YAMAL LNG ENVIRONMENTAL AND SOCIAL SCOPING REPORT

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Yamal LNG

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GLOSSARY OF ABBREVIATIONS

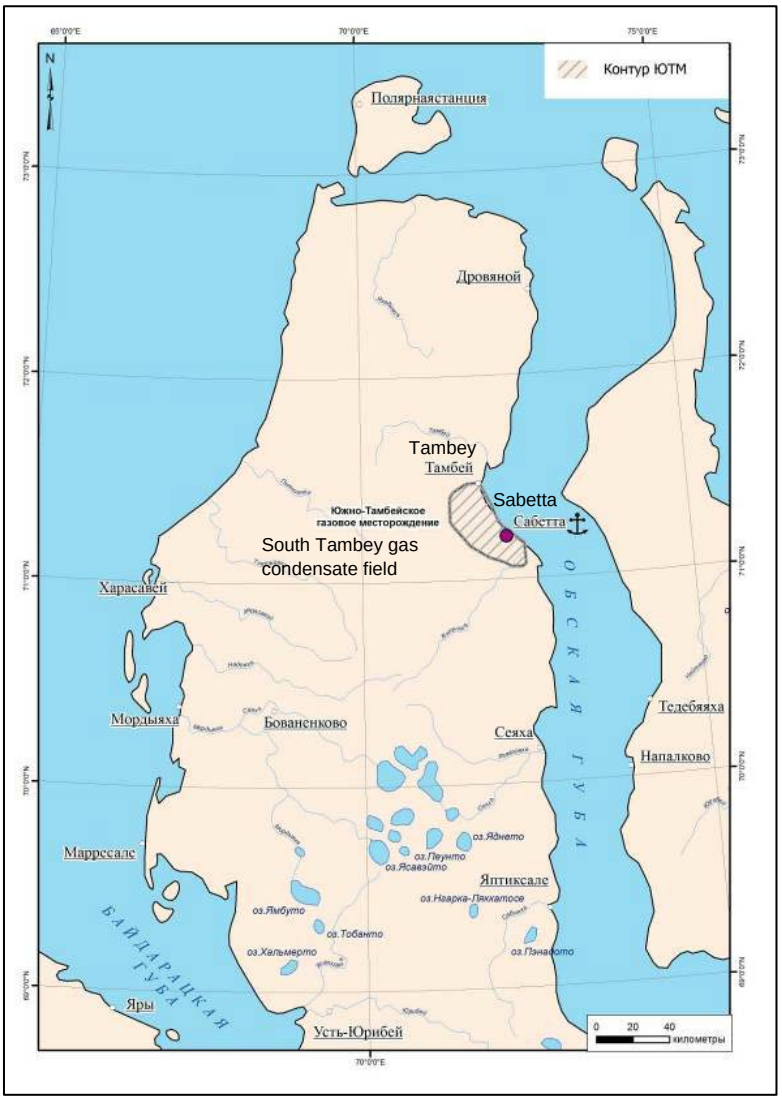
C3MR	Propane pre-cooled mixed refrigerant process
CGTP	Complex Gas Treatment Plant
CH_4	Methane
CO	Carbon monoxide
CO_2	Carbon dioxide
EBRD	European Bank for Reconstruction and Development
ECA	Export Credit Agency
EMS	Environmental Management System
ESAP	Environmental and Social Action Plan
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
GBS	Gravity Base Structure
GHG	Greenhouse Gases
IFC	International Finance Corporation
IPIECA	International Petroleum Industry Environment Association
LNG	Liquefied Natural Gas
MP	Management Plans
MPC	Maximum Permissible Concentration
NO_2	Nitrogen dioxide
NO_x	Oxides of nitrogen
NTS	Non-Technical Summary
OECD	Organisation for Economic Cooperation and Development
OVOS	“Оценка Воздействия на Окружающую Среду” (an Environmental Impact Assessment in the Russian regulatory practice/statutory permitting)
PM	Particulate Matter
RF	Russian Federation
SEP	Stakeholder Engagement Plan
SO_2	Sulphur dioxide
SPZ	Sanitary Protection Zone
VOC	Volatile Organic Compounds
YNAR	Yamal-Nenets Autonomous Region

1 INTRODUCTION

1.1 INTRODUCTION TO YAMAL LNG PROJECT

JSC Yamal LNG (the “Company” or Yamal LNG) is developing the Yamal LNG Project (the “Project”), which is an integrated upstream production and liquefied natural gas (“LNG”) plant development project located on the Yamal Peninsula in northern Russia. The Project will exploit the South Tambey Gas Condensate Field, which is situated in the north-eastern section of the Yamal Peninsula, some 540 km north-east of the regional centre of Salekhard city (see Figure 1.1).

Figure 1.1: Location of the Project



The production facilities and infrastructure required for the Project will comprise:

- Onshore gas production wells and associated pipelines and transport infrastructure to support well development and operation.

- Integrated gas treatment and liquefaction facilities, including an onshore LNG plant consisting of three trains with a production capacity 16.5 million tons per annum and facilities for production of one million tons per annum of condensate.
- Marine facilities in the port of Sabetta to ship LNG and condensate, and also to provide facilities for materials import and export.
- Workers accommodation camps for the construction and operation periods.
- An airport.

The Company owns the hydrocarbon production rights with respect to the Field and will operate as a project company for the purposes of implementing the Project, i.e. designing, developing, constructing, operating, managing and decommissioning the Project.

The Company comprises the following shareholder parties:

- JSC Novatek – Russia's major independent producer of natural gas that undertakes exploration, production, processing and marketing of gas and liquid hydrocarbons[1]; and
- Total Exploration & Production – a branch of Total involved in prospecting, exploratory drilling, and production of liquid and natural gas[2].

The Company is seeking to procure project financing for the Project and funding is expected to be raised from Export Credit Agencies ("ECAs"), commercial banks ("Banks"), capital markets (including bond underwriters and bond investors), and other prospective lending institutions (collectively, the "Lenders" or "Yamal LNG Lenders"). In line with this financing strategy, the Project is being developed in compliance with the following environmental and social requirements:

- Russian law, codes and standards.
- All applicable international laws and conventions to which the Russian Federation is a signatory and which have been ratified into law in the Russian Federation.
- Applicable international Lender requirements, including:
  - The Equator Principles (2006).
  - The Organisation for Economic Cooperation and Development (OECD) Common Approaches (2007).
  - The World Bank/IFC Environmental, Health and Safety Guidelines (April 2007) including the General EHS guidelines and applicable Industry Sector Guidelines.
  - The IFC Performance Standards (January 2012).
  - The EBRD Performance Requirements (2008).

The Project performance will therefore be assessed against the standards provided within the above national and international environmental and social requirements. Where applicable national regulations and/or international conventions differ from the levels and measures presented in the applicable Lender standards, the Yamal LNG Project will apply the most stringent standard except where there is a strong justification to deviate from the most stringent standard.

[1] http://www.novatek.ru/
[2] http://www.total.com/

1.2 INTRODUCTION TO THE SCOPING REPORT

This report represents the 'Scoping Report' for the Project and has been prepared as part of the Project's Environmental and Social Impact Assessment (ESIA) process. The ESIA, including this Scoping Report, is being developed in addition to the OVOS (environmental assessment) materials developed as part of the Russian Federation planning process, and is specifically developed to demonstrate compliance with international Lender requirements (as described above). In particular, the Scoping Report has been developed in line with good international industry practice including the EU guidance on scoping[3].

Scoping is the process of determining the content and extent of the matters that should be covered in the ESIA and associated documentation. It should be noted that the scoping report is not intended to provide detailed information regarding the Project. Instead it is a preliminary overview of the Project intended to form the basis for early engagement with relevant stakeholders and to help identify potential Project impacts. Further detail will be provided within a suite of additional documents that will be developed during the course of the full ESIA process.

This report is structured in a manner that addresses the scoping requirements as follows:

Chapter 2 describes the approach taken to the ESIA scoping process.

Chapter 3 outlines the approach to stakeholder engagement.

Chapter 4 provides a description of Project alternatives.

Chapter 5 includes a brief description of the Project.

Chapter 6 provides a description of the environmental and social baseline conditions of the Project area.

Chapter 7 describes the Project's potential environmental and social impacts and outlines the approach to assessment and mitigation of such impacts in the ESIA.

Chapter 8 outlines the work plan and timeframes for the entire ESIA process.

[3] http://ec.europa.eu/environment/eia/eia-guidelines/g-scoping-full-text.pdf

2 APPROACH TO PROJECT ESIA SCOPING

2.1 OVERVIEW

Scoping is the process of determining the content and extent of the matters that should be covered in the ESIA and associated documentation. The scoping process aims to identify the types of environmental and social impacts (both adverse and beneficial) to be investigated and reported in the ESIA, and to identify those aspects that are potentially of greatest significance.

The scoping process also covers:

- Project alternatives that have been considered.
- Baseline surveys and investigations that should be carried out to supplement those conducted for the OVOS process.
- Methods and criteria to be used for prediction and evaluation of effects.
- Mitigation measures which should be considered.
- Organisations to be consulted during the environmental studies.
- Definition of the boundaries of the Project assets, facilities, activities and Area of Influence that are to be considered in the ESIA.
- The structure and content of the ESIA.

2.2 IDENTIFICATION OF POTENTIAL IMPACTS

The primary methods for identification of potential environmental and social impacts are through:

- **Review of existing Project assessments and information.** In the case of the Yamal LNG Project, OVOS materials are being developed as part of the Russian planning approval process. These documents provide information on existing baseline data, impact assessments and mitigation measures. As such, the OVOS materials provide valuable input data to the development of the ESIA, including the scoping process. At the time of writing the Scoping Report, OVOS materials have been submitted to the Russian authorities for "Expertisa" review (this is a formal expert review under the Russian planning approval process) for the following proposed Project facilities/activities (see also Chapter 5 for a description of the facilities):
  - The complex for the production, processing, liquefaction, and export of liquefied natural gas and gas condensate (i.e. the LNG Plant and associated infrastructure facilities).
  - The worker camp facilities necessary for the development of the South Tambey Gas Condensate Field (including worker accommodation).
  - The early works seaport facilities near the Sabetta camp, including construction of shipping approach channel in the Obskaya estuary (i.e. for materials offloading during the construction period).
  - The drilling of gas production wells.
  - The airport 'Sabetta' (the OVOS for the airport is currently under revision following receipt of Expertisa conclusion comments).
  - The main seaport facilities (i.e. the facilities for export of LNG and condensate); the OVOS approval process for the main seaport facilities has not yet been completed,

although the final issue of OVOS materials for the main seaport facilities will be submitted by the beginning of 2013.

- **Stakeholder Engagement.** Yamal LNG has developed a Stakeholder Engagement Plan (SEP) for the Project in order to direct its engagement with relevant stakeholders, including potentially affected communities. A key objective of the engagement processes defined in the SEP is to identify stakeholder concerns and issues, and to ensure that these are appropriately and demonstrably addressed in the ESIA. The future engagement activities will build on the consultations already undertaken as part of the OVOS processes, and include routine engagement and a means to redress grievances. Further details on the stakeholder engagement process are provided in Section 3.
- '**Source-Pathway-Receptor' Analysis.** Identification of potentially significant environmental and social impacts is also undertaken through a structured consideration of the potential sources of impact, the pathways through which impacts may affect the environment and humans (e.g. transport of emissions/discharges through the environment) and the nature of receptors (e.g. humans, flora and fauna etc.) that may be impacted. In doing so, consideration is given to both:
  - The characteristics of the Project and associated activities that may impact on the environment and society (i.e. the 'sources' of impact). The sources of impact are identified systematically through consideration of:
    - Each of the different phases of the Project, namely Construction, Commissioning, Operations and Decommissioning.
    - The relevant different environmental and social aspects/topics.
  - The characteristics of the environmental and social baseline or other conditions that could be susceptible to significant adverse effects (the 'receptors' of impact).

In order to identify those aspects that may lead be to potentially significant impacts, consideration is given to:

1. Will there be a large change in environmental or socio-economic conditions?
2. Will new features/structures be out-of-scale with the existing environment?
3. Will the impact be unusual in the area or particularly complex?
4. Will the impact extend over a large area?
5. Will there be any potential for transboundary impact?
6. Will many people be impacted?
7. Will many receptors of other types (fauna and flora, businesses, facilities) be impacted?
8. Will valuable or scarce features or resources be impacted?
9. Is there a risk that applicable environmental standards will be breached?
10. Is there a risk that protected sites, areas, or features will be impacted?
11. Is there a high probability of the impact on environmental or socio-economic conditions occurring?
12. Will the impact continue for a long time?
13. Will the impact be permanent rather than temporary?
14. Will the impact be continuous rather than intermittent?

15. If it is intermittent will it be frequent rather than rare?
16. Will the impact be irreversible?
17. Will it be difficult to avoid, or reduce or repair or compensate for the impact?

The ESIA will use an impact assessment methodology that considers the above variables for each potential impact in turn taking likelihood and severity of impact into account. Where impacts are identified, mitigation measures will be developed based on the mitigation hierarchy, which comprises avoidance, minimisation, restoration and finally offset of impacts in that order of priority.

3 STAKEHOLDER ENGAGEMENT

3.1 BACKGROUND

Engagement with stakeholders is of key importance in ensuring that potential adverse impacts are identified and managed, and that benefits to the community stemming from the Project are enhanced. Initiating the engagement process in the early phase of the Project helps ensure timely public access to all relevant information and gives stakeholders an opportunity to input into the Project design, the identification and assessment of impacts and mitigation/enhancement measures. To best facilitate this process the Project has developed a Stakeholder Engagement Plan (SEP) which will be updated periodically throughout the life of the Project. The SEP describes:

- The identification of key stakeholders.
- The consultation activities that have been undertaken to date.
- Planned future stakeholder engagement processes through the Project lifecycle.

A brief summary of each of the above aspects is provided below.

3.2 IDENTIFICATION OF KEY STAKEHOLDERS

For the purposes of effective and tailored engagement, the following stakeholder categories have been identified:

- Affected Parties – persons, groups and other entities within the Project Area of Influence (see Chapter 5.9) that are directly affected (actually or potentially) by the Project and/or have been identified as most susceptible to change associated with the Project. They should be closely engaged in the identification of impacts and their significance, as well as in decision-making on mitigation and management measures;
- Other Interested Parties – individuals/groups/entities that may not experience direct impacts from the Project but who consider or perceive their interests as being affected by the Project and/or who could influence the Project and the process of its implementation in some way; and
- Vulnerable Groups – persons who may be disproportionately impacted or further disadvantaged by the Project relative to other groups due to their vulnerable status, and that may require special engagement efforts to ensure their equal representation in the consultation and decision-making process associated with the Project.

A comprehensive list of stakeholders at the local, regional, federal and international levels has been identified in the SEP.

3.3 CONSULTATION ACTIVITIES UNDERTAKEN TO DATE

To date, consultation in the form of statutory public hearings has been used as the primary method of involving the communities residing in the areas potentially impacted by the Project. The primary purpose of the public hearings has been to maintain regular and frequent dialogue with the communities, keep them informed about the Project developments, planned activities and the

associated potential impacts, and provide opportunities to give input during the development of mitigation measures.

The following main consultation activities have been undertaken by the Yamal LNG Project to date (see Section 6 and Figure 6.1 for the locations of the communities where the public hearings identified below were held):

- Public hearing to accompany the release of the Declaration of Intent for the Yamal LNG Project "Production of liquefied natural gas from the South Tambey Gas Condensate Field in the Yamal Peninsula", held in the settlement of Yar-Sale on 27 May 2010;
- Public hearing on the design documents for construction of seaport facilities in Sabetta village on the Yamal peninsula, including on the design of a shipping approach channel in the Obskaya estuary (early works facilities), including OVOS, held in the settlement of Seyakha on 06 December 2011;
- Public hearing on the OVOS materials for the worker camp facilities necessary for the development of the South Tambey Gas Condensate Field, held in the settlement of Seyakha on 19 December 2011;
- Public hearing on the OVOS materials for drilling of production wells (3,550m and 4,350m depth) at the South Tambey Gas Condensate Field, held in the settlement of Seyakha on 20 March 2012;
- Public hearing on the design documentation for construction of the Complex for production, processing, liquefaction, and export of liquefied natural gas and gas condensate from the South Tambey Gas Condensate Field, including "The list of environmental protection measures" section, and including the OVOS, held in the settlement of Seyakha on 13 August 2012;
- Public hearing on the work programme for dredging tests in the northern section of the Obskaya estuary, including "The list of environmental protection measures" section, and including the OVOS, held in the settlement of Seyakha on 13 August 2012;
- Public hearing on the work programme for dredging tests in the northern section of the Obskaya estuary, including "The list of environmental protection measures" section, and including the OVOS, held in the settlement of Tazovskiy on 16 August 2012;
- Public hearing on the design documents for construction of seaport facilities in Sabetta village on the Yamal peninsula, including on the design of a shipping approach channel in the Obskaya estuary (early works facilities and main seaport facilities), and including the OVOS, held in the settlement of Seyakha on 11 December 2012;
- Public hearing on the design documents for construction of seaport facilities in Sabetta village on the Yamal peninsula, including on the design of a shipping approach channel in the Obskaya estuary (early works facilities and main seaport facilities), and including the OVOS, held in the settlement of Tazovskiy on 13 December 2012.

A summary of the key concerns and suggestions raised by participants during these consultations is provided in Table 3.1 below. Further details are provided in the SEP.

Table 3.1: Summary of Key Concerns and Suggestions Raised in Previous Stakeholder Engagement Activities	
Nature and dates/ location of engagement	**Key concerns and suggestions raised**
Public hearing on Declaration of Intent for the Yamal LNG Project Yar-Sale settlement, District Centre for Culture and Arts, 27 May 2010	Land take and associated impacts on traditional land use, including on reindeer grazing areas. Potential impacts on subsistence fishing. Effects of linear infrastructure (pipelines, access roads) on traditional migration routes of local reindeer herders. Availability of reindeer crossings on the linear infrastructure facilities. Potential impacts of contractor activities on areas in traditional use by reindeer herders. Availability of job opportunities and professional training for the local indigenous population, particularly for the youth. Use of local construction materials. Code of conduct for Project personnel, including prohibition of the use of firearms and dogs. Environmental monitoring of the development. Bilateral Cooperation Agreement between the Project and local administration. Support and assistance to the local indigenous population (fuel and food supply, availability of flights to Seyakha settlement). Compensation schemes for affected population.
Public hearing on the OVOS for early works seaport facilities in Sabetta village, including shipping approach channel in the Obskaya estuary Seyakha settlement, Village centre of culture 06 December 2011 (Note: some associated facilities to the Project were discussed during the event)	Availability of job opportunities and training for the local indigenous population, particularly for the youth. Preferential recruitment of local population. Regular reporting on the activities being undertaken. Rehabilitation of disturbed lands. Organisation of a fish hatchery for sturgeon and muksun in the Novy Port area. Observance of all environmental safeguards during construction and further implementation of works. Include within the scope of seaport works dredging of the local rivers to allow the receipt of dry cargo vessels, specifically at the request of local herders. Develop response measures in case of emergencies in the open sea area. Future prospects of gas supply to the local indigenous settlements.

Table 3.1: Summary of Key Concerns and Suggestions Raised in Previous Stakeholder Engagement Activities	
Nature and dates/ location of engagement	**Key concerns and suggestions raised**
	Disposal of wastes. Compensation for damage to marine resources, particularly fish.
Public hearing on the OVOS for the for the worker camp facilities necessary for the development of the South Tambey Gas Condensate Field Seyakha settlement Village centre of culture 19 December 2011	Cleaning of the Project area from wastes left by the previous contractor. Rehabilitation of disturbed lands. Temporary access roads required during construction and their associated impact on agricultural lands. The use of existing winter roads and passages, as well as the responsibility for their maintenance. Maintenance and repair of the summer road/passage. Future prospects of gas supply to the local indigenous settlements. Availability of job opportunities and professional training for the local indigenous population, particularly for the youth. Preferential recruitment of local population. Regulation/restriction of alcohol sales in Sabetta village. Assistance to local indigenous population with fuel supply and diesel generator, as well as with transportation to remote areas of reindeer herding and availability of helicopters for local residents' needs (to facilitate access to medical and educational facilities). Reindeer crossings on the linear infrastructure facilities (transport routes and pipelines). Carrying out environmental monitoring with participation of stakeholders. Compensation for any damages sustained. Housing programme for the local population.
Public hearings on the OVOS for drilling of production wells (3,550m and 4,350m depth) at the South Tambey Gas Condensate Field Seyakha settlement	Environmental and safety precautions during implementation of the Project. Potential impacts on fish as a result of drilling. Taking into account interests of the local indigenous population, including gathering up-to-date information about sacred worship and burial sites. Compensation for any damages sustained.

