port are maintaining the fragile status of local ecosystems, including productive lichen pastures, conserving permafrost through thermal insulation, regulating the water regime of the seasonally thawed layer, and maintaining the stability of the terrain. At the same time, the soils of the subject area are also a natural depositing medium for pollutants and microorganisms, including causative agents of dangerous diseases.

Due to intensive exogenous geological processes, the Project area is characterized by poorly developed thin soils (psammozems / Arenosols, alluvial / Fluvisols) with no economic value. The soils loss will be

followed by their rapid – within a few years or decades – restoration on sites free from buildings and pavements. Mature clearly profiled soils (Spodic Cryosols, Gleysols) and thick organogenic horizons (Histic Gleysols, Histosols, Histic Turbic Cryosols) were formed over hundreds and first thousands of years, but they are also highly sensitive to technological impacts, and restoration of their profile after physical and mechanical damage would not be practical.

To this end, given the above functions of the local soils, the key soil management recommendation is to take the utmost care to keep soils undisturbed. For those areas that will be disturbed but will be free from buildings, land reclamation and monitoring measures should be implemented in accordance with the Consultant's recommendations (Appendix 9). The integral impact of the planned activity on the soils is assessed as being of moderate significance; effective reclamation of disturbed lands based on the Consultant's proposals will reduce its significance to **low**.

Groundwaters within the designed sites ofthe Field, Plant and Port facilities are not used in economic activities and are not highly sensitive to technogenesis. The shallow groundwater horizon is generally represented by fresh, free-flowing, supra-permafrost waters of the seasonally thawed layer which undergo phase changes on the annual basis. Along with waters of hydrogenous non-through taliks, which are confined to modern alluvial, marine and biogenic sediments and hydrologically associated with surface water bodies that caused their presence, those horizons are not protected from the ingress of pollutants with surface runoff and act as a carrier medium.

One hydrogeological feature of the license area is cryohaline water (cryopegs) found in this area – these are intra-permafrost supercooled brines, occurring at a depth of 10-20 m, which occurrences on the surface are an accident factor due to the pressure levels, high corrosivity and negative temperature of these waters. It is predicted that the impact of the planned activity on the permafrost waters will be significant, but local and most pronounced during the construction period. During that stage, the occurrences of cryopegs are most likely, and the fact that the results of the current surveys do not allow accurate prediction of their occurrences should be compensated for by developing and implementing an appropriate action plan.

The integral significance of the Project impact on the groundwater within its sites can be assessed as **low**. Deeper aquifers will be affected by direct injection of treated wastewater to formation: the risk of adverse ecological effects of this activity is assessed by the Consultant as low; however, wastewater containing reservoirs and sites of injection wells should be monitored for potential cross-flows, upflows of water, and other unexpected changes in geological environment due to the Project impacts.

15.2.5 Biodiversity impact

The terrestrial ecosystems within the Salmanovskiy (Utrenniy) License Area are represented by natural and locally transformed habitats. The former, within the license area, is represented mainly by the northern Hypo-Arctic tundra communities and, as of Q2 2020, occupies 99.1% of the LA territory Modified habitats include disturbed tundra areas adjoining the exploration drilling sites of late 20th century, as well as sites of facilities existing, being constructed or dismantled at the Salmanovskoye (Utrenneye) OGCF. Land plots and strips with a maximum width of 50 m, with vegetation communities transformed or degraded as a result of activation of exogenous geological processes, are also classified by the Consultant as modified habitats. As a result of the Project implementation (to a maximum extent), the proportion of natural and modified habitats of 98.5 / 1.5 % will be achieved, i.e. most of the natural habitats within the Project's area of influence will be preserved.

Forb-subshrub-moss, sedge and cottongrass moss tundras typical of the Gydan Peninsula are common in the license area. Fragmented terrain, differences in duration of presence of snow blanket and its thickness, varying grain size distribution of soils and active development cryogenic and other exogenous geological processes determine the complexity of vegetation cover at the meso- and micro-level. This results in a variety of different combinations and complexes of vegetation. Results of the engineering surveys for the Arctic LNG 2 Project and the Utrenniy Airport, as well as local environmental monitoring in the Salmanovskiy (Utrenniy) license area demonstrate a high vulnerability and slow pace of restoration of local vegetation communities in technogenically disturbed areas (it is also noted that restoration takes less time in areas where organogenic soil horizons are not destructed) Natural restoration of disturbed plant communities will take at least few decades.

Flora within the license area is relatively poor: only 124 species of vascular plants of 75 genera and 28 families. By species composition, it is similar to other floras of the northern Hypo-Arctic tundra sub-zone of the Yamal-Gydan region. Arctic and Arctalpine species play the most important role (48 %) in the structure of flora, while the contribution of boreal species is the smallest. All flora species are native, no phytoinvasions are reported so far. Over 20 plant species listed in the Red Data Book of YNAO may be

present within the Salmanovskiy (Utrenniy) license area[68]. The local environmental monitoring identified four species of vascular plants protected at the regional level as status III rare species: vogul brome (*Bromopsis vogulica*), tundra woodrush (*Luzula tundricola*), tufted saxifrage (*Saxifraga cespitosa*) and valerium (*Polemonium boreale*). In addition, four species listed in the appendix of the Red Data Book of YNAO as "requiring special attention" are reportedly present in the study area: *Ranunculus nivalis, Papaver jugoricum, Parrya nudicaulis, Eremogone polaris*. The identified habitats and populations of rare and protected plant species are not affected by the technogenic impact of the Project construction and operation.

Within the studied area, rare communities with restricted range, relying on specific rare environmental conditions, are sparse forb-graminous meadows on the seashore sandy cliffs. These communities develop in a narrow range of environmental conditions, occupy extremely small territories and contain rare and protected species of plants listed in the Red Data Book of YNAO, and feature a high aesthetic value due to abundance of species with bright blossom. These plant communities develop in unstable habitats and are subject to environmental monitoring.

The terrestrial vertebrates fauna in the Salmanovskiy (Utrenniy) license area is also typical of the northern Hypo-Arctic tundras. Birds of 80 species use this area for nesting or on migration, and up to seven species of mammals may be present in the LA. Six bird species listed in the Red Data Book of Russia and three bird species listed in the Red Data Book of YNAO can be areographically expected in within the License Area. Two more species are not listed in the federal and regional Red Data Books, but have a conservation status of the International Union for Conservation of Nature. Physical presence of four species of terrestrial vertebrates listed in the Red Data Books of the RF and YNAO has been registered during the survey and monitoring activities within the LA: Bewick's swan (*Cygnus bewickii*), peregrine (*Falco peregrinus*), snowy owl (*Nyctea scandiaca*) and lesser white-fronted goose (*Anser erytropus*). All these species are nesting in the study area, however only one of them is present in all seasons (snowy owl).

Hydrobiological communities of waterbodies and watercourses of the Gydan Peninsula are relatively poor. The total of 42 taxons of phytoplankton and 45 taxons of zooplankton have been identified in the Salmanovskiy (Utrenniy) LA. Macroozoobenthos is represented by *Nematoda* and *Oligochaeta, Phyllopoda, Bivalvia, Hydrachnidia* and larvae of amphibiotic insects. The richest diversity and dominant position is reported for larvae of Belgica antarctica (Chironomidae). Ichthyofauna of inland waterbodies of the Gydan Peninsula is closely linked to that of the Ob Estuary, and many species that live in the Estuary use rivers and lakes for foraging and sometimes - for spawning. The Coregonidae family is represented by the largest number of species in the rivers and lakes, however, only one species - Arctic grayling (*Thymallus arcticus*) — lives solely in the inland waterbodies and watercourses (i.e. never calls the Ob Estuary).

Conclusion about absence of ecosystems that would meet the IFC's PS6 criteria of critical habitats are present within the territories and water areas affected by the Project is confirmed by the engineering surveys and environmental monitoring results over the period 2012-2019. Potential critical habitats are located at a minimum distance of 25 and 70 km from the license area and the Project facilities, respectively. Such habitats belong to the existing designated conservation areas at the federal (Gydanskiy National Park) and regional (Yamalskiy sanctuary) level, wetlands of international importance (Ramsar Convention), and important bird areas of international importance. Also, it is important to note a relatively high ecological and biological significance of ecosystems in the Yuribey River valley located 25 km south of the LA boundary and 80 km south-east of the Port and LNG & SGC Plant. Scientific publications highlight a need to ensure conservation of these ecosystems.

The key ecosystem service in the Project area is cattle herding. The greatest damage during the construction of the designed facilities will be caused to reindeer pastures which are supposed to be withdrawn for permanent and temporary use, after which their hundred-percent restoration will take a very long time (few decades), due to the slow rate of development of the complex tundra communities comprising perennial dwarf-shrubs, lichens and mosses; in areas of deep transformation of terrain, restoration will be totally impossible. An important impact on customary fishing practices is also possible, particularly in the lower reaches of Khaltsyney-Yakha and Nyaday-Pynche Rivers which will be most exposed to direct and indirect impacts of the Project.

Marine ecosystems of the Ob Estuary. Due to the significant contribution of the Ob River runoff in the water balance of the Arctic Ocean and its proximity to the lower reaches of habitats and migration routes of a

[68] YNAO Government Resolution "On the Red Data Book of the Yamal-Nenets Autonomous Okrug" of 11 May 2018, No.522-P (as revised on 26 December 2018)

large number of rare and endangered animal species, the entire Ob Estuary is included in the list of *Ecologically or Biologically Significant Marine Areas (EBSA*) according to the Convention on Biological Diversity (Rio de Janeiro, 1992). It is also one of the most important fishing regions of Russia with the largest and most productive population of whitefish (muksun (*Coregonus muksun*), chester (*C. nasus*), omul (*C. autumnalis*), etc.) and the habitat of Siberian sturgeon (*Acipenser baerii*) — species listed in the IUCN Red List as an "endangered species".

Hydrobiological communities in the Project area develop in the conditions of generally low levels of salinity, with significant variations of this parameter between seasons and from year to year. Diatom algae are at the heart of local phytoplankton communities. Zooplankton in the Project area is characterized by fairly wide taxonomic diversity, including copepods, rotifers and cladocerans. Species of these groups can live in both fresh water and in significantly diluted brackish waters. Zoobenthos is characterized by limited diversity, uneven distribution of species and significant spatial variability of abundance and biomass. The main contribution to the total abundance and biomass of bottom invertebrates is made by polychaete *Marenzelleria arctia* and *Ampharete vega arctia*, isopod *Saduria entomon*, oligochaete *Limnodrilus hoffmeisteri*, and amphipods *Pontoporeia femorata* and *Monoporeia affinis*. An interesting feature of benthos in the water areas exposed to the Project impacts is almost complete absence of shell-fish which are represented by a fairly rich variety in the Ob Estuary areas with less saline waters to the south, and to the north of the affected areas where average salinity higher and sea water influxes are more frequent. The poor diversity of macro-zoobenthos is due to the hydrological conditions in the water area with a complex thermohaline structure: fresh-water species common in the areas further to the sough in the Ob Estuary, and marine species characteristic of its sea part are either absent here or just survive in the pessimum environment, therefore, euryhaline species dominate. It should be noted that all common representatives of zoobenthos in the concerned bottom habitats are valuable food resource for fish.

Ichthyofauna species list of the Ob and Taz estuaries of the Kara Sea includes up to 55 species of fish, whereas only 36 of them live in the area affected by the Project. The surveys showed a predominantly low density and uneven distribution of ichthyofauna across the water areas, with the migratory Arctic omul, semi-anadromous Asian smelt (*Osmerus mordax dentex*) and Siberian vendas (*Coregonus sardinella*), the bottom four-horned sculpin (*Triglopsis quodricornis*). Less common in the survey catches were navaga (*Eleginus navaga*), lamprey (*Lethenteron kessleri*), Siberian whitefish (*Coregonus lavaretus pidschian*), peled (*Coregonus peled*), chester, humpback salmon (*Oncorhynchus gorbuscha*), roach. Almost all species of fish use waters in the Project's area of influence for foraging and migration to the wintering and spawning grounds. Two alien fish species have been found in catches during the survey and monitoring activities: bream (*Abramis brama*) and humpback salmon (*Oncorhynchus gorbuscha)*, for which habitats in the middle part of the Ob Estuary are far from optimum.

Marine birds and mammals fauna in the work areas within the Ob Estuary is relatively scarce. Nesting of colonial alcidine birds is limited due to the lack of rock cliffs and predominance of low submerged coasts. Most common birds in the Project water area are seagulls - Heuglin's gull (*Larus fuscus heuglini*) and glaucous gull (*Larus hyperboreus*), black-throated loon (*Gavia arctica*), and abundant diving long-tailed duck (*Clangula hyemalis*).