Table 3.1: Summary of Key Concerns and Suggestions Raised in Previous Stakeholder Engagement Activities	
Nature and dates/ location of engagement	**Key concerns and suggestions raised**
Village centre of culture 20 March 2012	Opportunities for socio-economic development, including for herders. Reindeer crossings on the linear infrastructure facilities. Rehabilitation of disturbed lands after the completion of the works. Future prospects of gas supply to the local indigenous settlements. Refrain from using pits for drilling waste and using alternative solutions for disposal, e.g. capsulation of drilling waste.
Public hearing on the work programme and OVOS for test dredging in the northern section of the Obskaya estuary Seyakha settlement Village centre of culture 13 August 2012 (Note: some associated facilities to the Project were discussed during the event)	Provision for mitigation measures to reduce environmental risks of the Project. Land use: to take into account and avoid negative influence on reindeer crossings and migration areas. Ways of compensation for impacts on fish stock (penalties, juvenile fishes release, etc.) Potential interaction with local indigenous population (compensation, development, education, etc.) Noise levels during spring-summer periods and suggested measures to avoid noise impacts on fawning, bird arrival, spawning season. Plans for village development, youth education, labour opportunities.
Public hearing on the OVOS for construction of the Complex for production, processing, liquefaction, and export of liquefied natural gas and gas condensate from the South Tambey Gas Condensate Field Seyakha settlement Village centre of culture 13 August 2012	

Table 3.1: Summary of Key Concerns and Suggestions Raised in Previous Stakeholder Engagement Activities	
Nature and dates/ location of engagement	**Key concerns and suggestions raised**
Public hearing on the work programme for dredging tests in the northern section of the Obskaya estuary, including "The list of environmental protection measures" section, including OVOS Tazovskiy settlement centre of culture and leisure 16 August 2012 (Note: some associated facilities to the Project were discussed during the event)	Job opportunities Fuel and lubricant spill prevention Environmental friendliness Support and assistance to the local indigenous population Prohibition on alcohol sales and carriage
Public hearing on the design documents for construction of seaport facilities in Sabetta village on the Yamal peninsula, including on the design of a shipping approach channel in the Obskaya estuary (early works facilities and main seaport facilities), including OVOS **Seyakha settlement** Village centre of culture 11 December 2012 (Note: some associated facilities to the	Ichthyofauna and fish resources preservation for the local indigenous communities use Indigenous nomadic and semi-nomadic people health Observance of all environmental safeguards during construction and further implementation of works. Compensation for damage to marine resources, particularly fish

Table 3.1: Summary of Key Concerns and Suggestions Raised in Previous Stakeholder Engagement Activities	
Nature and dates/ location of engagement	**Key concerns and suggestions raised**
Project were discussed during the event)	
Public hearing on the design documents for construction of seaport facilities in Sabetta village on the Yamal peninsula, including on the design of a shipping approach channel in the Obskaya estuary (early works facilities and main seaport facilities), including OVOS Tazovskiy settlement centre of traditional culture 13 December 2012 (Note: some associated facilities to the Project were discussed during the event)	Prohibition to carry out any kind of hunting or fishing activities within the seaport boundaries and surrounding areas as well as prohibition on firearms and fishing gears possession Fuel and lubricant spill prevention within the water body of Obskaya estuary The conduct of operations only within the strictly limited appropriate/agreed areas Continuous monitoring of ichthyofauna of Obskaya estuary conditions with the involvement of the members of public and non-governmental organisations of the Yamal region Compliance with environmental legislation requirements Cargo delivery by sea for the construction of socially significant facilities in Tazovskiy district The construction of fuel stations at village settlements in the Tazovskiy district for the needs of indigenous communities Employment and medical assistance for the population of the district

3.4 CURRENT AND FUTURE ENGAGEMENT ACTIVITIES

Future and ongoing stakeholder engagement activities will include the disclosure process associated with the release of the Project ESIA. This will comprise:

- Disclosure of the SEP and Scoping Report. The SEP and this Scoping Report are to be placed in the public domain. Consultation meetings will be held in Project affected communities and with other stakeholders in which the contents of the SEP and Scoping Report will be presented for discussion, thereby helping to ensure that stakeholders' views are taken into account in the development of the ESIA.
- Disclosure of the ESIA package. The ESIA materials (including a Non-Technical Summary (NTS), a final draft of the main Environmental and Social Impact Assessment report, Environmental & Social Action Plan (ESAP) and Environmental & Social Management Plans (ESMP)) will be placed in public domain. Disclosure of the ESIA package of materials will involve:
  - An anticipated 60 day disclosure period (the precise duration of the required disclosure period will depend on this specific requirements of individual Lenders); and
  - Public consultation meetings within the disclosure period. Meetings will be held with Project affected communities and with other stakeholders to present and discuss findings of the ESIA and measures proposed in the ESAP and ESMP.

Following the end of the disclosure period and receipt of all comments, the ESIA materials will be revised and the finalised ESIA materials disclosed.

In addition to the disclosure of the ESIA and the SEP, the Project will continue to regularly engage with its stakeholders throughout the Project lifespan. A summary of the future stakeholder engagement and disclosure methods is provided in Table 3.2 below.

Table 3.2: Stakeholder Engagement and Disclosure Methods

Stakeholder Group	Project Information Shared	Means of communication/ disclosure
Local population in the Project Area of Influence	SEP and Scoping Report ESIA package (ESIA, ESAP, ESMP), Non-Technical Summary of the ESIA, and Stakeholder Engagement Plan; Public Grievance Procedure[4]; Regular updates on Project development.	Public notices. Electronic publications and press releases on the Yamal LNG Project web-site. Dissemination of hard copies at designated public locations. Press releases in the local media. Consultation meetings. Information leaflets and brochures. Separate focus group meetings with vulnerable groups, as appropriate.

[4] See the SEP for a description of the Project's Public Grievance Procedure.

Table 3.2: Stakeholder Engagement and Disclosure Methods		
Stakeholder Group	**Project Information Shared**	**Means of communication/ disclosure**
Non-governmental and community based organisations	SEP and Scoping Report International ESIA package (ESIA, ESAP, ESMP), Non-Technical Summary, and Stakeholder Engagement Plan; Public Grievance Procedure; Regular updates on Project development.	Public notices. Electronic publications and press releases on the Yamal LNG Project web-site. Dissemination of hard copies at designated public locations. Press releases in the local media. Consultation meetings. Information leaflets and brochures.
Government authorities and agencies	SEP and Scoping Report ESIA package (ESIA, ESAP, ESMP), Non-Technical Summary, and Stakeholder Engagement Plan; Regular updates on Project development; Additional types of Project's information if required for the purposes permitting and statutory reporting.	Dissemination of hard copies of the Scoping Report and SEP at municipal administrations. Dissemination of hard copies of the ESIA package, NTS and SEP at municipal (district and village) administrations. Project status reports. Meetings and round tables.
Related businesses and enterprises	Non-Technical Summary and Stakeholder Engagement Plan; Public Grievance Procedure; Updates on Project development and tender/procurement announcements.	Electronic publications and press releases on the Yamal LNG Project web-site. Information leaflets and brochures. Procurement notifications.
Project Employees	Employee Grievance Procedure; Updates on Project development.	Staff handbook. Email updates covering the Project staff and personnel. Regular meetings with the staff. Posts on information boards in the offices and on site. Reports, leaflets.

The SEP will remain in the public domain for the entire period of Project life and will be updated on a regular basis as the Project progresses through its various phases in order to ensure timely identification of any new stakeholders and interested parties, and their involvement in the process of collaboration with the Project. The methods of engagement will also be revised periodically to maintain their effectiveness and relevance to the Project's evolving status.

3.5 COOPERATION AND ASSISTANCE PROGRAMME

In addition to the engagement activities carried out as part of the statutory public review process and those planned for in accordance with international Lenders' requirements, the Yamal LNG

Project has launched the Cooperation and Assistance Programme for Indigenous Population of the Yamal District. This initiative has been endorsed by the District's Municipal Administration and by the Public Association for Indigenous Minorities of the North "Yamal", and will also be based on the Project's collaboration with the local public associations representing the interests of Indigenous People. Further details on the Programme are provided in the SEP.

4 PROJECT ALTERNATIVES

4.1 BACKGROUND

The basis for the development of the hydrocarbon fields of the Yamal Peninsula was set out in the "Program of Comprehensive Development of the Yamal Peninsula and the Adjacent Water Areas", which was drawn up by OJSC "Gazprom" and the Administration of the Yamal-Nenets Autonomous Okrug in 2007. The program established three industrial areas, each of which is associated with a group of oil and/or gas fields:

- the Bovanenkovo industrial area;
- the Tambey industrial area; and
- the Southern industrial area.

The Tambey industrial area comprises six fields, including the South Tambey Gas Condensate Field. The different development options considered for this field are described in this section.

4.2 THE 'NO PROJECT' ALTERNATIVE

The 'no project' alternative considers the outcomes should the Project not go ahead. In this case, not developing the Project would mean that the large reserves of the South Tambey Gas Condensate Field (see Section 5 for full details) would remain unexploited. This would result in:

- The loss of a resource development project of both national economic importance and international energy resource importance.
- Failure to capitalize on previous well development in the field that has resulted in up to 80% of the reserves having already been explored and being ready for commercial production. This may lead to increased pressure to capitalize on other, less well developed, fields either in the Yamal region or elsewhere in the Russian Federation.
- Failure to meet the requirements of the Resolution of the Russian Federation's Government # 1713-R "On the Comprehensive Plan of Development of LNG Production in the Yamal Peninsula" dated October 11, 2010.
- The loss of regional development and inward investment opportunities associated with the Project in the Yamal region.

In addition, as part of the development Project, disused facilities on the site and contamination associated with previous oil and gas exploration and production activities (by previous operators) in the field will be removed and reinstated respectively by Yamal LNG. Without this Project it is uncertain whether such remediation works would be undertaken.

The 'no project' option would avoid the potential adverse environmental and social impacts identified in Section 7 of this scoping report. However, the economic, social and environmental benefits of the Project associated with the aspects identified above, coupled with the international demand for gas, are compelling.

4.3 PRELIMINARY OPTION DEVELOPMENT AND SCREENING

Following a decision to proceed with the Project, the identification of preliminary high-level development options for the Project included consideration of:

1. Methods for the export of gas reserves, and in particular either:
   a) Gas pipeline transport of natural gas to end users
   b) Export as LNG via carriers.

2. For LNG export, the following sub-options were considered:
   a) Geographic location of LNG facilities either in:
      i. the Yamal peninsula
      ii. remote locations nearer to ice-free conditions.

   b) Development of LNG facilities as either:
      i. Offshore facilities
      ii. Near-shore coastal facilities on barges
      iii. Onshore facilities.

   c) LNG export by either:
      i. Loading jetty
      ii. Offshore single point mooring.

Each of these high-level options is discussed below.

4.3.1 GAS PIPELINES VERSUS LNG

The option of delivering natural gas from the South Tambey Gas Condensate Field to international consumers via the construction of gas pipelines was subject to economic and technical appraisal, which included consideration of existing and forecast demand for natural gas in key markets (Asia-Pacific, USA, Europe and other regions). A summary of the environmental as well as technical, economic and logistical advantages and disadvantages of the gas pipeline and LNG options is provided in Table 4.1 below.

Table 4.1: Summary of Comparison of Export Options

Aspect		Gas Pipeline	LNG
Environmental	Advantages	• Typically lower overall GHG emissions than LNG	• Relatively limited physical footprint
	Disadvantages	• Very extensive physical footprint including linear developments (pipelines & compressor stations) with associated environmental and social impacts	• Need for port development & dredging

Aspect		Gas Pipeline	LNG
Technical, economic & logistical	Advantages	• Running costs	• Greater access to all global markets
	Disadvantages	• Limited access to some global markets • Longer construction period • Maintenance of extensive pipeline system	• Shipping in ice conditions

The absence of access to existing pipeline networks for the delivery of gas to the identified markets, and the extremely long distances required for new pipeline networks, rendered this option uneconomical and technically/logistically challenging. In addition, the development of pipelines over such extensive distances would lead to a range of potential environmental and social impacts.

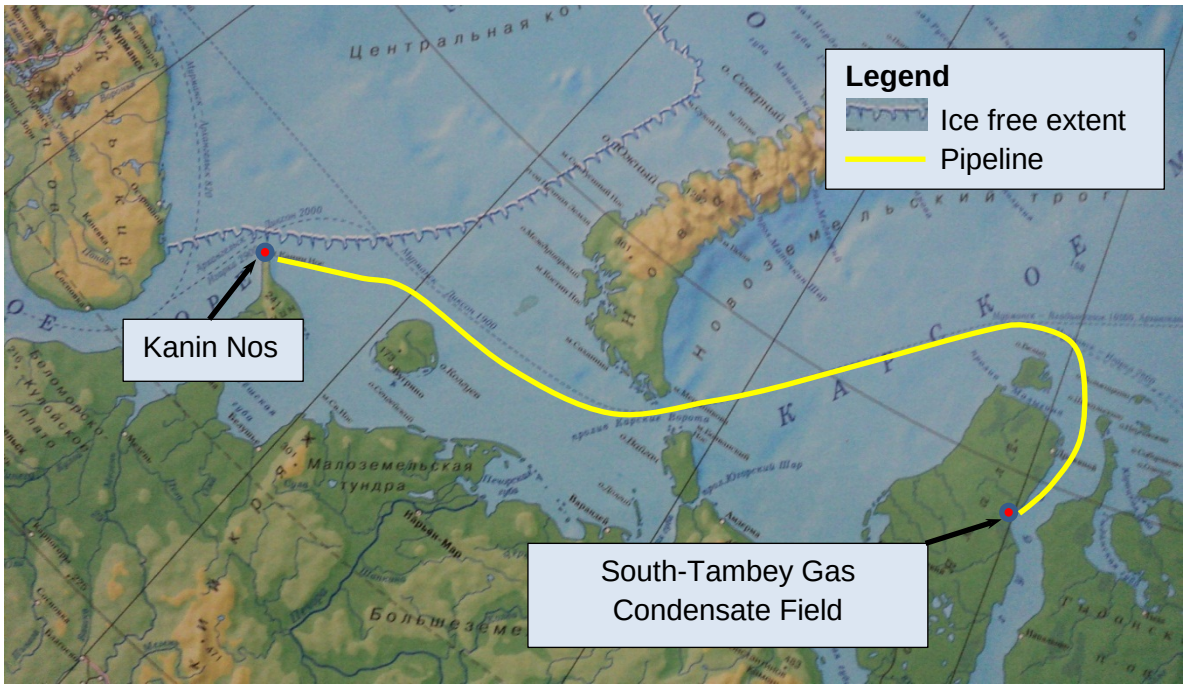
The economic and technical review revealed that the development of an LNG production facility was both economically viable and technically feasible. It was therefore decided to further explore LNG development options for the Project.

4.3.2 LNG DEVELOPMENT OPTIONS

Remote (from Yamal) locations versus Yamal Peninsula

The sea around the Yamal peninsula is ice bound for 7-8 months per year. The potential for transporting gas from the South Tambey Gas Condensate Field by pipeline to a remote LNG plant located near to year-round ice-free seas was therefore considered. Based on review of the extent of year-round ice-free conditions, a potential remote location for the LNG plant west of Yamal was identified in the north of the Kanin Nos peninsula off the Barents Sea (see Figure 4.1). There are no potential year-round ice-free ports east of Yamal.

Figure 4.1 Ice Free Sea Extent in the Region



A potential LNG plant at Kanin Nos would be linked to the South Tambey Gas Condensate Field via an offshore gas pipeline (sample route shown on Figure 4.1).

However, this option has a number of significant disadvantages:

- The option to readily export LNG eastward is removed (without very extensive shipping distances).
- Major infrastructure will be require at both Kanin Nos (the LNG plant) and in Yamal (a major compressor station to transport the gas to the LNG plant), resulting in significant land take in two separate locations.
- The required offshore gas pipeline between the field in Yamal and the LNG plant in Kanin Nos would be approximately 975km in length. This would result in:
  - Potential severe environmental impacts over an extensive marine area (including during construction).
  - Significant impact on construction costs and time schedules.

Overall, it was concluded that construction of a remote LNG plant on the Kanin Nos peninsula was not a preferable option in terms of cost, schedule or environment considerations.

Offshore versus onshore LNG facilities

The conceptual design for LNG production, including both the required pre-processing in a complex gas treatment plant (CGTP) and the LNG process itself, has considered the following placement alternatives, which were subject to technical and engineering review:

- Offshore placement away from the shore utilizing either:
  - a concrete gravity base structure (GBS); or

  - an artificial island.
- Near-shore placement in the coastal area, utilizing concrete or steel barges.
- Onshore placement of facilities, utilizing either:
  - modular component assembly on piles (where modular/pre-fabricated units are constructed offsite and then transported to site); or
  - 'stick build' construction methods (i.e. construction and fabrication onsite).
- For the CGTP facilities, offshore and near-shore options were dismissed on the basis of:
  - Offshore – excessive cost with limited identified benefits.
  - Near-shore – complex barge structures would be required, and construction would require large volumes of excavation and backfill as well as extensive piling.

Therefore, an onshore location for the CGTP was assessed to be the preferred option.

For the LNG facilities a summary of advantages and disadvantages of the different options is summarized below in Table 4.2.

Table 4.2: Comparison of Onshore, near-shore and offshore LNG

Option	Advantages	Disadvantages
Onshore – stick build	• No large module transport	• Large camp site required • Large labour requirements • Climate impacts on construction • Schedule risks • Difficult ground works • (un-)controlled environment
Onshore – modular build	• Installation time • No ice load • No settlement issues • Allow multiple yards (fabrication areas) • Schedule • Easy start-up • Logistics • Proven technology and engineering solution	• LNG tanks stick built • Large module transport • Offloading jetty and associated channel dredging required (unless offshore mooring – see below)

Option	Advantages	Disadvantages
Offshore - GBS	• In field installation time • Commissioning in yard • Low labour requirements • Controlled environment	• Ice load problems • Settlement • Cost(significant higher CAPEX compared to onshore options) • Multiple platforms required with significant footprint • Extended overall schedule • Reduce expansion flexibility • Offshore pipeline required (including trenching requirements) • Size of required facilities would be novel/unproven
Offshore – artificial island	• Reduced ice-load problem	• Piling requirements • Long installation time • Materials availability • Offshore pipeline required (including trenching requirements) • Significant offshore footprint
Near-shore	• Installation time • No ice load • No settlement issues • Easy start-up	• Complex barge requirements • Large excavation and backfill required • Trestle/bridge or dredging to offloading jetty • Large transit barges • Number and size of piles • Cutting of shore line (coastal processes) • Channel dredging required (unless offshore mooring – see below)

Based on the feasibility studies undertaken, onshore modular build construction of the LNG Plant was determined to be the most technically viable solution.

Export loading via jetty versus offshore mooring

The following options for LNG loading were considered for an onshore LNG production facility:

- Loading jetty.
- Offshore single point mooring.

A summary comparison of the two options is provided below in Table 4.3.

Table 4.3: Comparison of LNG loading options

	Jetty	Offshore mooring
Advantages	• Short distance for LNG pipeline from LNG plant to loading point • Provide structures for loading/unloading facilities for other materials	• Reduced need for dredging of shipping channel • Limited footprint
Disadvantages	• Need for shipping channel dredging • Physical footprint in coastal region	• Technical complexities for extended cryogenic LNG pipeline from LNG plant to loading point • Impracticability in ice condition

Following detailed review, the option of a jetty development was selected as the preferred option. The principal difficulties with the offshore mooring point option relate to the technical issues with the length of the required cryogenic LNG pipeline to the mooring and technical impracticalities of operating an offshore mooring loading facility in ice conditions.

4.4 DETAILED OPTION APPRAISAL

4.4.1 OVERVIEW OF LOCATION ALTERNATIVES

Three possible onshore CGTP/LNG development location options in the Yamal peninsula region were developed for further appraisal. Each of these is summarized below, and an overall location plan is given in Figure 4.5.

Option 1 (Kharasavey cape)

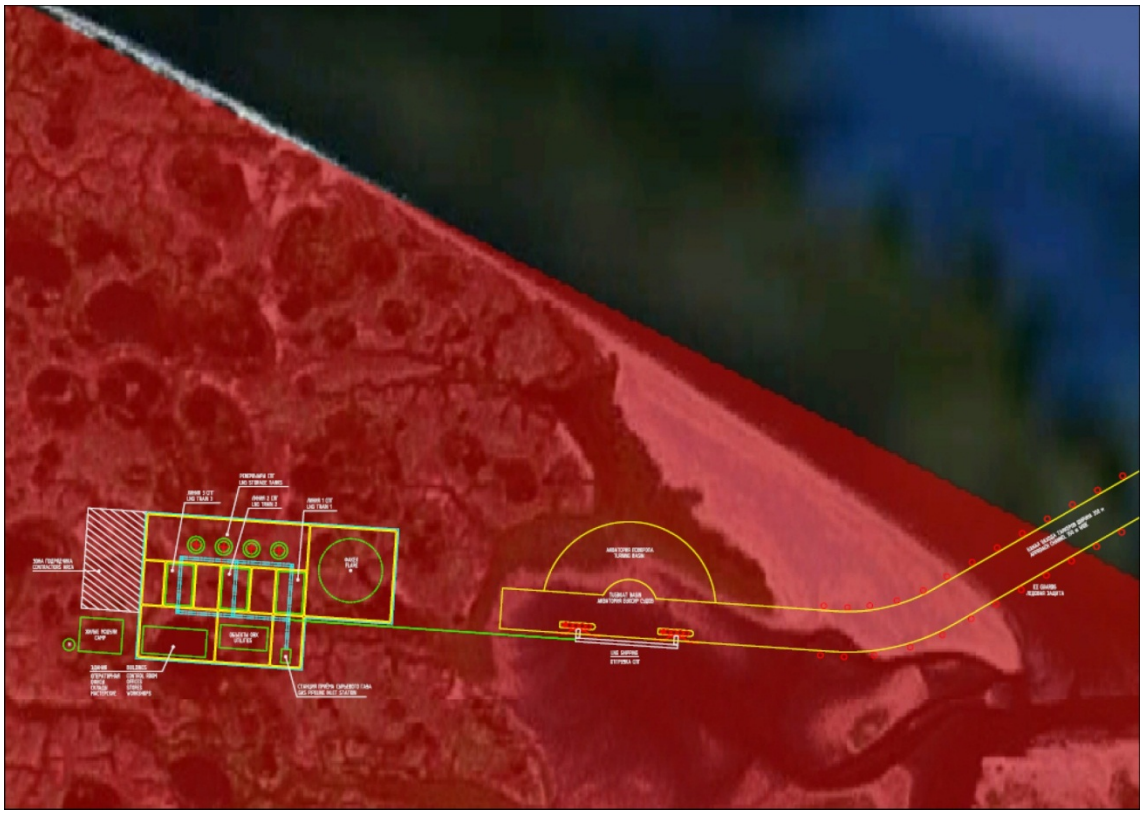
The LNG Plant located on an area in the western shore of the Yamal Peninsula near the Kharasavey cape. Gas from the South Tambey Gas Condensate Field is gathered in a pipeline network and pre-processed at a CGTP in the field area and then transported westward to the LNG Plant via an approximately 170km long gas pipeline. For layout of the LNG Plant and jetty see Figure 4.2.

Figure 4.2: Layout of Option 1 at Kharasavey Cape

Option 2 (Drovyanoy cape)

LNG Plant located on an area in the north-eastern shore of the Yamal Peninsula near the Drovyanoy cape. Gas from the South Tambey Gas Condensate Field is gathered in a pipeline network and pre-processed at a CGTP in the field area and then transported northward to the LNG Plant via an approximately 195km long gas pipeline. For layout of the LNG Plant and jetty see Figure 4.3.

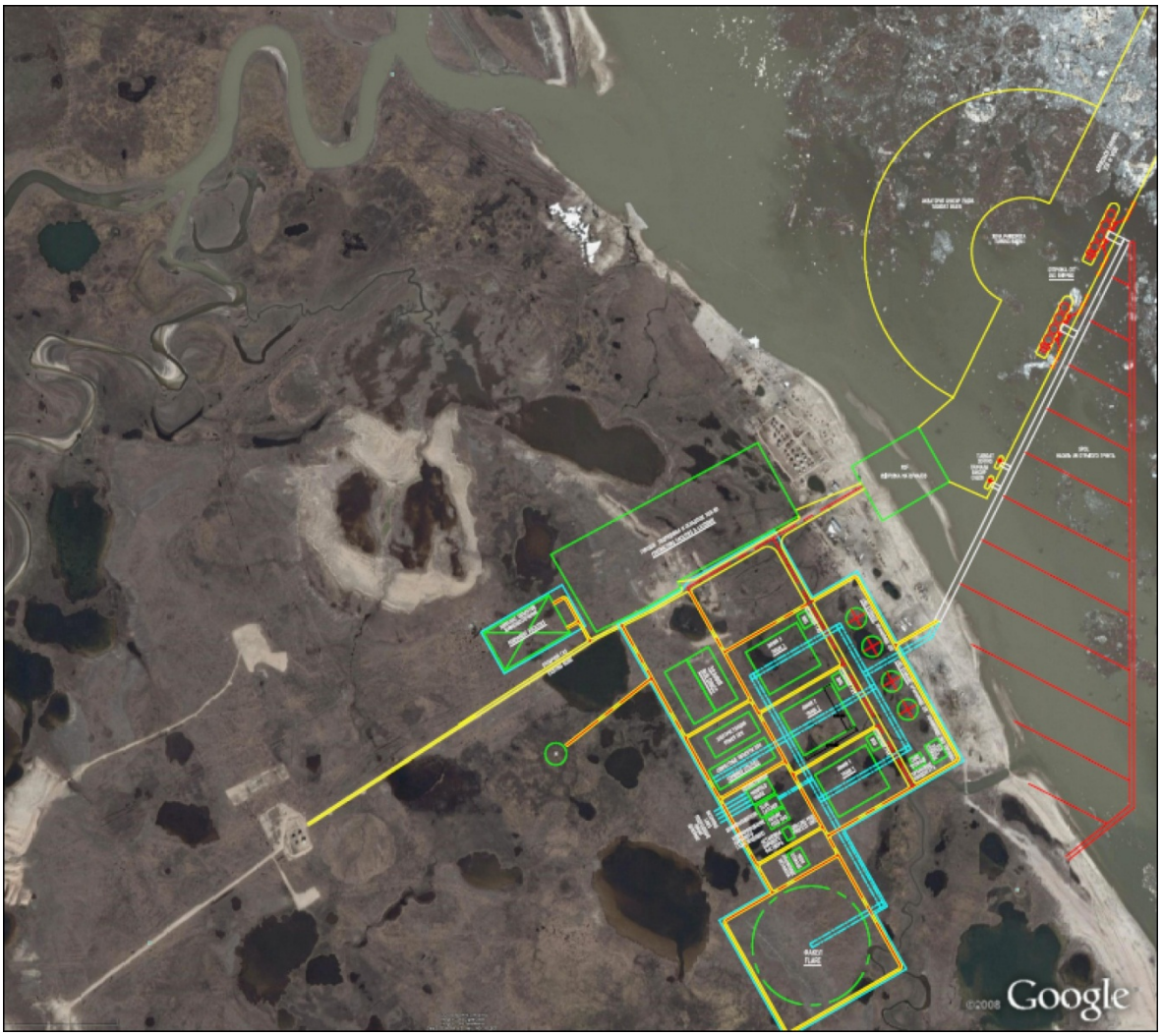
Figure 4.3: Layout of Option 2 at Drovyanoy Cape



Option 3 (Sabetta)

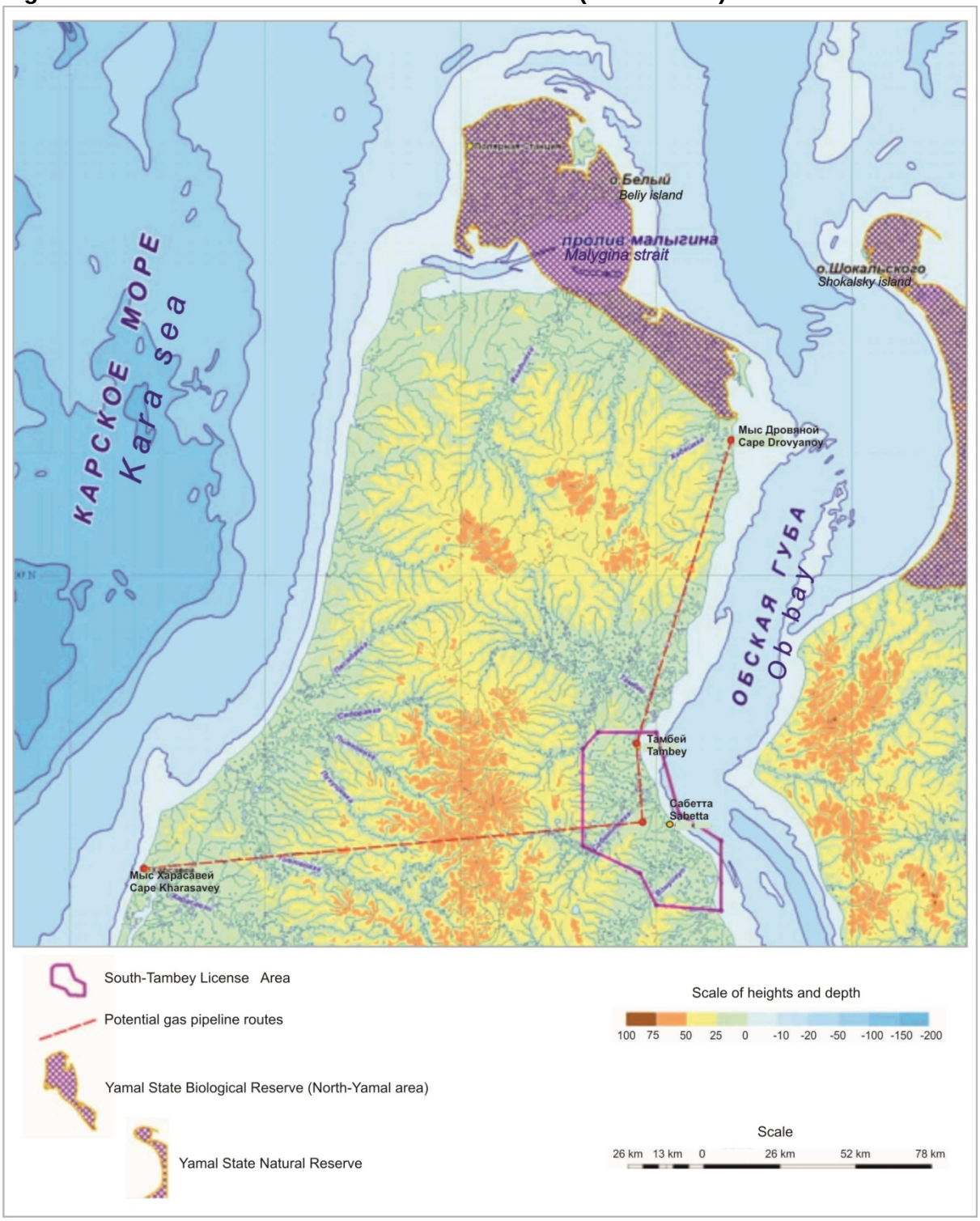
Combined CGTP/LNG located in an area on the eastern shore of the Yamal Peninsula near Sabetta, in the near vicinity of the South Tambey Gas Condensate Field. Gas is gathered in a pipeline network within the field area. For layout see Figure 4.4.

Figure 4.4 Layout of Option 3 at Sabetta



The locations for each of these options are shown on Figure 4.5 below.

Figure 4.5 Site Alternatives on Yamal Peninsula (not to scale)



4.4.2 APPROACH AND CRITERIA

Each of the three location options is assessed in terms of their environmental, technical, logistical and cost performance. The environmental appraisal of each option is first described in Section 4.4.3, and then the overall option appraisal against all parameters is summarized in Section 4.4.4.

4.4.3 ENVIRONMENTAL OPTION APPRAISAL

The following environmental factors were considered in the assessment of the three LNG location alternatives within the Yamal peninsula:

- Atmospheric emissions.
- Seawater environment.
- Onshore surface waters.
- Landscape and soil cover.
- Flora.
- Hydrocoles and Ichthyofauna (aquatic organisms).
- Fauna (especially birds and mammals).
- Shore line vulnerability to oil pollution.
- Integral environmental vulnerability of adjacent marine areas.

In addition, consideration was also given to:

- The presence of specially protected environmental zones.
- The availability/presence of existing infrastructure.

The comparison of the three location alternatives against each of the above aspects is provided in turn below, and a summary assessment is provided in Table 4.4.

- **Atmospheric emissions**

  Options 1 and 2 would require gas from the South Tambey Gas Condensate Field to be transported by pipeline to the proposed LNG facilities/shipping ports at Kharasavey Cape and the Drovyanoy Cape respectively. In order to transport the gas over these distances (170km and 195km respectively), an associated compressor station would be required in the South Tambey Gas Condensate Field. Such a compressor station would not be required for Option 3. Therefore Options 1 and 2 would lead to greater levels of atmospheric emissions during operation than Option 3.

- **Seawater environment**

  An important criterion in terms of potential impacts on the marine environment is the level of dredging required to enable shipping to reach the seaport. This in turn depends on the seawater depth on the approach to the three port location options. The length of the shortest distance from shore to the 10m bottom contour has therefore been assessed for the three options as follows:

  - Option 1 Kharasavey cape - 5.2 km
  - Option 2 Drovyanoy cape - 19 km
  - Option 3 Sabetta - 3.5 km.

  Therefore, Option 3 would require the least dredging.

- **Onshore surface waters**

  Pipelines and other required linear structures may impact negatively on surface waters that they cross, especially during construction. These include negative impacts on hydrology and water quality at the crossing location, and the drainage or waterlogging of adjacent areas if

surface flow conditions are altered. Such impacts can be mitigated by the use of appropriate construction methods (e.g. aerial spans for pipelines and bridges for roads), but nonetheless residual impacts and risks are likely to remain. The pipeline transport systems required for Options 1 and 2 mean that these options would require the following number of additional surface water crossings compared to Option 3:

- Option 1 Kharasavey cape - 30 crossings
- Option 2 Drovyanoy cape - 52 crossings.

Option 3 would require only a limited number of surface water crossings (relative to the other options) in the South Tambey Gas Condensate Field for the gas gathering pipeline network and associated road infrastructure for the well developments. The lowest risk of negative impact from surface water crossings is therefore provided by Option 3.

- **Ecosystems**

  The sensitivity of the natural ecosystems potentially affected by each of the three options was also used as an evaluation criterion. The pipeline route to the Kharasavey cape crosses approximately 55km of vulnerable natural complexes that would be restorable over a period of more than 14 years. The pipeline to the Drovyanoy cape would cross approximately 23km of similarly vulnerable areas. By comparison, the establishment of an LNG Production Facility and shipping port near Sabetta would not require the construction of a trunk pipeline and hence Option 3 has a lesser effect on vulnerable habitat.

- **Flora**

  The vulnerability of plant associations potentially affected by the three options was used as an evaluation criterion. In Option 1, 148.3 km of the pipeline to the Kharasavey cape crosses highly unstable plants associations. The pipeline to the Drovyanoy cape (Option 2) includes 91.7 km of similar areas. Establishing an LNG Production Facility and shipping port near Sabetta does not require the construction of a trunk pipeline and hence Option 3 has a lesser effect on plant cover.

- **Hydrocoles and Ichthyofauna (aquatic organisms)**

  The presence of sensitive fish habitats and species, and more especially species included in the Red Book of the Russian Federation, in the waters near the LNG shipping terminals locations was used as an evaluation criterion. The most significant species in the region is the Siberian sturgeon, which is designated as ‘threatened’. The Siberian sturgeon is known to be found near the Drovyanoy cape (Option 2) and Sabetta (Option 3), but not near Kharasavey (Option 1).

- **Terrestrial Fauna and Marine Mammals**

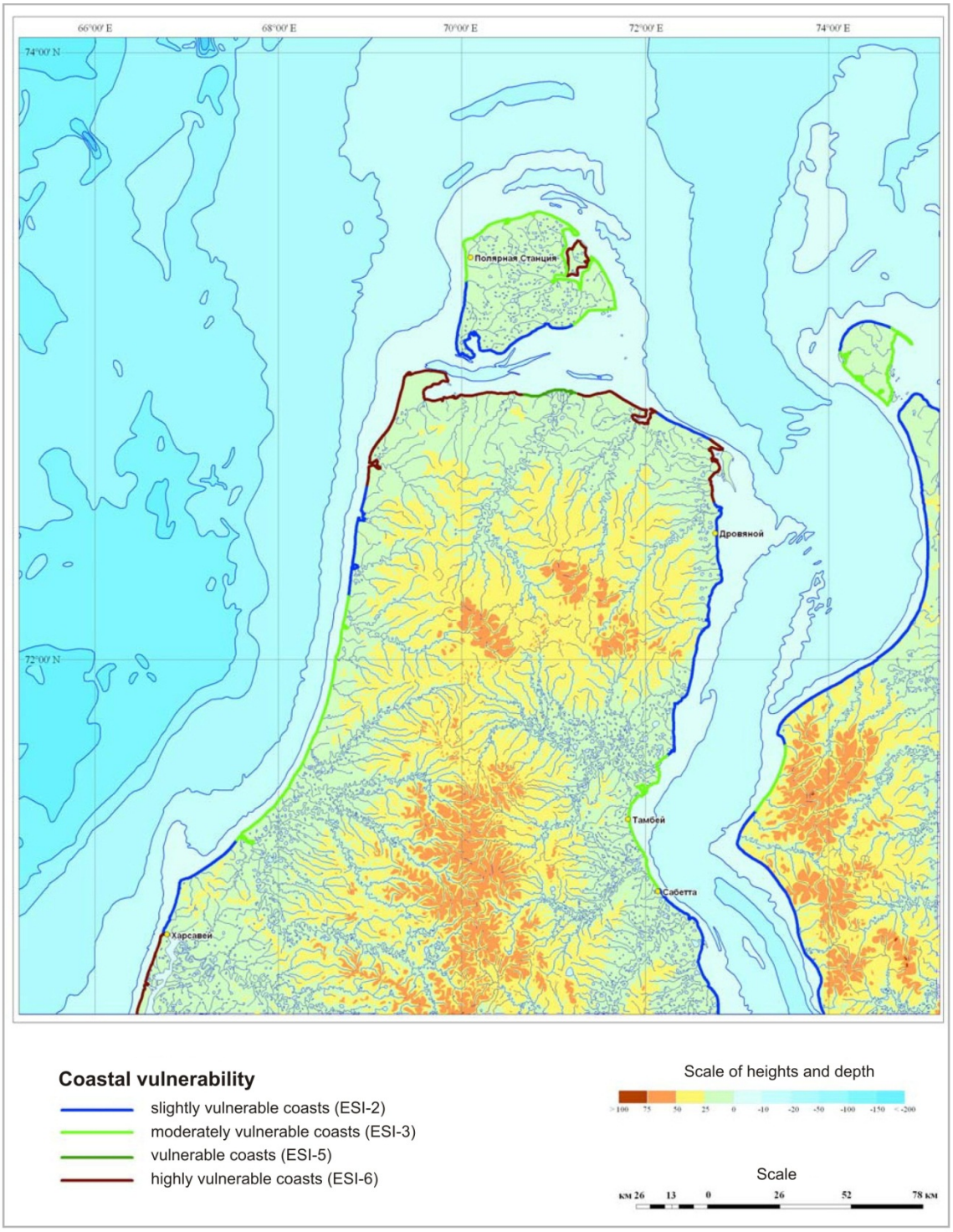
  The presence of sensitive faunal species in proximity of the three location options was used as an evaluation criterion. Special attention was given to marine mammals on the basis that 4 out of 5 marine mammals included in the Red Book of the Russian Federation may be found in the waters around the northern coast of the Yamal peninsula. Of the three options, marine mammals are less numerous in waters off Sabetta (Option 3). Cetaceans are more numerous near Kharasavey Cape (Option 1), and both cetaceans and pinnipeds are more numerous near Drovyanoy Cape (Option 2).