Among marine mammals, common but not abundant are seals - bearded seal *Erignathus barbatus* and ringed seal *Phoca hispida*. White whale (*Delphinapterus leucas*) — toothed whale of narwhales family - sporadically visits the Ob Estuary including the Project area. Single individuals of two other species - walrus (*Odobenus rosmarus, Atlantic subspecies*) and polar bear (*Ursus maritimus*) — are present occasionally, as the Project area is outside their main ranges.

Conclusion about absence of ecosystems that would meet the criteria of critical habitats are present within the Ob Estuary water area affected by the Project is confirmed by the engineering surveys and environmental monitoring results over the period 2012-2019. The role of this area in maintaining the number of commercial, rare and endangered fish species is minimal compared to the southward zone of the Ob and the Taz Estuaries confluence (area identified as an Arctic water area of a high environmental value "Ob-Taz sector of Kara Sea": Soloviev et al., 2018), which is proposed to have the status of a fishery conservation area, since there is high concentration of many fish species wintering and spawning in this area, including the Siberian sturgeon (Matkovskiy et al., 2014). The Project implementation 120-140 km downstream of the boundaries of the above water area of a high environmental value will minimize the likelihood of direct impacts on this area; it appears to be one of the studied marine habitats closest to the Project hydraulic structures, which can be acknowledged as equivalent to critical in terms of its significance and, potentially, legal status.

The predicted integrated significance of the planned activity's impact on the various components of biodiversity of **terrestrial** and **aquatic** ecosystems and on related ecosystem functions (ecosystem services) is assessed by the Consultant as **moderate** and **high**, respectively, and is reduced to **low** and **moderate** by taking effective measures aimed at prevention, minimization and compensation for expected damage.

Impact on biota will be prevented and reduced by the measures listed in Chapter 9 herein for prevention and mitigation of impact on ecosystem components (air and water, soil, etc.), and the engineering measures designed to reduce potential damage from specific facilities - fish protection systems at water intakes, bird protection devices on overhead transmission lines, wildlife crossings over utility corridors, "soft start" arrangement for underwater technical operations, etc.

A key measure is comprehensive biodiversity monitoring of terrestrial and marine ecosystems. The monitoring programme should provide for additional studies to fill the gaps in the existing information on biota. First of all, it should include search of nesting grounds, molting concentrations and migration stops of anseriformes, which are potentially present in the wetlands in the south-east and north-east of the license area; search for nesting grounds of the rare and protected bird species identified during the surveys and monitoring activities; search for and registration of places with presence of rare and protected species of plants; entomological and soil-zoological surveys. The importance of providing a scientific assessment of impact on the key groups of organisms dictates the need to conduct specialised studies where the main focus should be on aerial counting of pinnipeds and animals migration research using satellite telemetry.

At the same time, according to the IFC Performance Standard 6, impact mitigation in the terrestrial and water areas with natural habitats should be focused to prevent eventual damage to biological diversity as far as possible, which necessitates additional measures for compensation of residual effects. Such measures include compensation stocking with juvenile fish which is conducted at present and planned in the future. To minimise the Project impact on terrestrial ecosystems it is recommended to identify preferred methods to be used for reclamation and restoration through research work. As optimum approaches to reclamation of disturbed land in the Arctic have not been developed, researched-backed reclamation and restoration of natural habitats is recommended as an additional measure to prevent eventual damage to biological diversity.

15.3 Potential Transboundary Impacts of the Project

The impact assessment did not identify any potential impacts of the planned activities which could cause significant effects beyond the national borders. Most impacts will be of local scale and will not extend further than few dozen kilometres from source.

Contribution of the Project to the regional and global pollution of atmospheric air and the world ocean is assessed as **negligibly low**, however, it is subject to monitoring and registration, particularly in terms of GHG emissions.

No significant transboundary impact is expected on populations of migrating birds and marine mammals in the habitats that extend beyond the boundaries of Russian Federation.

15.4 Project in the Context of Global Climate Change

15.4.1 Climate risks assessment and Project adaptation measures

Considering the Equator Principles 4 and the Recommendations of the Task Force on Climate-related Financial Disclosures, the assessment of climate change risks for the Project is provided for two categories of risks: physical risks (climate change in the global and regional context) and transition risks (considering the global trend of transition to low carbon economy). Such risks, as well as benefits must be identified and assessed in time to take the necessary management steps and adopt adequate design to minimise the risks and increase sustainability of the technology-intensive Project in the medium and long term.

The climate baseline and trends have been considered using the key climate variables in the region, as well as available publications with analysis of long-term existing and predicted climate trends. The global climate changes and their manifestation in the Russian Federation are documented and expressed in the form of extreme weather events and long-term changes of climate conditions: growth of annual average temperature of ground-level air, extreme minimum and maximum temperatures, intensity of extreme weather events. These manifestations of climate change also have other consequences, such as gradual

increasing of seasonally thawed layer, degradation of bearing capacity of permafrost, reduced availability period of winter roads, diminishing area of ice along the Northern Sea Route, etc.

It has been established that for the Project, in the long term, the expected increase in average annual temperatures, as well as increase in the number and intensity of extreme events fall within the scope of **moderate** physical risk factors. In a long term, the likely most significant direct long-term effects of such risks in relation to the Project may include degradation of bearing capacity of permafrost and extreme physical ambient impacts on the Project facilities (uneven and "stress" loads, sharp temperature changes, etc.), which may cause deformations and loss of stability and integrity of the facilities and infrastructure. Such risks can be minimized by adopting design solutions that take account of these factors and provide for an increased safety margin for the bearing capacity of foundations and structures, and by selecting appropriate building materials. The above adaptation measures have been considered in the design, and after their implementation the risk will be reduced to **low**.

In the harsh conditions of the Arctic, any increase in the extremity of any weather events or their occurrence rate will have a cumulative aggravating effect in terms of the impact on health and safety of the projects' personnel. The physical risk and magnitude of this impact are estimated in the range of **medium** to **high**; however, the impact on the health of the Project personnel will be reduced to a **low** level if the current weather conditions are duly considered when choosing work clothes and PPE, planning of outdoor works and heat supply arrangements, and if adequate response procedures are developed and implemented to address the challenges posed by weather hazards.

Considering the scientifically proven link between anthropogenic emissions of greenhouse gases and observed changes of climate, the global community is facing the challenge of reducing GHG emissions rapidly enough, and transition to low carbon economy. To facilitate the GHG emissions reduction efforts, the Paris Climate Agreement was prepared at the end of year 2015 which regulates the measures applied since year 2020 to decrease carbon dioxide levels in atmospheric air. Most countries including Russia signed the Agreement in 2016.

Transition to low carbon economy can be implemented as a gradual process if initiated universally in the near future, and entities will have enough time to get prepared and identify their transition strategies and mitigation measures. This way, the risk of materialisation of most adverse climate change scenarios will be lower, i.e. physical risks will be minimised. Basically, it is expected that the use of fossil fuel for energy generation will be phased out in a long term, therefore, businesses most likely to be exposed to immediate effects of the transition period are those engaged with production and processing of coal, oil and natural gas (listed in the descending order of sensitivity to the change), and those using the above resources in their production processes.

The transition risks to be mentioned are tax on emissions of greenhouse gas (GHG), potential regulation and distribution of feedstock and products, increased cost of insurance, changes in consumers' energy and services use behaviour, Falling demand for LNG due to preference of other products and other energy sources with lower GHG emissions, etc. The Company can adopt a range of measures to minimise these risks, including

- Making an allowance for potential increase of GHG tax and insurance costs, and for falling demand, in the financial models for the investment efficiency estimation and planning of costs;
- Timely identification of changes in regulatory requirements already at the stage of their preparation;
- Strategic planning and adequate control of GHG emissions at all stages of the Project (using all reasonable tools);
- Adopting up-to-date resource and energy efficient technologies (implemented at the design phase);
- Effective production management;
- Regular preparation, verification and disclosure of GHG reports.

15.4.2 Greenhouse Gas Emissions

LLC "Arctic LNG 2" is aware of possible consequences of climate change in the global context, and especially in the Arctic region, and the need to focus on minimising and effective management of GHG emissions. The approach adopted for the estimation of GHG emissions is based on the applicable IPCC guidance and reference documents recognised at the international level, as well as industry guidance documents. Preferences are given to international methodologies that are compatible with the Russian regulations.

According to the assessment results, expected level of GHG emissions from the Project is 253,680 t CO2-e per year over the whole period of construction; during the period of operation (starting from 2026), the Project emissions of GHG are not likely to exceed 5.67 M t CO2-e per year.

Since the annual GHG emissions of the Project are higher than the reporting threshold of 50,000 t CO2-equivalent set by RF Government Directive No.716-r dated April 22, 2015, and the threshold of 25 thousand ton of CO2-e/year set by the IFC Performance Standards, direct and indirect emissions of GHG from the Project must be reported on annual basis. Exceedance of the threshold of 100 CO_2-e/year also triggers the requirement to publish annual reports on Scope 1 and Scope 2 GHG emissions during the Project operation stage.

In this connection, the Project will provide for the compilation of annual reports on the actual amount of greenhouse gas emissions, which will be available to relevant government agencies and lenders. For compliance with the IFI standards, annual reports on greenhouse gas emissions during the Project operation must be made available to all stakeholders.

After the facilities commissioning, the actual emissions will be re-assessed using the measured values or records. It is expected that actual GHG emissions from the Project will be lower than the estimated values, as the calculation is based on conservative approach, using the projections in the design documentation and high utilization of the capacities.

Since the Project represents a greenfield development, the principle of ensuring maximum possible energy and resource efficiency is incorporated in the process of design development for the structures and facilities. The spatial design, processes and equipment configurations have been selected with reference to the best available technologies, and with a view to optimising the production and auxiliary processes and logistic schemes. Therefore, implementation of the designed schemes will minimise direct and fugitive emissions of greenhouse gases through selection of the most efficient generation processes and effective use of heat and electric energy, as well as prevention of potential leaks of natural gas and gas condensate at processing and transportation.

Implementation of the designed resource and energy efficient solutions for the Project will be ensured through the designer supervision and oversight of the practices at the stage of construction and commissioning, through monitoring of process performance over the transition period till full-scale operation, monitoring of implementation of the Environmental and Social Management Plans in terms of emissions to air.

The key factors for effective management of GHG emissions during the operation phase are: timely maintenance of equipment; emissions monitoring and control; updating the inventory of emission sources and GHG emissions register; annual evaluation of absolute and specific GHG emissions of the Project. Sensible energy-saving solutions in accordance with international best practice should also be implemented whenever possible.

15.5 Social and Health Impact Assessment

The ESHIA process included examination of potential impacts of the Project on social conditions and communities' health. Summary of the key impacts is provided below.

15.5.1 Impact on Community Health and Safety

The Project construction and operation may have an impact on the nomadic indigenous population within the Salmanovskiy (Utrenniy) LA. For instance, impacts can be generated by the existing construction sites or production facilities and by the relevant operating machinery and equipment. There may also be risks associated with the presence at the sites of hazardous substances and materials. In addition, reindeer herds and reindeer sleds may collide with structures associated with linear infrastructure (e.g. gas pipelines, etc.). The health and safety of the Tazovskiy Municipal District residents as a whole may also be affected by vehicle traffic on public roads.

Nomadic communities may be exposed to stress effect. This impact may be due to the manifestation of a number of sources of concern, including traffic, restrictions on the traditional economic activities within the boundary of the license area, the emergence of construction personnel, etc.

Significant health impacts associated with noise, vibration and emissions of air pollutants are not expected due to the remoteness of the places of permanent residence of the population from the Project facilities.

The significance of the aforementioned potential impacts is assessed as **moderate** or **high**. To mitigate these, the Consultants proposed corrective measures that will help reduce their level to **low** or **moderate**.

15.5.2 Impact on Economy and Employment

Positive effects on the economy and employment of the population can be generated by new jobs, as well as through the potential involvement of local businesses. These businesses can provide services and perform work for the Project. However, it should be noted that these effects will be limited. In addition, positive effects are expected from the Company paying taxes to the local regions and implementing socio-economic programs.