- **Shore line vulnerability to oil hydrocarbon pollution**

  The index of environmental susceptibility as accepted by the International Petroleum Industry Environmental Conservation Association (IPIECA), is shown in Figure 4.6. Based on review

of this data, the shores near Kharasavey Cape (Option 1) and Drovyanoy Cape (Option 2) are relatively more susceptible than the shores near Sabetta (Option 3).

Figure 4.6 : Coastal Sensitivity Index



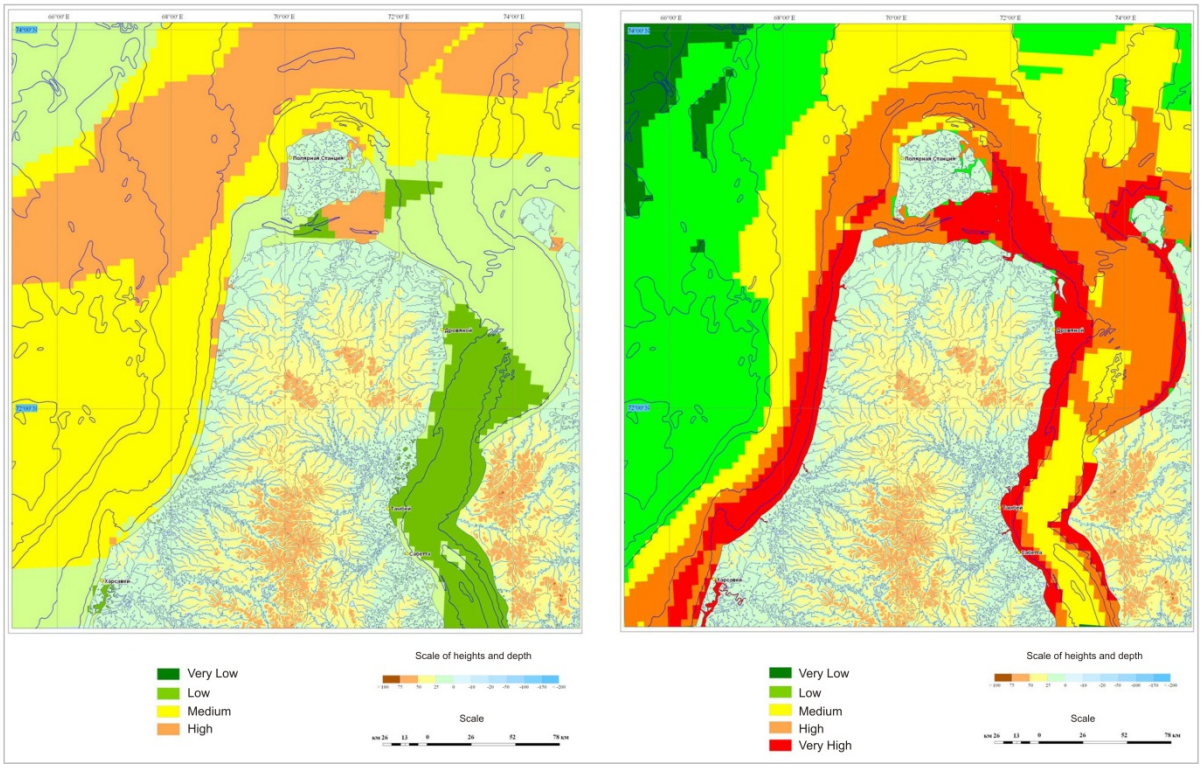
- **Integral environmental vulnerability of adjacent marine areas**

  The assessment was based on the compilation of integral vulnerability maps on the basis of GIS and thematic mapping for following parameters:

- Specially protected natural reservation.
- Phytoplankton vulnerability.
- Zooplankton vulnerability.
- Benthos vulnerability.
- Ichthyofauna.
- Birds.
- Pinniped and cetaceans.
- Semi-aquatic mammals.

The presence and size of areas whose integral environmental vulnerability is particularly susceptibility were reviewed (see Figure 4.7). In summer time the seaward width of the most susceptible areas for the three locations are: Drovyanoy Cape (Option 2) - 23km, Kharasavey Cape (Option 1) - 13km, and Sabetta (Option 3) - 6km.

Figure 4.7 : Coastal Vulnerability Mapping in Winter (left) and Summer (right)



- **Special protection areas**

  The distance of designated special protection areas from the three LNG location options was used as an evaluation criterion. The distances are summarized below:

  - Option 1: Kharasavey cape is approximately 34km from the southern area of the Yamal wildlife preserve.
  - Option 2: Drovyanoy cape is approximately 8km from the northern area of the Yamal wildlife preserve (see Figure 4.5).

- Option 3: Sabetta is approximately 140km from the northern area of the Yamal wildlife preserve, and approximately 180km from the southern area of the Yamal wildlife preserve.

A summary of the above option appraisal was undertaken using a simple 3-point scoring system. For each aspect, the option identified as having the least impact was given 1 point, the option with the next lowest impact was given 2 points, and the most impacting option was given 3 points. Where two or more options had broadly similar impacts they were awarded the same score. The results of this assessment are presented in Table 4.4 below.

Table 4.4. Results of ranking of facilities location

Criteria	Characteristics	Options, points		
		1 Kharasavey	**2 Drovyanoy**	**3 Sabetta settlement**
Atmospheric emissions	Gross discharge into the atmosphere	2	2	1
Sea waters adjacent to the LNG Shipping Facilities	The length of the shortest way from the shore to 10m bottom contour	2	3	1
Onshore surface waters	The quantity of water bodies crossed by the pipelines	2	3	1
Ecosystems	The nature complexes restorability	3	2	1
Flora	The resistance level of plants associations	3	2	1
Hydrocoles and Ichthyofauna	The presence of fish, included in The Red Book, in the water areas	1	2	2
Terrestrial fauna and marine mammals	The concentration of pinnipeds and cetaceans	2	3	1
Shore line vulnerability to oil hydrocarbons pollution	The index of environmental susceptibility, accepted by IPIECA	2	2	1
Environmental integrity of adjacent sea area	The size of areas with the most susceptibility level	2	3	1
Specially protected environmental areas	The distance from the LNG production facility to the borders of the specially protected environmental zones	2	3	1
Points in total:		**21**	**25**	**11**

Overall it is concluded that the location of the LNG facilities in Sabetta (Option 3) represents the best option from an environmental perspective. A primary differentiator for Option 3 is that it does not require the construction of trunk gas pipelines. However, even if those factors on which the pipeline construction has the greatest impact (atmosphere emissions, onshore surface waters,

ecosystems and flora) are discounted, the results of the assessment in the table above would still identify Option 3 as the preferred location.

4.4.4 OVERALL OPTION APPRAISAL

A summary of the key non-environmental (technical, economic and logistical) relative advantages and disadvantages of the three-options is provided in Table 4.5 below.

Table 4.5: Non-Environmental Aspects Comparison

	Option 1 Kharasavey Cape	**Option 2 Drovyanoy Cape**	**Option 3 Sabetta**
Advantages	• Some existing infrastructure	• Shortest export shipping distances	• No trunk pipelines (cost and schedule benefits) • Some existing infrastructure
Disadvantages	• Costs/time schedule of trunk pipeline • Pipeline compressor required • Ice ridging (shipping impacts) • Split locations for CGTP and LNG Plant • Dredging requirements	• Limited existing infrastructure • Pipeline compressor required • Costs/time schedule of trunk pipeline • Greatest area on maintenance channel dredging likely • Split locations for CGTP and LNG Plant	• Dredging requirements

On the basis of the overall assessment of alternative locations within the Yamal peninsula, it was determined that Option 3, the development of the LNG, CGTP and export facilities near Sabetta, represents the preferred development option.

4.5 DEVELOPMENT OF PREFERRED OPTION

The preferred development option has been identified as the development of the LNG plant, seaport and other associated facilities near Sabetta on the eastern coast of Yamal and in close proximity to the South Tambey Gas Condensate Field. Within this development option further refinement of the Project design was assessed in terms of the following key elements:

- Location of a disposal site for dredged materials.
- Precise location of the seaport.
- Sources for water supply.
- Waste disposal options.
- Gas compression and LNG technology cooling medium alternatives.

Each of these is discussed separately below.

4.5.1 ALTERNATIVES FOR DREDGE SPOIL DISPOSAL

Dredging activities will be the responsibility of Rosmorport and, as such, are considered to be an associated activity i.e. an activity that is not under Yamal LNG's direct control (see Section 5.9). Nevertheless, Yamal LNG will seek to exert influence over dredging activities and alternative dredging strategies are considered below.

One of the key issues during the Project implementation is disposal of approximately 17 million m^3 of spoil from dredging of the approach channels to the seaport. Two main alternatives for disposal of dredged materials were considered:

- Land-based site for disposal.
- Water area of the Gulf of Ob.

These are discussed below.

Land-based site for disposal

There are no suitable existing onshore facilities for the disposal of dredge material in the vicinity of the Project, and therefore a new onshore disposal site would need to be developed. Such a disposal site would need to occupy approximately 4,000 hectares, based on consideration of specific local conditions, soil grading of dredging area and side stability requirements.

The following elements would be required to develop the disposal site:

- Creation of a road highway network to deliver construction materials to the site.
- Arrangement of earth banking and disposal sites.
- Settling vessels/ponds.
- Construction of a system of slurry pipelines.
- Development of a withdrawal system for clarified water.

A light berth with spoil storage facilities would be constructed with pile support in the near-shore coastal area. Dredged material would be transported from the dredging areas by the dredging vessels and deposited into the storage berth. The deposited spoil would then be pumped via slurry pipelines to an onshore disposal site. The main environmental factors of this option are as follows:

- Withdrawal of land resources.
- Impacts to terrestrial flora and fauna at the disposal site.
- Impacts on water resources and marine flora and fauna from the construction of the berth.

Offshore disposal site

The environmental considerations for an offshore disposal site in the Gulf of Ob primarily relate to sedimentation impacts on the seabed (e.g. smothering of benthic communities) and generation of suspended sediments.

Selection of the preferred disposal option

Overall, the potential environmental impacts are assessed to be more extensive for land-based disposal than offshore disposal. As an illustration of this a comparison of the environmental

damage calculations (in rubles and as required under Russian permitting procedures) for the two options is provided in the Table 4.6.

Table 4.6: Environmental damage for the different alternatives of dredged ground disposal (M rubles)

Natural environment component or pollution source	Land-based site for disposal	Water area of the Gulf of Ob
Fauna	115.00	115.00
Fish resources	559.853	151.310
Waste disposal	17,546.280	0
Water resources	404.144	173.576
Total for construction period	18,625.277	324.886

On the basis of the above assessment, the disposal of dredged material within an allocated offshore site in the Gulf of Ob has been identified as the preferred disposal option.

4.5.2 ALTERNATIVES FOR PORT LOCATIONS

Initially 2 alternatives for the precise port location in the Sabetta region were considered – nearby the Sabetta settlement itself and nearby the Cape Poruy (see Figure 4.8).

Figure 4.8 : Alternative port locations (not to scale)

Criteria of the alternatives assessment are present in the Table 4.7.

Table 4.7: Criteria for the port location assessment

Criteria	Alternative 1 - Sabetta	Alternative 2 – Cape Poruy
Safety from drifting ice	Provided	Not provided
Distance to isobaths 15 m	7.5 km	4.3 km
Existing infrastructure	Present	Not present
Topographic conditions for construction	Favourable	Unfavourable
Length of pipeline for LNG transportation	Not required	App. 50 km

Based on the above assessment, the Sabetta settlement location was selected as the most favorable option for the majority of the considered criteria and was therefore selected as the preferred location.

4.5.3 CHOICES FOR WATER INTAKE FOR WATER SUPPLY

Approximately 1,900 m^3/day of water will be required by the Project for drinking and process usage. The production capacity of the existing water intake from the Glubokoye Lake is 240m^3/day and it will therefore be necessary to develop other water supply sources. The following alternative additional water supply options have been considered:

- Surface water intake from the rivers and lakes in the area of Sabetta settlement;
- Water intake from groundwater wells;
- Water intake from the Gulf of Ob.

These options are assessed below:

- **Onshore surface water abstraction**

  Engineering/hydrological surveys have revealed that the lakes and rivers of the construction area located within 4km from the Sabetta settlement (Sinedyakha, Salyamlekambadayakha, Sabetayakha, Venuymueyakha), are frozen over and the rivers have no flow during the winter period.

- **Groundwater abstraction**

  Analysis of underground horizons has revealed that they cannot provide the required water volumes. The construction area lies in a permafrost area and the underground waters (the first water-bearing horizon) lie close to the water surface (from 0.1 to 0.3 m) and cannot be used for drinking. The waters of the deeper horizons (600-900 m) are highly mineralized and contain increased amount of hydrogen sulfide, and so cannot be used for drinking water.

- **Water abstraction from the Gulf of Ob**

  Water abstraction from the Gulf of Ob could supply the required volumes of water, but desalination would be required.

Based on the abovementioned alternatives, water abstraction from the Gulf of Ob (with desalination) is identified as the only feasible option.

4.5.4 SOLID WASTE DISPOSAL

There are currently no available non-hazardous waste disposal facilities in the near vicinity of the Project licence area. Options for the disposal of non-hazardous waste include the following, and a summary of the comparative assessment is provided in Table 4.8 below:

- Temporary storage of wastes on the Project site prior to transport to existing municipal waste facilities at the regional level.
- Development of a dedicated Project landfill within the Project licence area for the disposal of non-hazardous Project wastes.
- Incineration of waste.

Table 4.8: Comparison of different solid waste management options

Option	Advantages	Disadvantages
Transport to remote landfill	• No requirement for waste facilities on site, reducing on-site impacts	• Requirement for temporary on site storage and transport of waste • Long transport distance (logistical issues)
On site landfill	• Reduced requirements for temporary waste storage • No requirements for waste transport	• Additional footprint in Project licence area • Landfill construction in permafrost
Incineration	• Reduces volume of waste • Ability to deal with selected non-hazardous wastes • No requirements for transport	• Potentially significant air emissions

The over-riding determining factor in rejecting the remote landfill option is the logistical difficulties of waste transport given the available infrastructure and climatic conditions in the Yamal region. Following review of the above aspects, the preferred solution for non-hazardous waste management is a combination of on-site landfill and incineration.

4.5.5 LNG TECHNOLOGY COOLING MEDIUM ALTERNATIVES

Air and water cooling options were assessed for the LNG process. Overall the water cooled option was discarded due to:

- Availability of water resources (see also Section 4.5.3 above)
- Protection of process equipment and piping from the potential freezing of seawater in arctic conditions
- Environmental impacts of heated water discharge to arctic environment

- Chlorination required for a water-cooled system and its resultant environmental impact.

While air cooled systems may generate additional noise (compared to water cooled systems), these impacts can be adequately mitigated through design.

The process of options analysis described in this chapter has resulted in the Project design which is presented in the following chapter.

5 PROJECT DESCRIPTION

5.1 GENERAL INFORMATION

The Yamal LNG Project is an integrated complex for production, processing, liquefaction, and export of liquefied natural gas and gas condensate from the South Tambey Gas Condensate Field. The Project will be developed and operated by Yamal LNG, in which Novatek holds 80% in partnership with Total S.A. which has the remaining 20% stake in the Company.

The South Tambey Gas Condensate Field is an onshore field situated in the north-eastern section of the Yamal Peninsula, some 540 km north-east of the regional center of Salekhard city (see Figure 5.1). The field reserves are estimated at 1,040 trillion cubic meters of natural gas on a "Proved plus Probable plus Possible" basis and 53 million tons of condensate on "Proved plus Probable plus Possible" basis. Other operators commenced exploration activities in the field in 1974 and 58 wells have previously been drilled.

Figure 5.1: Yamal Peninsula and Project location

The Project location is at latitude 71°N within the Arctic Circle. Due to its northern location, climatic conditions are extreme, winter daylight is very limited and population densities are very low. The Project's location presents a number of challenges both in terms of working conditions, availability of labour, access to gas markets and environmental and socio-economic sensitivities including protected flora and fauna, the presence of permafrost and indigenous people. A large workforce will be required, particularly during the construction phase, which will be transported to site by air.

In view of the fundamental design decisions (see Chapter 4) and the remote location of the Project relative to both markets and a skilled workforce, the main facilities necessary to realize the Project are as follows:

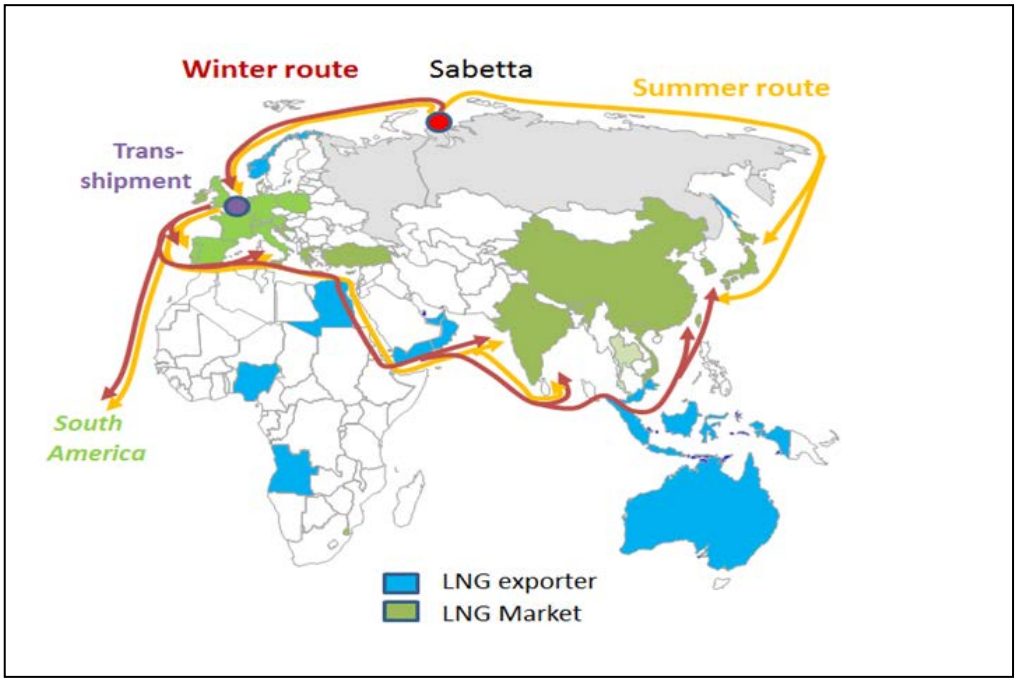
- Gas (and condensate) gathering network, including a network of production wells and gathering pipelines;
- Gas pre-processing treatment facilities and a methanol unit (for treatment prior to liquefaction);
- The LNG plant (for the liquefaction of natural gas) including 3 process trains;
- A 380MW power plant;
- LNG and condensate storage tanks;
- An airport (primarily for transportation of workers);
- Supporting infrastructure in the form of local roads, bridges (for stream and river crossings) aerial electrical transmission lines, workshops, waste management facilities and workers' facilities;
- Workers' accommodation and auxiliary infrastructure facilities;
- An early seaport facilities (Materials Offloading Facility (MOF)/berth for the delivery of equipment, heavy plant and construction materials during construction phase) and main seaport facilities (for LNG and gas condensate shipping during operations), including the approach channel; and
- A fleet of diesel-powered double-hulled LNG carriers and condensate tankers for year round operation in the Eastern Barents and Kara Seas as well as in the Ob Bay and summer navigation along Northern Sea Route (also to be operated by third parties).