A positive effect will be generated on the local agricultural enterprise, MUE State Farm Antipayutinskiy, by the loan of the rights for the use of its land and by paying the appropriate compensation. At the same time, a negative impact on the activities of the state farm may be associated with the Salmanovskoye (Utrenneye) OGCF facilities setup, as well as the airport operation, blocking or restricting the use of one of the reindeer herds migration routes. The significance of this impact is assessed as **moderate**. To reduce it, appropriate measures were proposed, including, inter alia, installation of crossings over gas pipelines, utility lines and other linear structures. As a result of these measures, the significance of the impact can be reduced to a **low** level.

The assessment also considered the potential impact of the Project on the aquatic biological resources of the Ob Estuary, and thus on the possibility of fishing in its waters by the local enterprises. Any negative effect of the Project activity on fishery is extremely unlikely. The scale of this impact is assessed as low, and its overall significance - as **low/moderate**. The implementation of the ESHIA related measures will reduce the significance of this impact to a **low** level.

15.5.3 Impacts on Labour Relations

It is expected that the risk of a negative impact on physical health and psychological well-being will be higher for visiting workers who are not adapted to local climatic conditions. In general, the impact will be negative and may include hypoxemia (oxygen deficiency), psychological disorders, the risk of hypothermia, a shortage of UV exposure, etc.

The greatest risk of injury during the construction and operation phases may be associated with falls from a height, work in a confined space, weight lifting, movement of construction equipment and vehicles, as well as other factors.

According to similar project experience, a significant number of employees may be involved in the construction and operation of the Arctic LNG 2 Project. This will require the construction of a large temporary accommodation camp. In absence of appropriate measures to manage residential properties, conflicts may arise between various groups of workers, uncontrolled contact of workers with the nomadic population, etc.

In the absence of the necessary measures, involvement of a significant number of employees from contracting and subcontracting organizations may lead to violations of the labour rights of employees, for example, to untimely or unfair remuneration and lack of access to the Grievance Mechanism.

The significance of the labour impacts at the stages of construction and operation can be **high**. To mitigate them, it was recommended that a range of activities are carried out that will help reduce these impacts to **negligibly low - moderate** level depending on the exposure levels.

15.5.4 Impact of Immigration Flow

Construction and operation of the Project will generate a significant influx of migrant workforce. At the peak of construction activity, the number of Project workforce may reach 15,000. This can lead to increased pressure on medical facilities, conflicts between workers and the local population, as well as the spread of infectious diseases. The significance of the indicated impacts is assessed as **moderate** or **high** depending on the particular aspect. The Consultant provided a list of recommended activities that will reduce the potential impacts to a **low or moderate** level.

15.5.5 Impact on Land Use Conditions

The Project construction and operation may lead to blocking and / or restricting the use of some sections of the reindeer herders' migration routes within the boundary of the Salmanovskiy (Utrenniy) license area (Figure 8.12 in Chapter 8). In addition, the planned activities may affect the quality of the pasture land, as well as fawning sites. Construction of the airport will also affect traditional activities of Nenets people. Significance of the potential impact on reindeer herding is **high**.

The planned activities will have an impact on the traditional fishery practices of the indigenous population. The Project activities may, to a certain extent, affect the three customary fishing grounds known by the time of reporting. Furthermore, construction of the Project facilities (including the Field) may restrict access to the above and other customary fishing grounds in the Salmanovskiy (Utrenniy) LA. Considering the aforementioned impacts, and in view of the identified deficit of suitable inland waterbodies for customary fishing, the impact on customary fishing is assessed as **high** in significance.

Indigenous communities may use the Project area for hunting and picking wild crops – activities that play a secondary role in the traditional economy of nomadic Nenets people. No areas specifically assigned for hunting and picking wild crops have been identified – the indigenous people practice hunting and picking along the migration routes of reindeer herds. Similarly to the impact on reindeer herding activities described above, potential impact on hunting and picking wild crops may be expressed in loss or restriction of access to the concerned areas. Overall significance of this impact before mitigation is assessed as **high**.

To minimize such potential impacts on the traditional economic activities of the indigenous population, a number of measures were proposed in the ESHIA. Key among these include the development of an Indigenous Peoples Development Plan[69] and provision of a system of crossing points at the intersections of herds migration routes with roads and utility lines. Crossings will also facilitate access to other customary land use sites (fishing, hunting, wild crops gathering grounds), and to the sacred sites.

Continued consultations with indigenous people and their representatives will also play an important role in the process of agreeing on crossing points' locations and clarification of their requirements in terms of granting access and right of way in the areas that they use by conventional rights.

15.5.6 Impact on cultural heritage

Two cultural heritage sites have been discovered as a result of studies in the area of the Salmanovskiy (Utrenniy) LA – medieval settlement sites Khaltsyneysalya-1 and Khaltsyneysalya-2. An urgent archaeological research (excavations) were conducted at the Khaltsyneysalya-1 settlement to collect information on this heritage site. After that, the site was removed from the register of identified heritage sites. The second site is located at a minimum distance of 700 m from the Project facilities. The planned activity is unlikely to affect the site in any way.

Chance finds cultural value are also possible in the area of construction within the gas and oil field. The significance of the potential impact on such objects is defined as **moderate**. A range of measures is identified to mitigate this impact. In particular, a Chance Finds Procedure will be developed. Provided that these measures are implemented, the significance of the above impacts can be reduced to a **negligibly low** level.

Within the boundary of the license area there are about 20 known places that are sacred to the indigenous population, with five of them located 130 to 1300 m from the Project sites. More sacred sites may be present in the license area, which have not been identified by the time of the ESHIA studies. Those may include, in particular, burial sites of indigenous people. Magnitude of the potential Project impact on sacred sites, burial grounds and access to them is assessed as **high**. To minimize this, a number of measures have been proposed in the ESHIA. After the proposed measures, the significance of residual effects can be reduced to **negligibly low – moderate** level.

It is expected that the Plant will not have a significant impact on the intangible cultural heritage (lifestyle, traditions and customs of the indigenous population) provided the measures set out in the ESHIA are implemented.

15.6 Cumulative Effects Involving the Project

15.6.1 Atmospheric air

Cumulative effects on atmospheric air involving the Project (and its associated facilities) are possible in case of implementation of the Arctic LNG 1 project or extension of the Arctic LNG 2 Project. Given the remote location of the nearest receptors, the cumulative impact can be tentatively assessed as low.

[69] The document name will be clarified during its development.

15.6.2 Geological environment

Implementation of the Arctic LNG 1 project within the area of the Utrenniy Terminal, or extension of the Arctic LNG 2 Project including construction of new linear and areal facilities may produce a local cumulative effect on permafrost and seasonally freezing ground, due to the direct impact as a result of increasing area of exposure, and also due to the long-term indirect consequences, particularly along the linear structures, which are difficult to predict and often extend beyond the site boundaries (such effects are related to secondary transformation of thermal conditions in ground and activation of dangerous geological processes). The expected significance of such cumulative impacts can be low or moderate (as adverse changes are irreversible, and there is a high degree of uncertainty as to the scale and nature of potential development and response of the geological environment).

Further industrial development of the Yamal Peninsula in the medium and long term, including construction of multiple linear facilities (roads, railways, pipelines) increases the risk of permafrost thawing and its adverse geological consequences, such as gas release cones, as well as risk of secondary mobilization of severe disease agents (anthrax, etc.). Contribution of the industrial development into these risks will be minor compared to the effects of climate change.

15.6.3 Marine environment and habitats

Geographically, soil dumping and dredging sites in the area of the Utrenniy terminal are remote from the places affected by dredging for the Obsky LNG project terminal and maintenance dredging activities under the Yamal LNG project. Considering the minor volumes of soil that will be produced during the maintenance dredging for the Yamal LNG project and dredging for the Obsky LNG project Terminal, their turbidity plumes are unlikely to overlap the turbidity plumes from the Arctic LNG 2 Project.

The works relating to additional widening of the Utrenniy Terminal water area (for the Arctic LNG 1 project or extension of the Arctic LNG 2 Project) will be conducted in the area with already disturbed seabed communities, after completion of the main dredging works for the Project. Given the constant load from regular maintenance dredging in the approach channel and water area of the Terminal, the additional dredging activity in a part of the adjacent water area is unlikely to cause any significant increase of the impact of dredging and soil dumping on all components of the marine ecosystem that was defined for the Arctic LNG 2 Project.

15.6.4 Ichthyofauna

Potential Cumulative impact on fish in the Ob Estuary is mainly attributable to suspension of solids at dredging and dumping and subsequent sedimentation resulting in loss of fish and food resources. Superimposed turbidity plumes from underwater technical operations for Sabetta port and Utrenniy terminal is unlikely, however, areas affected by various dredging and short-term seasonal underwater operations may overlap, with a potential adverse effect on fish resource recovery capability after the previous round of dredging activities.

Other projects in the south of Ob Estuary may also affect habitats and migration areas of the same populations of valuable commercial species of fish. Furthermore, other industrial projects implemented onshore may have impact on semidiadromous fish in their fresh-water phase. Considering the scale of dredging activities, the damage that may be caused to the food resources, and presence of valuable commercial fish species, as well as potential presence of endangered species, cumulative impact on salt-water fish and semidiadromous fish is assessed as moderate. The planned activity can make a significant contribution into these impacts.

15.6.5 Marine mammals

Cumulative impacts on the marine mammals may be caused by the existing and planned marine operations of the Yamal LNG, Obsky LNG, Novy Port, Arctic LNG 1 projects, works for the reconstruction of the sea channel, seismic studies within the existing license areas in the Ob Estuary, including those for the future Arctic LNG 3 project.

Implementation of the planned LNG projects in the Ob Estuary will intensify the existing impacts, due to the higher frequency and intensity of shipping activity. It is highly likely that the cumulative impact of factors such as physical presence of vessels, increased underwater noise, high turbidity of water, and food base degradation will make some individual animals or their groups leave this water area for other places, and search for alternative feeding grounds within the Ob Estuary (cause white whales to leave the natural habitat and feeding ground). The increased vessels traffic in the northern section of the Ob Estuary may potentially represent threat to the populations of ice-associated pinnipeds, due to potential death of babies

of ice-based seals during ice-breaker escorting of vessels during the animals' breeding period. According to the monitoring records, ringed seals tend to use the traditional hatching habitats on fast ice and, whenever possible, choose areas with unobstructed access to water away from the vessels traffic routes. Direct impact of icebreakers will affect only the area within the vessels traffic corridor.

The resulting cumulative impact on marine mammals from all existing and planned activities within the Ob Estuary can be assessed as moderate. The Project's contribution to the cumulative impacts is expected to be moderate; a more significant impact is possible in the navigation route section between the approach channels to the Sabetta and Utrenniy terminals, where impact of the Project shipping activity will differ from the existing impacts due to the significant - from 60 to 75 % - increase of the number, dimensions and capacity of the vessels.

15.6.6 Natural tundra habitats

Habitats in the potential development areas on Gydan Peninsula - Shtormovoye, Gydanskoye, Ladertoyskoye, Trekhbugornoye, Minkhovskoye fields, and also Vostochno-Messoyakhskoye field which is currently being developed, are similar to those in the Salmanovskiy (Utrenniy) license area and adjacent territories. The land acquisition is relatively small, in the general context of existing habitats in the region. However, considering sensitivity and low regenerative capability of the habitats, and total duration of the impacts, the cumulative impact can be tentatively assessed as **moderate**. Contribution of the planned activities into this impact can be low or moderate.

15.6.7 Avifauna

Potential cumulative impact on migrating birds is quite high, considering the fact that certain bird species may gather in temporary flocks in the Ob Estuary or nearby inland water bodies during migration periods, there is a relatively high potential for cumulative effects. Such effects may result in relation to all planned development projects on the Gydan Peninsula and in the Ob Estuary that cause deterioration of food supply, disturbance and fragmentation of coastal tundra habitats and wetlands in the region.

In relation to development of the oil and gas field of the Gydan Peninsula in the medium and long term, it is expected that direct transformation will affect a relatively small part of the habitats, however, the indirect impacts may cover somewhat larger areas. Construction of the Utrenniy Airport will improve the conditions for further industrial development of the peninsula, which are likely to produce further impact on the bird fauna due to increased helicopter traffic over the Salmanovskiy (Utrenniy) LA in relation to development of nearby fields.

Considering the geographic extent of migration routes of some bird species, and the uncertainty about potential impact of other development projects in the long term, the cumulative impacts can be tentatively assessed as moderate, while the Project's contribution to the impact is assessed as low.