LNG carrier and condensate tanker operations and offshore activities will be carried out by the third parties. The LNG carrier and condensate tanker operations and offshore activities are not subject to project financing nor directly under Yamal LNG's control, but are essential to the Project's viability and are therefore considered within the ESIA as associated facilities[5] ; associated facilities are described further in Section 5.9.

Figure 5.2 shows the summer and winter export routes.

[5] Associated facilities are defined in line with IFC Performance Standards as facilities "*that are not funded as part of the project and that would not have been constructed or expanded if the project did not exist and without which the project would not be viable.*"

Figure 5.2.: Indicative shipping routes



A detailed map of the Project facilities is shown in Appendix 1, Figure A1.

5.2 PROJECT TIMEFRAMES

Based on current assessment of the available reserves the Project is expected to achieve constant gas production rated at 28 million billion m^3/year (16.5 million tons / year as liquefied natural gas) for about 20 years. Thus, the completion of field operations will take place in the 2040s.

However, it should be noted that the exhaustion of the proven field reserves is not likely to entail the end of operations for the LNG plant and other facilities built under the Project. Instead it is likely that the LNG plant, the seaport and the airport will be used for exploitation of other hydrocarbon fields within the region.

In accordance with Yamal LNG's field development plan, LNG production will ramp up over a three year period as successive wells and LNG trains are brought into operation in 2016, 2017 and 2018. A non-exhaustive list of the major facilities associated with each phase is outlined below.

Initial phase (2016)

The following facilities comprise the first phase:

- Well pads for 58 wells (multiple wells will be drilled from each well pad).
- Gas inlet facilities consisting of slug catchers, separation and condensate stabilization train, methanol injection, regeneration and production unit.
- The first LNG process line (or 'train') with a capacity of 5.5 million tonnes LNG/year (5.5Mtpa). This train consists of a CO_2 removal unit, drier unit, mercury guard-bed and propane pre-cooled mixed refrigerant (C3MR) liquefaction unit.

- The first phase further consists of two LNG tanks, boil-off gas compressor, fractionation unit, ethane and propane refrigerant storage bullets, instrument air system and nitrogen separation unit, as well as water treatment distribution and collection facilities, including a fire water system.
- The first berths for receiving of construction materials and shipping the LNG and stable condensate.
- Four gas turbine units for supply of electrical power.
- Auxiliary and infrastructure facilities.

Second phase (2017)

During the second phase well pads for a further 35 wells, a second LNG train and an additional LNG storage tank, power generating equipment and auxiliary and infrastructure facilities will be commissioned.

Final Phase (2018)

The following facilities comprise the third stage: a further 31 wells (drilled from the phase 1 and 2 well pads); a third LNG process train; an additional LNG storage tank, and; associated power generating units.

During the operational phase an additional 84 wells will be drilled to maintain the production plateau for the plant. In addition, as field formation pressure falls during production it is planned to build a booster compressor station with the first of several compressor units being commissioned around 2021.

Start of construction

In order to meet the production timeframes, early construction works on infrastructure facilities, including accommodation facilities in Sabetta, administrative buildings, a fuel depot, the inter-field roads and the airport runway started in 2011. There is therefore a significant early works construction workforce on site at the time this Scoping Report has been prepared.

5.3 MAJOR FACILITIES DESCRIPTION

When implementing the Project, a substantial number of facilities will be required for production, processing and transportation of the gas and condensate prior to liquefaction of the gas and storage and export of both gas and condensate. Other facilities and infrastructure will also be required to support the main production facilities. A brief description of these major facilities/activities is given below.

5.3.1 WELL DRILLING

Over the three phases outlined above a total of 208 wells will be drilled from 19 well pads within the South Tambey Gas Condensate Field. The wells will be drilled using directional drilling technology to optimize gas recovery and to minimize the footprint associated with the drilling operations. During the first phase of the field development, the wells will be drilled to measured depths (including directional drilling) of 3,550 meters and 4,350 meters. For the early wells, the waste drill cuttings will be placed into a temporary storage pit close to the well pad. In the longer

term, Yamal LNG intends to inject drill wastes and waste water into suitable subsurface horizons using cuttings reinjection technology. Design studies are currently being undertaken to substantiate the feasibility of injecting wastes. In particular, geological field studies are being undertaken to select a suitable sub-surface reservoir to receive the wastes.

When performing the well testing studies, hydrocarbons will be burnt at an appropriately lined flare pit. The minimum volume of hydrocarbons required for the test should be flowed and well test durations will be reduced to a minimum. An efficient test flare burner head equipped with an appropriate combustion enhancement system will be used to minimize incomplete combustion, black smoke and hydrocarbon fallout. It is planned that the liquid phase (condensate and water) will be separated. Residual hydrocarbons will be collected from the flare pits and disposed in an appropriately manner via the Project's waste management facilities (described below).

5.3.2 GAS COLLECTION – GATHERING PIPELINES

A network of small diameter gas pipelines will be required to transport gas from each well pad to the LNG plant. Figure A1 in Appendix 1 shows the 19 well pads located within a 20km radius of the main LNG facility and a connecting pipeline network. The pipelines will typically be above ground with a diameter of between 250 and 700mm, suspended by stanchions (supports). The pipeline will be elevated in strategic locations at a height the does not hinder reindeer migration.

To prevent hydrate formation, methanol will be injected into the gas collection network pipelines.

There will also be a network of roads to provide access to the well pads, as well as power lines.

5.3.3 LNG PLANT

The Project will use air-cooled APCI C3MR liquefaction technology for each of the three 5.5 Mtpa LNG trains. The following process facilities comprise the LNG plant when complete:

- LNG inlet structures, including the gas treatment units to separate gaseous and liquids phases and to separate produced water from condensate and stabilize the condensate.
- Methanol regeneration unit designed to recover methanol from the water-methanol mixture in order to re-use it.
- Acid gas removal unit to remove CO_2 and small amounts of methanol from the raw gas in order to prevent solid CO_2 build up inside the cryogenic equipment.
- Gas drier and mercury removal unit.
- Liquefaction and cooling unit.
- Various storage units including three tanks each of 50,000m^3 capacity for condensate.
- Four LNG storage tanks each with a capacity of 160,000m^3.
- Compressed air system to feed air to the nitrogen producing units, the utility air system and Instrumentation section.
- Nitrogen system, for production of liquid nitrogen and to purge the gas flare system.
- Flare system, used for the emergency release of gas in abnormal conditions or during maintenance and start-up/shut down periods.

5.4 SEAPORT (EARLY WORKS FACILITIES)

Due to the Project's remote location and absence of suitable year-round over land transport infrastructure, most of the construction materials and equipment will be delivered to site by sea. Yamal LNG will construct facilities to receive heavy equipment and other construction materials via a basic seaport (or Materials Offloading Facility (MOF)). The MOF will be located adjacent and to the north of the main LNG site (Figure A1) and include the following facilities and activities:

- Berth waters (turning/manoeuvring area) and approach channel that is 4km in length with a minimum water depth of 12m that will necessitate some dredging.
- Navigation aids.
- Reconstruction of pre-existing berths to receive vessels carrying oil products for use during construction (2 berths 206 meters long in total).
- Off-loading berth terminals for receiving construction cargoes (2 berths 294m long in total).
- Re-handling berth terminals for roll-on roll off cargoes (from 'Ro-Ro' type vessels) and oversized modules (2 berths 472m in total).
- Berths for receiving pontoons with oversized modules (150m long).
- Utility facilities for industrial and warehouse purposes (including site for washing the floating booms, repair garage and storage facilities, utility lines and structures).

5.5 SEAPORT (MAIN FACILITIES)

Separate seaport facilities will be required for the export of LNG and condensate during the Project's operations phase. The operations phase seaport will primarily serve the Yamal LNG Project's needs, however it will not be operated by Yamal LNG but instead by the Federal Agency of Sea and River Transport (Rosmorport).

At the present time, the design solutions for these facilities are being finalised. The seaport will be designed to accommodate ice breaking LNG carriers up to 300m in length with a draft of 11.7 m. Each LNG carrier is expected to be capable of transporting up to 170,000m^3 of LNG.

Because the operations phase seaport will be operated by Rosmorport, and is only part funded by Yamal LNG, it is considered to be an Associated Facility (see Chapter 5.9 Area of influence, associated and out-of-scope facilities).

5.6 WORKER ACCOMMODATION

During the construction period the Project will require a large skilled workforce that is estimated to peak at approximately 7,000 personnel working in rotation in 2014 i.e. 3,500 construction workers on site at any one time. The workers' accommodation will be located mainly at Sabetta approximately 6km south of the main LNG site. Workers will be housed in dedicated workers' accommodation blocks that will either be newly built or renovated existing buildings. Existing structures that are not required for the Project will be dismantled and the areas will be reinstated.

Due to the remote location of the Project, all utilities and services required to support worker accommodation will have to be purpose built, including: boilers for heating, water supply and wastewater treatment, solid waste management, power supplies (gas powered), fire fighting

system, fire tenders and personnel, canteen and link roads with the main site and accommodation/welfare facilities. The accommodation areas will evolve in line with the phased construction approach.

Further accommodation will be constructed in close proximity to the LNG plant for operations personnel. The operations phase field camp will be designed to accommodate 1,050 workers during each shift. Operations phase workers will work in rotation i.e. two shifts each of approximately 1,050 workers. The operations phase facilities will include:

- Dormitories.
- Community centre.
- Canteen.
- Health and recreation module.
- Warehouse for food and non-food products.
- Enclosed parking area.
- Checkpoint.
- Auxiliary buildings.

Buildings will be constructed with piled foundations and elevated above ground level to protect the permafrost i.e. to prevent thawing of permafrost.

5.7 AIRPORT

The airport construction site is approximately 4km to the west of an existing unpaved air strip of the decommissioned airport (see Figure A1). Construction will be carried out on imported soil of suitable load bearing capacity that will raise the ground level at the airport by 1.6m relative to the pre-existing elevation.

The airport will be designed and constructed with the following specifications:

- Runway length of 2,704m and a width of 46m with a shoulder reinforced to 10.5m on both sides.
- Helicopter pad of 42x40 meters size.
- A taxiway which connects the runway with an apron.
- An apron of sufficient size to accommodate three IL-76-TD/ Boeing 737 type aircraft with extra space for helicopters.
- A de-icing area.
- A cargo storage area.

The airfield pavement will comprise reinforced concrete pre-stressed slabs[6] .

A sanitary sewer system will be provided, with outflow coming from buildings to storage tanks and further transportation to treatment facilities at Sabetta. During the operational stage storm water

[6] GOST 25912.2-1991 reinforced concrete pre-stressed slabs pag-18 for aerodrome pavement construction.

from the following areas will be directed for treatment on site prior to discharge: bunding around the fuel tanks in the fuel depot, filling station and boiler tanks.

Discharge from the de-icing area will be diverted through conduits equipped with block valves and directed to the collection reservoirs of the de-icing liquid.

A number of methods are available for de-icing of the runway, taxiways, the apron and the helicopter pad. The preferred methods will be determined in accordance with applicable regulations and standards during certification and preparation for operation.

It is planned to deliver aviation fuel to the airport warehouse from the upper fuel depot, located 4km from the airport, by motor transport.

The first fixed wing flights at the airport are planned to commence in late 2013. In the interim, personnel are required to travel by helicopter to site.

5.8 OTHER PROJECT INFRASTRUCTURE

5.8.1 WASTE MANAGEMENT

The Project will have its own waste management facilities including a dedicated landfill complete with separate cells for disposal of solid domestic and industrial waste. The landfill will be constructed and managed in line with good international industry practice in a manner that prevents contamination of the surrounding soils and water resources i.e. leachate collection and treatment. The waste management facility will also include incinerator units equipped with a system for incinerating the exhaust gas capable of incinerating combustible wastes. An incinerator will also be located at the LNG facility. Wastewater and drilling wastes will be disposed of into suitable subsurface horizons using deep well injection technology.

The landfill and waste injection complex will be commissioned in 2014 and 2015 respectively. In the interim wastes will be transferred to licensed landfill sites located in Salekhard or temporarily stored until the landfill/deep well injection facilities have been constructed and are ready to receive Project wastes.

In addition to Project wastes, there are considerable volumes of legacy wastes from previous oil and gas exploration and production activities in the area. Yamal LNG has commissioned specialist waste contractors to collect this waste and transfer it to existing recycling facilities or licensed landfills located in Surgut via the Ob river. Some early construction wastes will also be disposed under licence to these waste management facilities.

Further details of the waste management facilities design, including technical specifications compare against GIIP will be provided in the ESIA. Waste management practices will also be defined in the Project's Environmental and Social Management Plans.

5.8.2 WATER ABSTRACTION AND TREATMENT

Water intake at the initial stage of construction will be performed from an existing source in the Sabetta settlement (Glubokoye Lake). The intake facilities are equipped with a fish-protecting device prior to treatment.

In the future, to coincide with operations phase water demands, the construction of a unit for surface water intake from the Gulf of Ob is envisaged as a source of water supply for the Project. To abstract the estimated daily water consumption of 1900m^3/day, two parallel operating lines will be designed with a capacity of 1500m^3/day for fire fighting water and 500m^3/day for domestic water usage. The water intake portals will be equipped with a fish protecting device to prevent entrainment of fish and shellfish. A water treatment system, inclusive of filtration, coagulation processes and a desalination unit is also planned.

5.8.3 SEWAGE TREATMENT PLANT

During the construction phase, effluents are being collected by a domestic household sewage system at the Sabetta settlement and are directed to a biological treatment unit with subsequent discharge of treated water. Treatment capacity will be expanded as construction proceeds. For Project facilities outside of Sabetta, domestic household effluents will be collected in sealed metal 0.5m^3 containers and transferred to the sewage treatment plant.

During the operations phase, drainage systems will allow for the collection and subsequent treatment of domestic and industrial waste water, including rainwater runoff from production process areas. Domestic wastewater will be treated to ensure the quality of treated water meets applicable standards for its discharge into underground horizons via the aforementioned disposal well[7].

5.9 AREA OF INFLUENCE, ASSOCIATED AND OUT-OF-SCOPE FACILITIES

5.9.1 AREA OF INFLUENCE

The Area of Influence will include areas both directly and indirectly affected by the Project within and beyond the Project licence area.

The areas directly affected by the Project include those affected by the direct physical impacts from the well pads, gathering pipelines, connecting roads, the materials offloading facility and main seaport (although see below in relation to the seaport as an associated facility), main LNG facilities, workers' accommodation camp, airports and other auxiliary facilities such as the waste management facility which are all within the Project licence area (see Figure 4.5) that extends over an area of 2,031km^2. Small sections of the licence area will also be used to source construction materials, both from dry quarries and via the dredging of sandy material from lake beds. These areas are shown in Figure A1, Appendix 1. It should be noted that the Project facilities do not

[7] The design specification of the injection disposal well for industrial effluents is currently in progress. Hydrogeological studies have been performed to justify placing wastes into the subsurface.

extend across the entire licence area, and that the majority of the licence area will remain available to its current users.

In addition to impacts within the Project licence area, the Project will also have direct and indirect impacts beyond the Project's battery limits (fence line of the Project facilities) and beyond the wider licence area, including:

- Light and visual impacts outside the fence area and to a lesser extent outside the licence area.
- Areas subject to increased reindeer grazing pressure where reindeer are displaced from the licence area.
- Socio-economic benefits to nearby communities and settlements within the Yamal District.
- Shipping routes and in particular the approach channel (an associated facility – see Chapter 5.9.2 below) where dredging is required.
- Flight paths, particularly the landing/take off flight path because of aircraft noise profiles.
- Ice-roads used by the Project in the winter.

5.9.2 ASSOCIATED FACILITIES

The Project will be dependent on a fleet of LNG carriers and condensate tankers for the export of the LNG and condensate. Ice-breaking LNG carriers and condensate tankers will be specifically designed to operate in the thick ice conditions prevalent in the waters surrounding the Yamal Peninsula and proposed shipping routes. However, the vessels will not be financed as part of the Yamal LNG Project nor will they be operated by Yamal LNG and are therefore considered to be Associated Facilities as defined by the International Finance Corporation (IFC)[8]. During operations Yamal LNG will nonetheless require that the LNG carrier and condensate tanker owners strictly adhere to international maritime regulations.

In terms of the seaport, Yamal LNG will only fund and be responsible for the construction of certain land-based port infrastructure (see below for details). The offshore activities, including dredging of the approach channel and offshore port/turning areas, will be the responsibility of the federal authorities. During the operations phase the seaport will serve the Yamal LNG Project's needs, although the seaport will also be available for use by other activities/enterprises. The seaport itself will not be operated by Yamal LNG but by the State Enterprise for Seaport Management "Rosmorport" (who are coordinated by the RF Ministry of Transport and the Federal Agency of Sea and River Transport). Agreements between Yamal LNG, the federal authorities and the Federal Agency of Sea and River Transport (Rosmorrechport) stipulates responsibility for the seaport will be split between Yamal LNG and Rosmorport as follows.

Yamal LNG provides design and construction of the following land based port infrastructure:

- Berths for handling of LNG, gas condensate.

[8] In accordance with IFC Performance Standard, Associated Facilities are those activities and facilities that are not part of the financed project and would not be conducted, built or expanded if the Project was not carried out, and without which the Project would not be viable.

- Jetties for the transfer of condensate and LNG.
- Berth for roll-on cargoes.
- Fleet-port berth.
- Storage area.
- Administrative and general activity zone.
- Utility networks and communication lines.

The federal authorities (during construction) and Rosmorport (during operations) are responsible for the following facilities:

- Approach channel with operating waters, including capital dredging and mine clearance (mine clearance has already been completed in conjunction with the Russian Northern Fleet).
- Maintenance dredging if required.
- Ice protection structures.
- Vessels traffic control system and navigating aids.
- Buildings for marine service divisions.

Other Associated Facilities include those used for the supply of raw materials (e.g. borrow pits and quarries, including facilities developed solely for the Project and existing facilities where a significant proportion of their output will be utilised by the Project).

5.9.3 OUT-OF-SCOPE ACTIVITIES

A description of activities that will not be addressed by the ESIA, typically because they fall outside of the Project's Area of Influence and YLNG's control, is provided below.

Due to their strengthened hulls, ice breaking vessels are typically much heavier than non-ice breaking LNG carriers and therefore uneconomical for use outside of ice conditions. It is therefore anticipated that LNG cargoes will be transferred to non-ice breaking vessels in northern Europe before continuing onward journeys to buyers. The location for these cargo transfers is currently unknown and likely to change periodically depending on market conditions. However, regardless of the actual location, the transfer of cargo will be the responsibility of the transhipment facility and both the transfer operations and the transhipment facilities themselves are considered to be outside of the scope of the ESIA.

The transfer of condensate from ice class tankers to non-ice class tankers is not envisaged. However, if it should become necessary at a later date, the transfer of condensate between vessels would similarly be considered outside of the scope of the ESIA.

The operation of licensed landfill facilities currently receiving Project and non-Project related legacy waste is also considered to be outside of the scope of the ESIA.

5.9.4 SUMMARY OF THE PROJECT, ASSOCIATED FACILITIES AND OUT OF SCOPE FACILITIES/ACTIVITIES

Project activities include all shore based facilities and activities within the licence area including:

- Drilling.
- Gathering pipelines.
- Main LNG facilities.
- Material offloading facility and LNG and gas condensate shipping.
- Airport.
- Workers accommodation facilities.
- Auxiliary facilities including quarries and borrow pits within the licence area.

Associated Facilities, operated by Rosmorport, include:

- Approach channel with operating waters, including dredging and ice-protection barriers.
- Vessels traffic control system and navigating aids.

Associated Facilities not related to Rosmorport include quarries located outside of the licence area (if applicable).

The operation of LNG carriers and condensate tankers under Yamal LNG charter will be considered as Associated Facilities as Yamal LNG will require that the vessel owners strictly adhere to international maritime regulations.

Out-of-scope activities include:

- Vessel construction.
- Transfer of cargo from ice breaking vessels to conventional vessels.
- Cargo receiving facilities at the destination terminal.
- Aircraft movements outside of the landing and take-off cycle.
- Remote waste reception facilities.

6 BASELINE CONDITIONS

6.1 EXISTING BASELINE STUDIES

The following studies and surveys have been undertaken in order to characterize the current natural conditions of the South Tambey Gas Condensate Field.

1. Engineering environmental surveys on land plots to be occupied by LNG Plant facilities. Completed by LLC “Frecom” in 2012.
2. Engineering environmental surveys on land plots designated for the construction of multiple well platforms Numbers 7, 25, 30, 39, 43, 44, 45, 46, and 47, a service contractors’ site, sites for installation of mobile automated gas-turbine electric power plants (MAEPP-2500), and associated linear facilities. Completed by LLC “Frecom” in 2011.
3. Engineering environmental surveys on land plots designated for the construction of multiple well platforms Numbers. 1, 2, 4, 6, 22, 26, 29, 35, 40, 41, and 42. Completed by LLC “Frecom” in 2012.
4. Engineering environmental surveys on a land plot designated for the construction of an airport in the vicinity of the Sabetta accommodation camp on Yamal Peninsula. Completed by LLC “Frecom” in 2012.
5. Environmental baseline (background) assessment of the Yuzhno-Tambeisk GCF territory. Completed by JSC “Ecoproject” in 2010.
6. Engineering hydrometeorological and engineering environmental surveys of land plots designated for the construction of accommodation camps for construction people and plant operators. Technical Report, Volume IV, Book 3. Completed by LLC “UralStroiProekt” in 2010.
7. Engineering environmental surveys in water areas designated for the construction of a sea port in the vicinity of the Sabetta accommodation camp and an approach channel in the Gulf of Ob, Yamal Peninsula. Completed by LLC “Eco-Express-Service” in 2011. Engineering environmental surveys on land plots designated for the construction of seaport onshore facilities in the vicinity of the Sabetta accommodation camp. Completed by LLC “Frecom” in 2011.

At the time of preparing this document, a report entitled “An inventory of natural sites and sites disturbed by factors of the man-made origin on the Yuzhno-Tambeisk (South Tambey) GCF territory” is being prepared on the basis of remote sensing data obtained by FGUSRE “Aerogeologia” in 2012. This report will give a comprehensive description of the baseline condition of sites disturbed by historical anthropogenic activity in the Yuzhno-Tambeisk GCF licence area, such as exploratory well sites, linear facilities (roads, pipelines), waste storage sites, quarries, etc.

6.2 ENVIRONMENTAL BASELINE

6.2.1 NATURAL CONDITIONS

The South Tambey Gas Condensate Field is situated in the north-eastern part of Yamal Peninsula, on the west shore of the Gulf of Ob. Geographically, the territory belongs to the Yamal province and is in a tundra zone. The field is situated within the Arctic Circle.

The climate is characterized by inclement long lasting winters and cold summers. The average annual air temperature does not exceed -10.2°C. February is the coldest month, with an average monthly temperature of -25.9°C. The average monthly temperature of the hottest month (August) is +6.4°C. The absolute minimum air temperature reaches approximately -49°C whereas the absolute maximum is approximately +30.0°C. Air temperatures above zero are recorded for approximately 100 days of the year and stable frosts last approximately eight months. Air temperatures above 5°C are recorded for around 44 days.

The surface soils are characterised by tundra humus gley and gleyic soils, boggy-tundra soils, and boggy soils. There is a continuous abundance of permafrost in the area with consequent universal development of cryogenic processes. This factor will be taken into consideration when designing facilities and assessing expected impacts on permafrost structures.

The typical vegetation communities in this region are represented by herbaceous-mossy and suffruticous-lichenous undulating tundra, which are formed on sandy-loam and sandy soil layers of marine and fluvial terraces. Lichen tundra communities are less common.

The abundance of various Actitis hypoleucos and Ancerine species (geese, diving ducks and Anatinae ducks) and a minor proportion of sparrow species are typical for tundra fauna.

The ichthyofauna (fish) is represented by over 40 species, of which the Siberian sturgeon (Acipenser baen) is included in the Red-Data Book of the RF.

The ornithofauna (birds) comprises about 80 species, including yellow-billed loon, red-breasted goose, Bewick's swan, scoter, duck hawk, white-tailed eagle, gyrfalcon, and snowy owl that are included in Red-Data Books of the Russian Federation (RF) and the Yamal Nenets Autonomous Okrug. There are about eight species of marine mammals in the region, of which the Atlantic walrus, white whale, and polar bear are listed in the Red-Data Book of the RF. Tundra reindeer are also listed in the Red-Data Book.

There are no areas with protected status in the Project licence area (see Chapter 5.9). The nearest nature protection territory is the Gydan State Nature Reserve and the Yamal State Biological Reserve.

The North-Yamal area of the Yamal State Biological Reserve of regional significance is situated at a distance of approximately 130 km northward of the licence area (see Figure 4.5). The South-Yamal area of the Yamal State Biological Reserve is situated at a distance of 170 km to the south-west of the Project licence area.

In general, tundra nature complexes are vulnerable to disturbance and their potential for self-regeneration is low, with regeneration typically occurring over many years. For this reason, the

ESIA documents will specify appropriate measures concerning prevention and mitigation of impacts on ecosystems in the Project Area of Influence.

Similarly, the presence of protected species in proximity of the Project's activities will demand thorough consideration of all potential impacts and mitigation measures necessary to minimise impacts.

While ecological baseline information has been collected during the preparation of the OVOS, the need for supplementary baseline data collection has been identified. Consequently, the additional studies will be performed to inform the international ESIA:

- Flora studies in freshwater bodies (rivers, lakes, estuaries and shallow coastal waters), scheduled for summer 2013.
- Ornithological studies, scheduled for spring, summer and autumn of 2013.
- Marine biota in the Project offshore areas of Obskaya Estuary.

6.2.2 EXISTING ANTHROPOGENIC DISTURBANCE

The South Tambey field was discovered in the mid-1970s. Extensive prospecting surveys and exploratory drilling operations have been performed by other operators in the past to estimate recoverable reserves. In total, 55 prospecting and exploratory wells were drilled on the Project licence area. Reportedly, reclamation of well sites was either partially completed or was not completed at all.

Before 2006, some wells were under pilot operations. Onsite operations included condensate separation and gas flaring in flare pits. Gas condensate was transported via pipelines to temporary storage areas, from where condensate was delivered to berth facilities and subsequently shipped by sea via the Obskaya estuary.

At that time infrastructure facilities consisted of:

- Sabetta accommodation camp with heat supply, water supply and wastewater removal systems.
- Gas supply wells and a mobile automated gas-turbine electric power plant.
- Industrial zone on the Sabetta accommodation camp territory (a boiler-house, garages, parking lots, a filling station, repair workshops, fuel storage tanks, etc.).
- Airport (aircraft parking areas, a refuelling station).
- Roads and pipelines for condensate transportation.

It should be noted that over several decades of field development, not all wastes were removed from the area but instead were stored on the shore of the Gulf of Ob. As a consequence, sizable

amounts of wastes were accumulated there, including metal scrap, construction debris and unused drilling mud components[9].

6.2.3 IDENTIFIED HISTORICAL CONTAMINATION

In line with RF legal requirements Yamal LNG has carried out engineering environmental surveys within the Project licence area. The scope of these surveys has included both land plots designated for the construction of new facilities (see Chapter 5) and the existing infrastructure (gas wells, pilot wells, an accommodation camp). The surveys included sampling of soil, groundwater, surface water and bottom sediments for further testing by an accredited laboratory. Analytical data were compared with background contamination levels and hygienic regulatory values.

The findings can be summarized as follows:

- **Soils**

  Minor exceedances of regulatory values for concentrations of cadmium, nickel, zinc, lead, and arsenic were found in some soil samples.

  Concentrations of cadmium in excess of regulatory norms were found in soil samples obtained from the territory of LNG Plant facilities and at multiple well platforms. In addition, concentrations of nickel in excess of regulatory norms were found in soil samples taken at certain multiple well platforms. Lead concentrations in soil samples obtained at well site # 21 were twice the Maximum Permissible Concentration (MPC).

  Concentrations of petroleum hydrocarbons in excess of the regulatory value were identified in some soil samples taken in the vicinity of the seaport onshore facilities, in the airport area and at multiple well platforms. MPC values were exceeded by no more than 1.5 to 2 times.

  In autumn 2012 a survey of drilling pits for earlier exploration drilling was conducted by means of remote sensing data interpretation. Samples of soil and water were then obtained during the field survey and sent for analysis. The results from this analysis are anticipated in December 2012. Detailed survey work to further delineate existing contamination within the Project licence area is also planned as part of the development of the ESIA. These works will be based on field work and remote sensing data of 2012 that serve as a basis for a historical contamination management programme.

- **Surface waters**

  Concentrations of most of contaminants found in surface water samples were lower than the MPC value established for water bodies of fishery significance. However, minor exceedances (2 to 3 x MPC) were found with regard to petroleum hydrocarbons, surfactants, iron and manganese in water samples taken from a lake which is situated in the immediate vicinity of the Sabetta accommodation camp.

[9] Yamal LNG has made a decision to make an inventory of accumulated wastes in order to then remove the wastes for recycling or disposal of in accordance with Russian regulatory requirements. The Company has selected contractors for the removal and disposal of the accumulated wastes. These works are to be completed in 2014.

Some water samples obtained from the Gulf of Ob demonstrated minor exceedances of MPC values established for water bodies of fishery significance in relation to: chlorides (up to 2.5 x MPC), magnesium (up to 1.4 x MPC), and petroleum hydrocarbons (1.3 to 1.6 x MPC).

- **Bottom sediments**

  No regulatory norms are established in the RF for contaminant levels in bottom sediments. However samples showed that concentrations of potential contaminants complied with the local background level.

6.3 SOCIAL BASELINE

6.3.1 INTRODUCTION

This section provides an outline of socio-economic conditions in the Project Area of Influence. The main aspects covered in this section include a description of the economic and demographic parameters, information about indigenous peoples active in the region, labour market, land use, social infrastructure, cultural heritage sites, and a number of other aspects.

Administratively, the Project is located within the Yamal-Nenets Autonomous Region or Okrug (YNAR or YNAO) of the Russian Federation (see Figure 6.1). The administrative division of the YNAR consists of the regional centre in the city of Salekhard and seven districts, including the Yamal District which hosts the Yamal LNG Project. The Yamal District is situated in the northern section of the YNAR and includes the largest island of the region – the Beliy Island (Figure 6.1).

The nearest permanent substantial settlement to the Project licence area is Seyakha village located approximately 120-km distance to the south. A populated area north of the Project facilities and just within the Project licence area is the Tambey Factoria[10] trading station (30 km north of the main Project facilities), which primarily serves as a trading post for nomadic reindeer herders migrating in the area. Also, within the Project licence area (located 6km south of the LNG plant site), there is the Sabetta Camp that will continue to be used to accommodate Project construction personnel (see also Chapter 5). All-year-round transport connection between Sabetta and the regional centre of Salekhard is only possible by helicopter. Water transport via the Obskaya estuary is feasible during the summer navigation season, while motor transport can be used on the local roads in the winter period.

The inter-settlement territories of the tundra are traditionally used by the indigenous nomadic herders (known locally as the tundra people) as part of their seasonal migrations between reindeer pastures (transhumance).

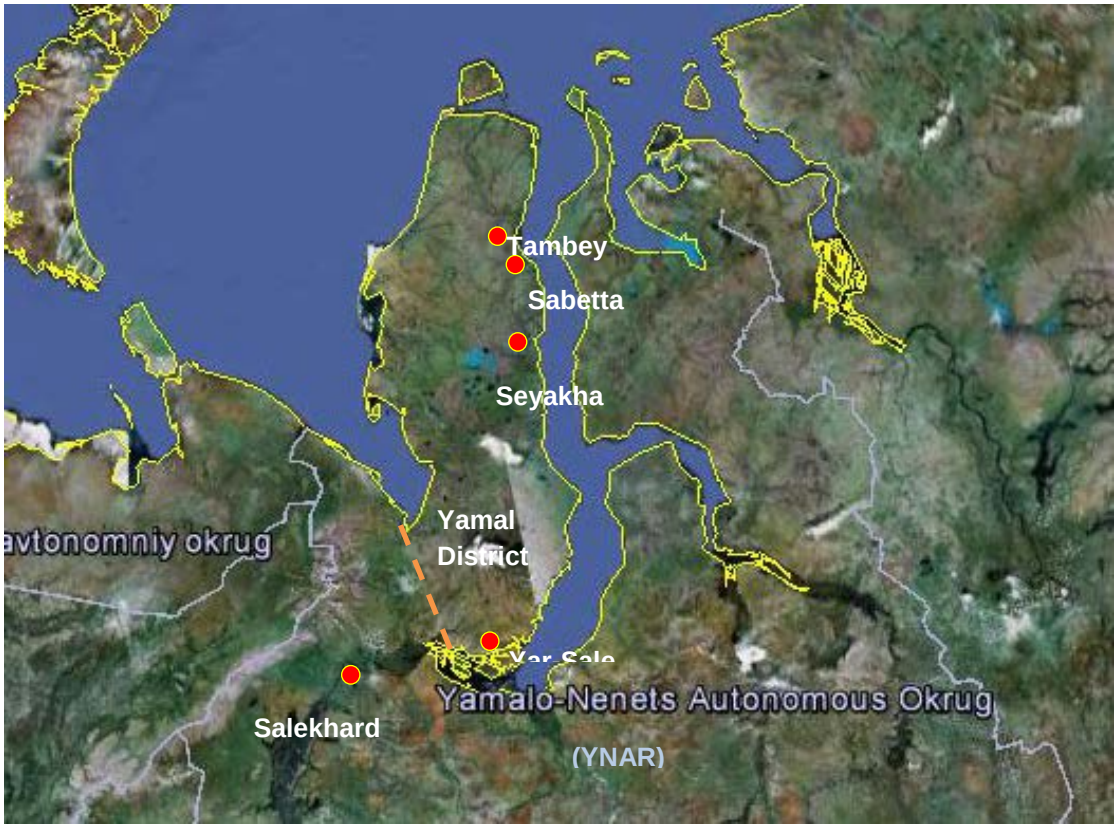
This report represents the ‘Scoping Report’ for the Project and has been prepared as part of the Project’s Environmental and Social Impact Assessment (ESIA) process. The ESIA, including this

[10] Trading post, also known as “Factoria” in Russian, is a local hub for sales, purchasing and provision, typically set up in remote regions of the North. Factoria is a supply-sale unit that allows barter operations by nomadic indigenous population and provision of credits. Factorias are important sources of communications, distribution of periodical press, as well as places of gathering for indigenous population residing in remote areas of the tundra. Tambey Factoria has been operational since 1934.

Scoping Report, is being developed in addition to the OVOS (environmental assessment) materials developed as part of the Russian Federation planning process, and is specifically developed to demonstrate compliance with international Lender requirements (as described above). In particular, the Scoping Report has been developed in line with good international industry practice including the EU guidance on scoping

This Section of the document has been developed basing on information contained in: Russian OVOS materials prepared for different Project facilities/activities; accompanying documents provided by the Company; socio-economic reports developed by the local Administration and federal authorities; other relevant data received from public sources. These sections will be significantly expanded within the international ESIA, including additional information collected during further development of the ESIA materials.

Figure 6.1: Map of the Yamal-Nenets Autonomous Region



6.3.2 ECONOMIC SITUATION

The backbone of the regional economy is oil and gas production, which accounts for 88% of industrial production in the YNAR. The YNAR industries produce 90% of Russia Federation's natural gas output and 22% of the world's natural gas output. The region features 17 different known gas deposits. The resource potential of the region is estimated at 95 trillion m^3 of gas, 5.8 billion tonnes of gas condensate, and 15.9 billion tonnes of oil.

Livestock production and processing is the main economic sector that provides employment for the indigenous population of the region and represents their primary source of livelihood. This sector is based on traditional activities such as reindeer breeding, fur farming, fishing, commercial hunting, and processing of meat, fish and furs.

6.3.3 TRADITIONAL ECONOMIC ACTIVITIES

Reindeer breeding is the principal traditional economic activity in the YNAR. The Yamal District is the world's leader in the number of domesticated reindeer with over 290,000 head as of January 2010. The nomadic reindeer herding in the Yamal District has been sufficiently resilient to withstand the economic crisis of the 1990s in Russia.

At present, there are three main forms of reindeer breeding and herding: municipal enterprises, communal, and private/family husbandries. Municipal enterprises typically consist of a number of breeding-herding 'brigades'[11]. Such brigades emerged during the Soviet period. Pasture areas, auxiliary buildings, equipment and an animal technician are allocated to each brigade. The composition of brigades still tends to be largely formed on a family basis.

Reindeer husbandry by private breeders and herders primarily draws on traditional/customary approaches and such private undertakings have limited accountability to the authorities. Private breeders tend not to have formal titles to the pastures in their use as grazing areas are typically selected on the basis of customary and personal agreements. As a rule, private breeders do not receive wages since their livelihoods are principally based on trading reindeer produce (including meat and antlers) and fish. In private husbandry, it remains a standard practice for the entire household to be involved in nomadic migration as part of the seasonal movement of the herds.

The most recent form of indigenous reindeer breeding and herding is 'commune based'. This form of husbandry first appeared in the region at the end of the 1990s and has been becoming more prevalent of late. Families tend to join the production communes as this enables simpler channels of produce sale and at a more favourable price. The fact that the communes also receive state allowances to maintain their herds represents another advantage. The seasonal migration span of the communes is typically shorter as compared with that of the municipal enterprises.

[11] Brigades emerged during the Soviet period and to date remain the main production units in the sector. A typical size of the herd amounts to 1000 – 2000 head, increasing up to 2000-2700 head after calving. In addition, it is typical for brigades to have privately-owned reindeer within a herd that belong to herders' families or their relatives. Generally, a herd may include in the range of 800-1500 private reindeer which are grazed together with those collectively owned or owned by the enterprise, or alongside in a separate herd.

Fisheries are also play a considerable role in the local economy. Fishing enterprises include both municipal and state-owned entities as well as private associations (communes, cooperatives and small private undertakings). Indigenous people constitute the largest workforce in the fishing industry. Fishing still draws significantly on traditional methods using nets and the migration of indigenous fishermen between the fishing areas accompanied by their families. Officially, the fishing areas in the region are assigned to the enterprises while the indigenous population in general still fish without a special permit and allocation of individual fishing grounds.

The Yamal Region has traditionally been a hunting ground for arctic fox, hare, squirrel, partridge and waterfowl. However, fur hunting is presently on the wane due to the lack of a sales market. Subsistence hunting still represents the traditional activity that is used by Yamal's indigenous communities, primarily as a subsistence food supply. Unlike the more profitable reindeer breeding and fishing activities, indigenous people generally resort to hunting on an occasional basis in order to diversify the family diet.

6.3.4 POPULATION AND DEMOGRAPHY

The total population of the YNAR amounted to 525,094 residents based on the 2010 National Census data (circa 0.4% of the country's overall population), including 443,043 urban residents and 79,861 rural population. The most recent data as of July 2012 show that the Region's population including registered migrants is 541,100 persons. The ethnic composition of the Region's population is as follows: Russians (59%), Ukrainians (13.1%), Tartars (5.5%), Nenets (5.2%), Khanty (1.6%), Selkup (0.3%). The Region is the historical homeland of the Indigenous Minorities of the North – the Nenets, the Khanty and the Selkups. Numbering around 37,000 persons, the Indigenous Peoples account for circa 7% of the region's total population, out of which over 14,000 people (40% of the Indigenous communities) are involved in the traditional nomadic activities, principally the breeding and herding of reindeer.