15.6.8 Indigenous people

All fields development projects (Gydanskoye, Shtormovoye, Geofizicheskoye, Soletsko-Khanaveyskoye and Trekhbugornoye) have a potential to cause physical withdrawal of grazing land and may disturb the annual herds migration routes and limit access to pastures. Given the area of planned land acquisition, the physical loss or limitation of availability of summer and winter pastures will be relatively small compared to the total area of pastures within the license areas. Considering that different pastures have different value for the herders, even small loss of pasture land (such as pastures at the Ob Estuary coast and calving grounds) may have cumulative effects on herders whose migration routes are exposed to impact of development projects at several fields.

Assessment of probability and significance of potential cumulative effects related to the long-term industrial development of the Peninsula is difficult at this stage. However, considering the scale of the expected development of oil and gas deposits of the Gydan Peninsula, and the threat of overgrazing in the north of the Peninsula, overall cumulative impact can be tentatively assessed as moderate or, in absence of project-specific mitigation measures - as high. Contribution of the Arctic LNG 2 Project to the impacts is assessed as moderate, and mitigation measures adopted at the project level can reduce the Project contribution to low.

Cumulative effect on fishery activity of herders is possible in connection with development of the Geofizicheskoye field which includes estuarian sections of small rivers discharging to the Ob Estuary, and, to a larger extent, development of the Gydanskoye, Trekhbugornoye and Soletsko-Khanaveyskoye fields in a longer term which may affect/ limit access to fishery resources in the upper and middle reaches of Yuribey River and its tributaries. The cumulative impact is tentatively assessed as moderate. Contribution

of the Project to the above impacts can be assessed as low or moderate, provided that adequate mitigation measures are adopted to minimise impact on the waterbodies and provide unimpeded access to the traditional fishing grounds on Neita-Yakha River.

Cumulative impact on health and safety of indigenous people is expected in relation to the influx of workforce from other regions, and the appearance of new construction/industrial sites and linear facilities as part of the industrial development of the Gydan Peninsula. After mitigation at the level of individual projects, cumulative risk of development of infection diseases including COVID-19, potential enhanced availability of drugs and alcohol, stress and conflicts with workforce is assessed as low. Contribution of the Project to these risks will be negligible. The total cumulative risk to safety of local communities can be assessed as moderate, considering the duration of the fields development activities, potential scale of the projects, and magnitude of consequences of potential safety incidents (despite their low likelihood).

15.6.9 Cultural Heritage

All identified development projects in Tazovskiy Municipal District have a potential to destruct cultural heritage, if not adequately managed. The risks are exacerbated due to poor knowledge of the heritage sites in the district. Therefore, companies involved in the fields development activities should take adequate measures. Without the above mitigation measures at the level of individual projects, the cumulate impacts / risk of damage of tangible heritage may be moderate. After implementation of mitigation measures to prevent / reduce the impact, residual risk of heritage damage at implementation of the planned activities is assessed as negligibly low. Potential contribution of the Project to the total cumulative impact is minor.

Considering the impact of development of other fields in the region, cumulative impact on the herder's access to their important heritage sites can be assessed as moderate. In combination with other industrial projects, potential cumulative impact on the intangible heritage may be low or moderate, depending on the mitigation measures adopted at the level of individual projects.

15.6.10 Conclusion on the results of cumulative impacts assessment

Table 15.4 provides a summary of the assessment of potential overlapping of impacts of the Project and third-party activities, as well as a tentative assessment of significance of the potential impacts and expected contribution of the Project into the combined effects.

Table 15.4: Assessment of cumulative impacts

Significant adverse impacts, including those being a concern to stakeholders and academic community	Integral assessment of significance of the residual impacts of the Project	Cumulative impact potential of the planned activity and third parties activities:		Significance of potential cumulative effects and expected contribution of the Project
		Past/ existing	Planned/ future	
Adverse changes in the geological environment, including impact on permafrost and related processes	Low	Cumulation with third-party activities is unlikely	Cumulation potential is high in relation to the Arctic LNG 1 project/ or extension of the Arctic LNG 2 Project	Low to Moderate, Project contribution - significant
Adverse impacts of air pollutants	Low	Cumulation with third-party activities is unlikely	Cumulation potential is high in relation to the Arctic LNG 1 project/ or extension of the Arctic LNG 2 Project	Low, due to remoteness of the nearest receptors, Project contribution - significant
Transformation of the Ob Estuary thermohaline structure	Not covered by the Project ESHIA	Moderate, in terms of joint operation of the sea channel with third parties, where the Arctic LNG 2 Project will make a significant contribution to cargo traffic intensity in the Ob Estuary		Moderate, but contribution to the impact is related to third-party activities
Increased water turbidity in the Ob Estuary and surface water bodies on Gydan Peninsula	Moderate	Low, due to the low likelihood of superimposition of turbidity plumes in the Ob Estuary during underwater technical operations in the areas of the Sabetta and Utrenniy terminals	High in relation to the Arctic LNG 1 project/ or extension of the Arctic LNG 2 Project.	Moderate, Project contribution - significant
Chemical pollution of surface waterbodies	Low (Ob Estuary)	Low to moderate, due to increased intensity of marine operations and hence higher risk of accidents		Low
	Low to moderate (Khaltsyney-Yakha and Nyaday-Pynche Rivers)	Cumulation with third-party activities is unlikely	Cumulation potential is present in relation to the Arctic LNG 1 project/ or extension of the Arctic LNG 2 Project. Low, as the fields to be developed in the future are located in other catchment areas	Low to moderate
Transformation of species composition and abundance of hydrobionts (rare and commercial fish species)	Moderate to high	Moderate, due to the influence of turbidity plumes in the Ob Estuary during underwater technical operations in the areas of the Sabetta and Utrenniy terminals.	High in relation to the Arctic LNG 1 project/ or extension of the Arctic LNG 2 Project, and also potential impacts of other development projects on the Gydan Peninsula which are implemented onshore and may affect semidiadromous fish in their fresh-water phase	Moderate, Project contribution - significant
Influence on marine mammals	Low	High, due to overlapping of impacts of dredging and vessels traffic of the Yamal LNG and Novy Port projects	High, due to the increased vessels traffic for the future LNG projects in the Ob Estuary	Moderate, Project contribution - moderate
Loss, fragmentation and degradation of natural tundra habitats	Low to moderate	Low, due to the low level of industrial development of the northern areas of the Gydan Peninsula	High, due to the active future development of nearby fields	Moderate, Project contribution - low or moderate
Impact on migratory bird species	Low	Moderate	High, due to the active future development of the northern territories of YNAO	Moderate, Project contribution - low