According to preliminary results of the National Population Census of 2010, the population of the Yamal District was 16,310 persons, including 11,265 persons who are the Indigenous People of the North and out of which circa 6,000 are nomadic. The birth and mortality rates in 2011 were 27.3 and 11.1 per 1,000 of inhabitants respectively.

There are no 'urban' settlements (as defined by the Administration) in the Yamal District. The district centre, the settlement of Yar-Sale (officially referred to as a 'rural' settlement), which has a total population of 6,486 persons and is located at the distance of some 460 km south of the Project License Area. Out of the total population of Yar-Sale, over 4,000 persons are the Indigenous Peoples.

The only permanent community within the Project licence area is the trading station of Tambey Factoria (at the northern perimeter of the Project licence area) which is part of the inter-settlement territory[12] and that primarily serves as a trading post for nomadic reindeer herders migrating in the

[12] Inter-settlements are areas typical with low population density where it is not possible to set up boundaries between the widely distributed individual settlements. The inter-settlement territories are typically used by the indigenous nomadic population as part of their traditional migration routes.

area. Currently available data (as of the 2010 Census) suggest that the permanent population in Tambey Factoria is 34 persons. The overall number of migrating population using the Tambey Factoria trading station is in the range of 600 people (or circa 118 nomadic households), with 99.5% of population being the Nenets indigenous reindeer herders. The Project is currently verifying the exact number of nomadic reindeer herders that use Tambey Factoria seasonally, i.e. predominantly twice a year – in spring and late autumn as part of their routine migrations. The number of residents in the Sabetta settlement amounts to nearly 1,200 rotation-based workers and there is no permanent population in this shift camp.

The licence area is also utilised by nomadic indigenous reindeer herders, hunters and subsistence fishermen. Outside of the Project licence area the nearest permanent community is Seyakha village under the Seyakha municipal village administration, located at approximately 120km distance south of the Project Site. The current permanent population of Seyakha is in the range of 2,600 residents in total, including over 2,000 people of the indigenous population out of which 99.6% are Nenets people and 0.4% are Khanty people.

6.3.5 VULNERABLE GROUPS

In the context of the Yamal LNG Project, representatives of the Indigenous Peoples of the North that are active in the Project Area of Influence account for over 80% of the local population. The indigenous communities have been identified as the main vulnerable group based on the criterion of their attachment to / dependence on specific natural environments and natural resources.

The majority of the population of Yamal District (nearly 70%) is represented by the Indigenous Peoples of which approximately 50% are people engaged in the traditional nomadic activities.

6.3.6 MIGRATION

According to the Federal Statistical Agency for the YNAR, inward migration in 2010 totalled 12,921 people, including 11,576 urban residents. During the same period, outward migration from the Region was 17,874 people, including 15,572 urban citizens. Thus, the net migration loss amounted to 4,953 people.

No disaggregated migration data is available at the level of individual rural settlements. According to the Federal Migration Service, 390 migrants arrived in the Yamal District in 2011 and 621 people left the district area, resulting in the net migration loss of 231 people.

6.3.7 LABOUR MARKET AND EMPLOYMENT

The number of employed people in the YNAR increased from 313,000 in 2000 to 366,000 in 2009. At the beginning of 2012, the unemployment rate was 3.6% (based on the ILO calculation methods). However, according to the Department of Employment of YNAR, the region has a shortage of labour and is characterised by low labour mobility.

In the Yamal District, during the reporting period of 2011, 471 citizens sought the assistance of the social services in search of suitable jobs, which signifies 102.8% increase compared to the number of applicants in 2010. By the end of the reported period, 118 residents of the District were registered as unemployed.

Representatives of the indigenous population account for 73% of the total number of the unemployed.

6.3.8 LAND USE

The Project licence area is located on grazing lands of the Yamalskoye municipal reindeer breeding farm which is within the jurisdiction of the Seyakha village administration. The grazing lands are primarily used for the seasonal migration of reindeer herds, mainly by the “Yamalskoye“ municipal reindeer breeding farm and a number of the indigenous breeding communes and families, with the total stock of over 60,000 head.

Circa 190 indigenous nomadic families (1,110 people) use this area. They predominantly live in the tundra and lead a nomadic lifestyle, i.e. migrating between the seasonal pastures depending on the time of the year, without resort to permanent housing. The privately owned reindeer stock is over 25,000 in total. The fawning (April-May) and fattening (until October) of domestic reindeer takes place on productive pastures adjoining the Obskaya estuary. Other activities undertaken in the area during the summer/autumn season include bird hunting, gathering of waterfowl eggs, mushrooms and berries.

The customary and formally registered fishing grounds used by the local communities and individual fishing entrepreneurs during the summer/autumn period are located in the Sabetta River basin and adjacent lakes.

The most convenient and easily passable locations (less elevated and less windy) are typically selected by the reindeer herders for their migration routes, also taking into account the suitable water crossings. Presently, the herders’ routes are based on the traditional migration paths.

More detailed information on the permanent and migratory population and land use patterns (including the reindeer herder migration pathways) in the Project licence area will be ascertained as part of the ESIA process.

6.3.9 SOCIAL INFRASTRUCTURE AND SERVICES

Public health system

At present, health care is delivered to the YNAR population through 31 medical facilities, including 19 hospitals, 5 specialised clinics, 3 self-contained outpatient institutions, and 4 ambulance stations.

Medical care in the Yamal District includes: 1 district hospital, 4 local hospitals, 1 out-patient clinic, and 5 rural first-aid and obstetrics stations. In addition, a total of 25 mobile paramedic units currently staffed with 23 paramedics and 14 nurses are available to serve the needs of the nomadic population.

Education

The public education system in the YNAR comprises 507 educational institutions, including 387 institutions under jurisdiction of the government education authorities.

The following educational institutions are available in the Yamal District:

- 7 pre-school facilities;
- 6 general educational institutions (schools/boarding schools);
- 1 extramural training school;
- 1 children supplementary education institution;
- 1 municipal educational institution for orphans and children without parental support;
- 2 municipal institutions of pre-school and primary education.

Other social infrastructure

At present, 226 cultural institutions (5 state-owned and 221 municipal institutions) operate in the YNAR, including78 municipal libraries; 83 social/recreation institutions with branches (national culture centres, recreation centres, youth clubs and culture/leisure centres, handicraft centres); 38 arts and cultural educational institutions; 19 museums and 3 cultural institutions of other types.

The Yamal District has 6 public libraries, of which 4 are part of the municipal social/recreation institutions; a district museum (the "Yamal Regional Museum"); 5 clubs; and the Yamal Childrens' School of Music with 2 units in Mys Kamenniy and Seyakha settlements.

6.3.10 COMMUNITY SAFETY AND SECURITY

Natural and man-induced hazards in the region are associated with a large number of potentially hazardous facilities primarily related to oil and gas production, processing and transportation, and extreme natural climatic conditions. In 2010, the Governor of the YNAR approved a long-term programme "Health and safety of the Yamal-Nenets Autonomous Region population for 2011-2013" aimed at prevention of, and response to, natural and man-induced emergencies, implementation of civil defence, emergency protection and fire prevention measures at the regional and inter-municipal levels.

6.3.11 TRANSPORT INFRASTRUCTURE

The inland transport system of the region is divided into two transport areas: the western and the eastern areas. The western transport area is based on the Ob River with a branch line of the Northern Railway system approaching the river near the Labytnanga Town. The heart of the entire transport system is the Salekhard-Labytanga industrial and transport centre which hosts large scale cargo transhipment operations from water to railway transport. In 2010, the Obskaya-Bovanenkovo-Karskaya rail-line was completed that is used for the delivery of cargoes for the development of the region's deposits. The eastern transport area is based on the use of the Novy Urengoy-Tyumen section of the Sverdlovsk Railway, as well as the medium-sized rivers: the Nadym, the Pur, and the Taz. In contrast to the western area, the eastern transport area is characterised by a relatively well-developed network of roads linked to the National road system.

The most serious transport-associated issue in the Region is the onshore connection of the two transport areas by railways or motorways. According to statistical data, the total length of hard-surface public roads is 4.1km. The density of hard-surface public roads is 0.03 km per 1,000 km^2 of the territory. The Yamal Peninsula is characterised by a poorly developed of the transport infrastructure. At present, a considerable volume of supplies is delivered to the Peninsula by sea during summer navigation period (via the Port of Kharasavey). A new railway line from Obskaya to

Bovanenkovo (525km) was built to allow all-year cargo-and-passenger transportation to the Western side of the Yamal Peninsula, approximately 150km from the Project at its nearest point.

The only all-year transport link between the Sabetta Camp and the administrative regional centre in Salekhard is provided by helicopters. Transportation by water via the Obskaya estuary is possible during the period of summer navigation. Local roads can be used in winter.

6.3.12 CULTURAL HERITAGE

Tangible forms of cultural heritage

To date, there has been limited survey of historical and cultural heritage in the Project Area of Influence. According to the YNAR Historical and Cultural Heritage Protection Agency, this area features three cultural heritage sites listed in the Regional Historical and Cultural Heritage Registry. Two sites known to be located within the Project licence area are:

- The Hill of Heads ('Neucheda') – located in the Sabetta Camp area and comprises a round mound on top of which reindeer antlers and skulls are traditionally placed; and
- The Seven Little Mounds ('Siiulortse') – consists of the seven small hills (with the height of 100-120 cm) on top of which rocks as well as reindeer antlers and skulls are placed.

A third sacred site, 'Khalvure Seda', is located outside the Project licence area. None of the sites is expected to be directly impacted by the Project activities either during the construction phase, or the operation phase as they do not overlap with the Project infrastructure, although measures to ensure the protection of these sites will be further developed and described in the ESIA.

According to verbal evidence of local indigenous residents, the Project licence area also includes 30 to 40 unregistered sites of historical and/or cultural heritage, including ancestral sacred sites, burial sites, and traditional worship and ritual sites.

The Government authorities and independent experts have recommended that prior to the commencement of further construction works additional detailed reconnaissance field survey be undertaken to determine the precise location of these sites relative to Project activities. Such additional surveys, including archaeological survey work and the identification of sacred sites, will be performed between June and September 2013.

Intangible Heritage

Spiritual aspects of cultural heritage primarily relate to traditional lifestyles, knowledge and skills, construction and maintenance of nomads' dwellings (chums – mobile wooden framed dwellings covered by reindeer hides), processing products of reindeer breeding, fishing and gathering, folk medicine, rituals and habits of the indigenous people.

7 IMPACTS AND MITIGATION MEASURES

7.1 SOCIAL IMPACTS

7.1.1 INTRODUCTION

This section outlines the key potential socio-economic aspects associated with the construction, commissioning and operations phases of the Project. It also describes the approach to assessing and mitigating the socio-economic impacts to be taken as part of the ESIA process. In accordance with the specifics of a scoping report, this section does not intend to provide detailed evaluation of the potential impacts or description of the associated management measures, but to identify the issues that will be duly addressed as part of the ESIA.

Potential social impacts from the realization of the Project are being identified through a combination of previous, current and future stakeholder engagement activities (see Chapter 3 and specifically Table 3-1) and the performance of a systematic structured review of the Project activities in relation to the following socio-economic aspects:

- The company personnel, its contractors and local community health, safety and security, including the potential for impacts associated with:
  - Safety aspects associated with the construction and operation of the Project infrastructure and transportations (including emergency preparedness and response);
  - The presence of security services to guard the Project infrastructure and related assets;
  - Community exposure to adverse health effects, such as potential risks associated with the potential introduction of contagious or non-endemic human diseases[13] due to the presence of the Project construction workers, as well as any psychological impact experienced by local communities as a result of the Project implementation.
- Population influx, i.e. the inflow of non-local population into the Project licence area, including the workforce and opportunistic economic migrants in search of employment and business prospects;
- Land acquisition and displacement resulting from the establishment of the Project infrastructure and associated transport routes, including the potential for the impacts associated with:
  - Economic displacement.
  - Effects on indigenous lands and traditional land use practices, primarily the reindeer herding and related pastures and migration routes.
- Economic impacts, including the potential for impacts on:
  - Direct and indirect employment and generation of additional job opportunities in the associated service and business sectors.
  - Indigenous livelihoods that are non-industrialised and based on the use of natural resources.

[13] Diseases not typical for the population of the region or territories within the Project Area of Influence

  - Fishing, hunting and gathering.
- Labour and working conditions, including the consideration of:
  - Occupational health and safety, taking account of the climatic conditions of the Arctic region.
  - Ethics at the workplace.
  - Worker accommodation and amenities.
  - Workforce demobilisation upon completion of the main Project phases.
  - Contractor labour practices.
- Cultural heritage, including:
  - Tangible heritage.
  - Intangible cultural heritage.
  - Cultural resources of indigenous peoples.
- Potential socio-economic benefits.

The potential impacts associated with each of the above aspects are addressed in turn in the following sub-sections, including separate consideration of the impacts during construction, commissioning and operation where appropriate.

In assessing the potential for social impacts it is important to take into consideration that, as described in Chapter 6.3, with the exception of a small number of permanent residents in Tambey, there are no sizeable permanent settlements or dwellings within the Project licence area; the nearest such community is located some 120km south from the Project location (the village of Seyakha). However, the Project licence area and the surrounding territories of the tundra have been traditionally utilised by indigenous reindeer herders who migrate seasonally across the area and by subsistence fishermen. Since the 1990s, the area currently occupied by the Sabetta Camp has been the location of the same-named factoria (trading station) used until recently relocated by the local indigenous residents and communes. Another trading station, Tambey Factoria, is located circa 30 km north of the Project licence area facilities and since the 1930s has been a trading post for migratory herders. Limited information and data on the numbers of land users and migration routes for reindeer herders is currently available at either a regional or district level.

At the local level it is preliminarily estimated that approximately 40 families are involved in reindeer herding on migration routes that cross the Project licence area. However, more detailed site-specific data are required to fully assess the potential extent of Project impacts and such data will be gathered as part of the ESIA development processes, including from the District and village administrations, government authorities and other available credible sources.

7.1.2 COMMUNITY HEALTH, SAFETY AND SECURITY

General Considerations

Community health, safety and security impacts and risks will be localised to the Project licence area and in particular individual onshore and offshore construction sites/areas. It is therefore not anticipated that there will be any direct adverse health, safety or security impacts on any permanent communities. It is, however, likely that there will be potential impacts associated with nomadic/transient land users, primarily reindeer herders migrating between the seasonal pastures

and indigenous fishermen, involved both in subsistence fisheries and small-scale commercial fish trade. In relation to such land users, particular attention will be required in the ESIA to the aforementioned Sabetta and Tambey Factorias (trading stations) - the former located within the Project licence area and is currently used by a number of reindeer herders (mainly the local communes), whereas the latter is located approximately 30km from the nearest site of Project facilities and has traditionally been the place of seasonal gathering for herders migrating through the tundra. The factorias represent the nearest significant congregation location for the land users (when in use primarily during spring and autumn periods) to the Project licence area.

Shipping risks associated with LNG carriers and condensate tankers on their shipping routes are outside of the scope of the financed Project and will therefore assessed in the ESIA to a level commensurate with their designation as Associated Facilities.

Construction

During construction of the Project, potential community health, safety and security impacts and risks will be primarily associated with the following aspects:

- Active construction areas. Areas of active construction with operating equipment and on-going works pose a risk to the public if access is not adequately controlled. Access control methods and the establishment of appropriate alternative bypass routes and means of egress where necessary will be addressed within the ESIA and ESMPs, including both for the onshore construction sites and offshore construction areas (e.g. dredging areas). The ESIA will describe access control measures, including physical and human security measures. Such measures will be implemented with due consideration of the specifics of traditional herding activities in the locality and based on discussion with the local land users. In relation to security measures, the ESIA and ESMP will address relevant protocols (codes of conduct) for security arrangements, for example including control of the use of security dogs and firearms as well as the general principles of ethical behaviour by security personnel. Wherever necessary, adequate crossings will be set up to allow migrating reindeer herders and their livestock to safely pass through or bypass the areas occupied by the construction activities.
- Noise and air emissions associated with construction activities. Given the low frequency occupancy of the Project licence area and the predominant seasonal frequency of the local land users' migrations, significant health impacts on local communities due to the elevated noise levels and air emissions are not expected.
- Construction Traffic. Increased traffic (marine and road) associated with construction, including the delivery of materials and personnel as well as localised movements of the equipment and machinery, may pose a potential safety risk to other users in the area. There is currently no developed road network outside of the licence area, except for the seasonal winter routes that are unlikely to be used for the purpose of transportation of major volumes of materials and goods. As construction equipment and materials will be mainly transported to the Project site by sea, the traffic risk is preliminarily estimated as low. Transportation of the construction personnel will be primarily by air with the use of helicopters, and, less predominantly, by sea during the navigable season. Nevertheless, these impacts will be considered within the ESIA, including the adoption of appropriate mitigation measures (these will include consideration of safety exclusion zones for offshore activities, road safety

measures and the design of crossing points for reindeer herders to allow their safe passage through the linear road infrastructure, etc.).

- Worker Influx. The influx of Project workers potentially poses the risk of bringing contagious human diseases that are not endemic to the region and that may affect local communities. However, the risk of this impact is preliminary estimated as low due to the fact that all of the construction workforce will be housed in dedicated on-site residential facilities. Another possible consequence resulting from the presence of a large-scale non-local workforce may be general disruption to the traditional local lifestyle in the previously sparsely populated area. Such impacts, and associated mitigation measures, will be addressed within the ESIA. Mitigation measures to be considered in the ESIA will include medical examinations for all workers prior to deployment on site, the provision of medical facilities at the Project site and workforce vaccinations as appropriate, strict enforcement of the rigorous code of conduct for all personnel etc.

Commissioning and Operation

During commissioning and operation of the Project, community health, safety and security impacts and risks will be primarily associated with:

- Active operational sites. Active operational sites pose a risk to local communities if access is not adequately controlled. Access control methods during commissioning/operation will be addressed within the ESIA and ESMPs in a similar manner to construction (see above).
- General noise and air emissions associated with commissioning of the LNG Plant (including flaring during the start-up) and operation. Given the low occupancy and seasonal migration frequency in the Project area, the potential health impacts on local communities will be limited. However, given the scale of noise and air emissions during commissioning and operation of the Project (and most specifically the LNG facilities), such impacts on local communities will be assessed in the ESIA. Considering the predominantly transient nature of potentially affected communities and the absence of permanent settlements in the vicinity of the Project facilities, the assessment will focus on the determination of the Sanitary Protection Zone (SPZ) around the Project facilities to ensure that adverse impacts to human health are not encountered (see also Section 7.2 in relation to air quality and noise impacts).
- Road traffic. Increased traffic associated with commissioning and operation, relative to pre project levels, may pose a safety risk to local land users. At the same time, the nature of the transportation arrangements due to the undeveloped road network in the area (as mentioned in the construction impact section above) will be taken into account, with the prevailing transport by air and sea. The traffic risks and impacts will be considered within the ESIA, including the adoption of appropriate mitigation measures (these will include consideration of road safety measures and the design of road crossing points for reindeer herders in suitable locations to be agreed directly with the herders).
- Major accident hazards. The assessment of risks associated with major accident hazards during the commissioning and operation of the Project facilities (including onshore facilities and shipping risks) will include consideration of risks to any third party land users and fishermen in the vicinity of the Project onshore and nearshore facilities. Specifically, such third parties, if applicable, will need to be addressed within the Project's emergency response and preparedness plans. The existing herder migration routes and temporary stopping/resting locations will be taken into account as part of the Project's overall emergency response planning. Due consideration will also be given in the development of

spill response measures in the coastal and aquatic areas to the prevention of impacts on fishermen as a result of any accidents involving the sea transport. Information concerning emergency preparedness and response planning will be shared with the district and village administrations and other relevant authorities (e.g. territorial branches of the Federal Ministry of Emergencies) to ensure their awareness of the proposed measures, any planned drill exercises, requisite communication protocols, etc.

7.1.3 POPULATION INFLUX

A significant Project workforce, peaking at 7,000 personnel during construction, will be introduced to the Project licence area. The impacts of such influx will be mitigated as the majority of personnel will be housed in dedicated Project accommodation facilities, with the remainder being housed in satellite accommodation located close to Project facilities, and will be subject to the rigorous code of conduct. No impacts on regional housing are anticipated.