Significant adverse impacts, including those being a concern to stakeholders and academic community	Integral assessment of significance of the residual impacts of the Project	Cumulative impact potential of the planned activity and third parties activities:		Significance of potential cumulative effects and expected contribution of the Project
		Past/ existing	Planned/ future	
Impacts on pastures and reindeer herding	Moderate	Low, due to the low level of industrial development of the northern areas of the Gydan Peninsula	High, due to the active future development of nearby fields, and potentially - all fields in the Gyda and Antipayuta tundras	Moderate, Project contribution - low or moderate
Impact on customary fishing practices	Moderate	Low, due to the low level of industrial development of the northern areas of the Gydan Peninsula	High, due to the active future development of nearby fields	Moderate, Project contribution - low or moderate
Impact on indigenous community health and safety	Low to moderate	Cumulation potential with third-party activities is minor, due to the low level of industrial development of the northern areas of the Gydan Peninsula	High, due to the active future development of nearby fields, and potentially - all fields in the Gyda and Antipayuta tundras	Moderate (impact on safety), low (health risks). Project contribution - low or negligible, respectively.
Impact on tangible cultural heritage of Nenets people	Moderate			Moderate, Project contribution - low
Impact on intangible cultural heritage of Nenets people	Low			Low to moderate, Project contribution - minor

Summary of the main conclusions drawn as a result of review of the Project and associated facilities in terms of their impacts with a cumulation potential is provided below.

- Cumulation of the Project impacts with effects of third-party activities in the affected region is not expected to result in exceedance of the applicable environmental quality limits outside the standard onshore and offshore areas where such excessive levels of impact are permissible (designed facilities' sites, sanitary protection zones).
- The most significant cumulative effects are expected as a result of potential superimposition of impacts of the Project and associated facilities on the water environment of the Ob Estuary (with impacts of underwater technical operations and marine operations of third parties), on air quality (with impacts of the Arctic LNG 1 project process trains), on loss, fragmentation and degradation of habitats of terrestrial vertebrates (with impacts of the additional Field facilities, and in the future - with development of other fields in the Gydan Petroleum Region by third parties).
- Coordination with third parties' activities and monitoring is an important prerequisite for prevention or mitigation of significant cumulative effects. In particular, knowing the dumping intervals (every 1-2 years) and the average duration of water turbidity plume (up to few hundred hours) estimated for similar project (Yamal LNG), the plans of underwater operations at Sabetta and the Utrenniy Terminal can be coordinated so as to minimise the likelihood of superimposition of associated impact on marine ecosystems of the Ob Estuary. The Company practices integrated environmental monitoring of the combined area of influence of the Yamal LNG and Arctic LNG 2 projects since 2020.

15.7 General Conclusion and Further Use of the ESHIA Results

Outputs of environmental and social review of construction and operation effects of the Project's and associated facilities indicate that, after implementation of the declared obligations of the Company, as well as environmental and social measures recommended by the Consultant, the planned activities will not cause any significant irreversible impact on the environmental, social and health situation that would be felt beyond the boundaries of the territories and water areas immediately used by the Project, and associated use-restricted territories.

In the territory of the Gydan Peninsula, the Project impacts will not extend beyond the boundaries of the Salmanovskiy (Utrenniy) subsoil area of federal significance which are proposed for use as the onshore

contour lines of the area of influence. Comprehensive monitoring of terrestrial and fresh-water ecosystems initiated in 2018 on the basis of results of the survey activities of 2012-2018 will inform validation of the predicted extent and levels of the Project impacts against the actual parameters, considering their natural background levels and development trends due to the global anthropogenic effects.

In the Kara Sea areas, the cumulative effects will be manifested to a significantly higher degree, due to the overlapping impacts of the Project and third-party activities, primarily the Yamal LNG project which marine area of influence extends to the Utrenniy Terminal and includes most of the influence area of the Arctic LNG 2 Project. Starting from year 2020, the two companies (OJSC "Yamal LNG" and LLC "Arctic LNG 2") joined their efforts for comprehensive monitoring of the marine environment within the combined area of influence of the two projects, whereas the monitoring activities extend beyond the delineated boundaries of their respective areas of influence to cover the receptors of potential impacts.

Configuration of one component of the Project – the Utrenniy Terminal – allows for extension of the LNG and SGC production, storage and offloading capacity from the three process trains (Arctic LNG 2 Project) to six. At present, the corresponding future development plans do not specify the time of implementation and resource base to be used. One potential alternative is implementation of the capacity extension under a third-party project, possibly by LLC "Arctic LNG 1" – subsidiary of NOVATEK that already holds a license for geological prospecting, development and production of hydrocarbons at several fields of the Gydan and Yamal petroleum regions, of which the nearest to the Project area of influence are the Gydanskoye gas field and the Geofizicheskoye OGCF.

The Company should monitor the plans for development of these and other fields in the neighbour onshore and offshore areas (particularly Shtormovoye gas condensate field), extension of LNG and SGC production and storage facilities within the Salmanovskiy (Utrenniy) LA, and for construction by third parties of transport corridors from the resource base to the Utrenniy Terminal and, as soon as specific details become known, analyse them and incorporate into the programmes for monitoring of the Project impacts and assessment of their potential cumulation with third-party activities.

Specific plans and procedures are to be defined and implemented within the scope of overarching management plan (issued by the Consultant as a separate document in the ESHIA package), to manage environmental and social aspects of high and moderate significance (as identified by the ESHIA), with reference to specific impacts and receptors, and the Project implementation phases. For the Project, the list of additional plans and procedures should cover the following:

- Stakeholder engagement;
- Indigenous people development;
- Conservation of cultural heritage (including chance finds procedures);
- Community health, safety and security;
- Traffic flows;
- Temporary accommodation camps;
- Labour and working conditions (including employment and general occupational safety);
- Biodiversity conservation;
- Restoration of disturbed ecosystems;
- Hazardous materials and waste management;
- Air emissions (including GHG);
- Water management;
- Impact on soil and subsoil;
- Code of Conduct for workers at the sites of the Project and its associated facilities (also applicable to contractors).

Management plans should be reviewed regularly and updated as necessary. Taking into account the quick development pace of the Project, the environmental and social management plan(s) will provide for the ability to quickly respond to changing circumstances and to consideration of the monitoring results.