However, in cases of emergency when medical treatment cannot be provided on site, the local health facilities are planned to be used. It may pose a risk of overloading the local health infrastructure, particularly given its limited capacity. Potential health impacts associated with the influx of workers to the area will be considered within the ESIA as described in Chapter 7.1.2 above.

Due to the nature of the local environment and the sparse and widely dispersed population, the undeveloped road network, and Project settings (with the Project being located within the strictly regulated state border control zone), it is not anticipated that construction and operation of the LNG plant and associated facilities will attract a major influx of opportunistic economic migrants (non-workforce) from other localities not directly associated with the Project, or lead to a natural increase in the existing population and significant changes in birth rate.

7.1.4 LAND ACQUISITION AND INVOLUNTARY RESETTLEMENT

There are no permanent residential communities within the Project licence area and therefore no physical resettlement will be required.

Indigenous reindeer herders and fishermen are known to use lands within Project licence area, including for reindeer pastures and seasonal migration routes. These land users may be affected during both Project construction and operation through a loss of access to lands and fishing/hunting grounds, therefore leading to potential economic displacement. Such impacts will be addressed in the ESIA, including assessment of economic losses[14], consequences for traditional resource-based livelihoods, any potential impacts on lands and natural resources in the traditional ownership or under customary use and the associated traditional economic activities (TEA), as well as the methods of compensation for such losses. Losses caused to indigenous people will be assessed in line with the international practice of managing land acquisition and economic displacement and the existing Russian statutory mechanisms. All mitigation and

[14] Losses will be further assessed through targeted interviews.

compensation measures will be developed through informed consultation and participation of the affected indigenous communities as set out in the SEP.

Reindeer herders

Potential impacts on reindeer herders to be considered in the ESIA include:

- Direct impacts on reindeer herder migration routes through loss of access to lands in the Project licence area. This may include a loss of access to specific Project areas and also range segmentation (leading to the division of pastures and the disruption of traditional paths of herders' seasonal migrations) by linear Project facilities such as pipelines, roads and transmission lines.
- Indirect impacts in the event that reindeer herders displaced from the affected pastures and migration routes in the Project licence area move into routes/areas already used by other herders, thus putting pressures on limited forage/lichen resources in the areas and causing a further cascade of the displacement effects.
- Loss of access to Sabetta Factoria and potentially reduced access to Tambey Factoria trading station.
- Disturbance or harassment of reindeer in the vicinity of the Project licence area from noise/light impacts from the Project facilities, the physical presence of workers and mobile Project equipment (including road vehicles) and animals (dogs).

In order to assess such impacts, further information and data are required on the following aspects, as part of the ESIA process:

- The location and direction of potentially affected (directly or indirectly) migration routes, including those used seasonally or alternating on a yearly basis.
- The availability of alternative routes and pastures in the area and the extent of herders' flexibility in switching to alternative pastures and migration paths.
- The numbers of herders and head of reindeer using the potentially affected pastures and migration routes, as well as the nature of the existing land tenure arrangements (i.e. title-based or customary).
- The carrying capacity (principally the levels of accessible forage/lichen grounds for the reindeer) and the restoration rate of the potentially affected pastures and herder migration routes.
- The usage (numbers and frequency/periods) of Sabetta and Tambey Factoria trading stations.

Mitigation measures will need to be considered and (if necessary) developed in the light of the above information. Measures that may need to be considered/developed include:

- Dedicated crossing locations on linear Project features.
- Assistance with migration route relocation (if required).
- Relocation or upgrade of the trading stations (if appropriate).
- Compensation, with the method of compensation such as monetary, land-based or in-kind, to be agreed with the users (see also above).
- Maintenance of any winter roads used by the Project.

Fishing, Hunting and Gathering

Potential impacts on fishing and hunting as well as gathering practices to be considered in the ESIA include:

- Loss of access to onshore and coastal/estuary fishing areas and any traditional hunting and gathering grounds in the Project licence area or safety exclusion zones.
- Impacts on fishing and hunting/gathering resources/habitat from construction activities (e.g. pipeline and road crossings of rivers, access roads, and offshore dredging).

In order to assess such impacts, further information and data are required on the following aspects, which will be sought as part of the ESIA process:

- The location of potentially affected fishing areas and hunting/gathering grounds.
- The numbers of fishermen, hunters and fish/animal catch data as well as produce gathered in the Project Area of Influence.

Mitigation measures will need to be considered and (if necessary) developed in light of the above information. Measures that are likely to be considered/developed will include:

- Single-span aerial road and pipeline crossings of rivers to minimise disturbance of rivers.
- Control (codes of conduct) of fishing, hunting and gathering by Project workers and contractors.
- Appropriate control of dredging activities (see also Chapter 7.2).
- Compensation (see above) and also payment of fees for fish loss under Russian Federation regulations.
- Maintenance of any winter roads used by the Project.

7.1.5 LABOUR AND WORKING CONDITIONS

Labour and working conditions will be regulated in compliance with the Project Standards, including Russian labour code and applicable ILO standards and guidelines. Yamal LNG has overall responsibility for ensuring compliance with the Project standards, including responsibility for managing contractors' compliance in order to meet occupational health and safety standards during construction and operations. The ESIA (including the ESMP) will identify minimum requirements and a mechanism that ensures these are adopted.

In addition, proper consideration will be given to location-specific aspects including the physical and psychological health risks associated with:

- Extreme low temperature conditions.
- Day light hour variations (e.g. seasonal affective disorder).
- Low air humidity (e.g. 'Arctic asthma').

The ESIA and ESMP will also address worker accommodation in line with Good International Industry Practice. Noise and air quality impacts on the workers accommodation will also be assessed in the ESIA, including confirmation that the permanent accommodation areas used

during operation are outside of the required SPZ. Further details of noise and air quality impacts are described in Chapter 7.2.

7.1.6 CULTURAL HERITAGE

Potential cultural heritage impacts may be associated with the disturbance or loss of either:

- Tangible resources, i.e. physical sites, structures, features, objects and parts of the natural landscape that have historical, ethnographic, spiritual, and cultural value (including archaeological, palaentological and man-made assets) and particularly those of importance to the indigenous peoples).
- Intangible cultural heritage, including traditional skills, practices, customs, rituals, spiritual ceremonies and knowledge, with the particular emphasis on the intangible cultural resources of the indigenous peoples.

Tangible resources

As was mentioned in Section 6.3.12, the area of South Tambey Gas Condensate Field has so far been insufficiently surveyed either by the government agencies or by independent research organisations. According to the YNAR Historical and Cultural Heritage Agency, three cultural heritage sites listed in the regional heritage registry are location in the vicinity of the Project licence area; two are located within the Project licence area, with the third feature being outside it. It is not anticipated that these features will be directly influenced by the Project activities either during the construction phase or the operation phase as their locations do not overlap with the Project infrastructure.

Preliminary discussions with representatives of the local indigenous communities have indicated that there may be in the range of 30 to 40 unregistered sites of historical and cultural heritage in the Project licensed area, including ancestral sacred sites, burial sites and places of ritual worship. The presence of such sites needs to be further ascertained and examined as part of the ESIA through detailed consultation with the relevant indigenous residents.

Taking into account the current insufficient knowledge of the historical and cultural features of the area, the Government authorities and independent experts have recommended that the Project undertake a detailed survey of the Project licensed area and its immediate surroundings to determine the presence, number and type of the objects that may represent cultural, historical or spiritual heritage. These aspects will be further investigated as part of the ESIA process.

Appropriate mitigation measures will be drawn up on the basis of the findings of detailed site survey data. In addition, a Chance Finds Procedure will be developed as part of the ESMPs to ensure that in the event of previously unknown cultural objects being discovered they will be appropriately managed.

Intangible cultural resources

The Project does not involve any commercial exploitation or use of the traditional knowledge and skills of the local indigenous communities. At the same time, it is recognised that some disruption may be caused to the spiritual worship practices or rites carried out by the local indigenous communities in relation to the sacred objects found within the Project licensed area. The ESIA

process will establish the nature and frequency of any spiritual/ceremonial activities practised and the associated ethnographic knowledge pertaining to objects. Appropriate mitigation measures will be developed based on consultation with the local indigenous communities.

7.1.7 POTENTIAL SOCIAL BENEFITS

In addition to the assessment of potential adverse social impacts, the ESIA will also assess the potential beneficial social effects. Such beneficial effects include:

- Regional and local economic development.
- Direct and indirect employment opportunities (see also Chapter 7.1.4).
- Business development and spin-off effects.
- Construction and upgrade of the social infrastructure and housing.
- Educational opportunities for local community (including vocational training).
- Significant improvements in regional and local transport infrastructure due to shipping routes development and airport construction (it is planned at the airport will serve civil aviation purposes).

The Project will also seek to benefit the local communities through the provision of assistance via the following existing programmes:

- Engagement and Support Programme for Yamal Region Indigenous People.
- Rural Development Programme for Seyakha Settlement.

Again, these programmes will be more fully described in the ESIA.

7.2 ENVIRONMENTAL IMPACTS

This section outlines the key environmental considerations associated with the construction, commissioning and operations phases of the Project. It also describes the approach to be taken within the ESIA. However, consistent with the nature and intent of a scoping report, it is not intended to provide detailed analysis or findings, but rather outline the issues that will be fully addressed in the ESIA.

7.2.1 ENVIRONMENTAL IMPACTS DURING THE CONSTRUCTION PHASE (INCLUDING PRE COMMISSIONING ACTIVITIES)

7.2.1.1 ATMOSPHERIC EMISSIONS

During preparatory and construction works, local air quality will be impacted by the emission of atmospheric pollutants. Air emission sources will include internal combustion engines of vehicles, construction and road machinery as well as diesel-fired power plants, boiler-houses and waste incinerators. These will lead to the atmospheric releases of hydrocarbon combustion products, primarily including: carbon monoxide (CO), oxides of nitrogen (NO_X), sulphur dioxide (SO_2), benz(a)pyrene, lead compounds, dioxins (associated with incinerator emissions) and soot/particulate matter (PM).

In addition, a significant impact on local air quality and nuisance may be caused by dust generated by the movement of construction vehicles, machinery and also during earthworks.

Other potential one-off atmospheric releases include gas venting from the removal of historical gas pipelines.

When preparing this section of the ESIA, a key focus will be given to construction activities at well cluster sites as flaring of (limited volumes of) hydrocarbons during well testing operations will represent a potentially significant source of air emissions.

Air emission sources, their locations and impact intensity will be assessed in respect to potential impacts on sensitive receptors, specifically residential areas and the most vulnerable natural complexes. Impacts will be assessed through the estimation of emission inventories, modelling assessment of the changes to local air quality levels and comparison against applicable air quality standards for the protection of human health and sensitive vegetation. Impact mitigation measures (including application of Project standards) along with air quality monitoring methods will be advanced.

7.2.1.2 NOISE AND VIBRATION

There will be a range of noise and vibration sources during construction including:

- Heavy equipment to be used during construction activities.
- Temporary power generators.
- Piling activities associated with the construction of pile-supported structures for seaports (leading to vibration-induced underwater noise and airborne noise) and LNG Plant's modular facilities (also leading to noise and vibration impacts).

All primary noise and vibration sources will be identified.

Noise and vibration sources, their locations and impact intensity will be assessed in respect to the impact on sensitive receptors, such as personnel accommodation camps, reindeer herders, and both terrestrial and marine fauna. Consideration will be given to bird nesting areas, spawning areas and marine mammal foraging areas (see also Section 7.2.1.6). In the event that the expected impact levels exceed standards applicable to the Project, relevant mitigation measures will be developed.

Noise modelling will be completed where necessary to confirm that relevant noise standards are met. Moreover, approaches to noise/vibration monitoring will be considered for construction activities causing significant noise/vibration levels.

7.2.1.3 IMPACTS ON SURFACE WATER BODIES

Impacts on surface water bodies are expected to occur as a result of water abstraction from lakes and the Gulf of Ob during early construction and late construction/operations, for water supply and process needs and from the discharge of wastewater to the natural environment. More specifically construction activities will result in the generation of sanitary wastewater, stormwater and 'hydrotest water' generated in the course of hydraulic pressure testing of pipelines, storage tanks or other equipment.

The Project ESIA will contain a description of applicable Project discharge limits and measures that will be used to ensure the standards are met. Measures will be defined in the ESIA, depending on the volume and nature of contaminants in the wastewaters, but are likely to include information on site drainage controls, interceptors, wastewater treatment plants amongst other measures. Similarly, the volume and characteristics of the hydrotest waters will be described in the ESIA, for example use and concentration of chemical additives if deemed to be necessary by engineers. Disposal options for hydrotest waters will be assessed; if hydrotest water containing harmful additives is to be discharged to a water body dispersion modelling will be undertaken to optimize the hydrotest philosophy, assess the magnitude of any harm and identify any need for mitigation measures.

Consideration will be given to impacts associated with the Associated Facility dredging activities in the Gulf of Ob, especially during the removal of any seabed sediments and placement of dredge spoil within a licensed disposal area (see also Section 7.2.1.7).

In addition, consideration will be given to potential oil/chemical spills; appropriate measures aimed at preventing potential spills and their migration on the ground surface and in water bodies will be described.

Where potential impacts to surface water quality are identified, appropriate methods will be developed to monitor impacts/verify effectiveness of protection measures designed to mitigate construction impacts. Monitoring measures will be captured as part of the ESMP.

7.2.1.4 IMPACTS ON SOILS AND THE GEOLOGICAL ENVIRONMENT

Construction activities may significantly impact the geological environment and soils within the construction sites. Impacts are associated with significant volumes of earthmoving operations, soil compaction, and creation of new land relief forms. All the facilities will rest on similar rocks and substrata.

Consideration will be given to the universal presence of permafrost in the Project license area and to potential complications that may arise during construction activities. For this reason, consideration will be given to methods to be applied for the construction of facilities/structures on permafrost rocks. In addition, appropriate measures for the prevention of permafrost degradation processes and the reinstatement on temporarily affected areas will be presented in the ESIA and within soil management plans.

Moreover, measures aimed at maintaining existing hydrology, thus preventing activation of hazardous natural processes (erosion, bog formation, flooding, etc.) as a consequence of both construction activities and changes in surface water runoff, will be detailed. Measures to monitor hazardous natural process will be proposed, as required, in areas where they are deemed likely to occur.

At the seaport, the construction of berthing facilities and jetties will have the potential to alter coastal process. The impacts on coastal process, including accelerated erosion and sedimentation processes will be presented in the ESIA.

Potential impacts to groundwater may result from piling and drilling activities (where preferential contamination pathways to groundwater horizons may be generated) and such risks will be

assessed in the ESIA and, where necessary, additional mitigation measures will be developed. Other potential sources of groundwater contamination relate to the risk of hydrocarbon and chemical spills. Pollution prevention measures that reduce the risk of spills occurring and entering the environment will be described in the ESIA.

7.2.1.5 BIODIVERSITY CONSERVATION (TERRESTRIAL AND FRESHWATER ECOSYSTEMS)

Tundra natural complexes in the Project license area are characterized by significant vulnerability and poor potential for self-regeneration. The region is occupied by ichthyofauna, mammals and bird species listed in Red-Data Books[15].

In this regard, all the environmental survey reports necessary for elaboration of design documents for each Project facility will be thoroughly studied (see also Section 6.2). Based on data currently available, and additional studies commissioned as part of the ESIA where appropriate, an assessment of the Project's impact on regional biodiversity will be completed and ecosystem services of natural complexes will be assessed.

The approach to ecological assessment and protection will be based primarily on the standards and guidance described in IFC Performance Standard 6: Biodiversity Conservation and Sustainable management of Living Natural Resources and its associated guidance. Project affected habitats will be categorized as modified, natural or critical habitats, and consistent with the entire ESIA, the mitigation hierarchy will be adopted, in which avoidance of impacts will be the preferred option. Where avoidance is not possible, measures to minimise impact and restore damage will be developed, with compensation and/or offsets for residual damage if applicable. Where offsets are required, the concept of 'no net loss' as defined in the IFC Performance Standards (PS6) will be adhered to and preference will be given to 'like-for-like' and 'in-kind' offsets to preserve the same biodiversity values.

The approach will also include full consideration of ecological value within the context of 'ecosystem services' i.e. the benefits derived from ecosystems in terms of: (i) provisioning services, which are the products people obtain from ecosystems; (ii) regulating services, which are the benefits people obtain from the regulation of ecosystem processes; (iii) cultural services, which are the non-material benefits people obtain from ecosystems; and (iv) supporting services, which are the natural processes that maintain the other services.

Short and long term ecological monitoring requirements will be developed as part of the ESIA. Where necessary, recommendations for additional biodiversity survey studies and or conservation efforts will be specified.

7.2.1.6 BIODIVERSITY CONSERVATION (MARINE ECOSYSTEMS)

[15] Refers to lists of threatened Species (also known as the Red List or Red Data List), The International Union for Conservation of Nature (IUCN) maintains the IUCN world Red Data List. A series of Regional Red Lists are also produced by countries, including the Russian Federation.

The same approach based on IFC Performance Standard 6 “Biodiversity Conservation and Sustainable Management of Living Natural Resources” described for terrestrial ecosystems above will be applied to marine ecosystems.

Potential impacts on marine biodiversity may be caused by the construction of berths in coastal zone areas. Ecosystems may be affected as a consequence of increased water turbidity, physical impact, construction vessels’ discharges, elevated noise levels (see Section 7.2.1.2), potential oil products spills and unavoidable destruction of marine organism habitats resulting from the physical impacts of piling and dredging during construction. As in the case of terrestrial ecosystems, environmental survey reports will be thoroughly studied within the ESIA in order to assess potential impacts to marine sensitivities and to develop appropriate mitigation measures that avoid or minimise adverse impacts. This will include consideration of data relating to the natural water/bottom sediments quality as well as data about flora and fauna.

The potential impacts associated with the introduction of invasive alien species will also be assessed and measures to minimise such impacts described in the ESIA. Of primary concern in this regard will be the introduction of invasive species in ballast water discharges from visiting construction related ships.

Potential environmental benefits, for example the creation of new habitat due to port structures, will also be examined.

For all potential impacts identified, the significance of impact or risk will be assessed and appropriate mitigation measures and monitoring measures will be presented.

7.2.1.7 IMPACTS CAUSED BY DREDGING OPERATIONS

The impacts from dredging performed by Rosmorport during the construction phase will be assessed to the extent possible within the ESIA as an associated facility/activity (i.e. recognizing that Yamal LNG will not be directly responsible for dredging during the construction phase but will be able to exert some influence).

The overall impact of dredging activities on both sea water quality and biodiversity will depend on alternatives to be selected for carrying out of soil excavation/soil dumping works. Impacts will manifest themselves in increasing salinity levels within the Gulf of Ob (due to removal/alteration of sand bars), smothering of the seabed, elevated water turbidity levels and change in the water chemical composition that, in turn, may affect benthos, ichthyofauna and other aquatic organisms. In addition, it will be necessary to consider potential impacts on ecosystem food chains as a potential instrument of an indirect impact of the regional marine biota.

It is necessary to consider and assess selected alternatives for soil excavation/soil dumping in order to minimise impacts on marine ecosystems. The ESIA will give full consideration the ecological value and presence of historical contaminants in the dredge and disposal areas.

7.2.1.8 WASTE MANAGEMENT

Construction activities will result in the generation of domestic waste and industrial waste including hazardous wastes.

To effect adequate waste management, all types of waste will be identified and a Waste Management Plan (for the construction period) will be developed. This plan will comprise an estimation of expected amounts of waste generated, the description of waste generation sources, and requirements for waste handling, recycling and disposal to interim waste management facilities[16] based on good international industry practice.

The plan will adopt the principles of 'waste management hierarchy' that considers prevention, reduction, reuse, recovery, recycling, removal and finally disposal of wastes and also environmental protection in terms of protection of:

- Soils and water resources.
- Air quality (in the case of incineration).
- Human health and safety.
- Impacts to fauna (with consideration given to scavenging animals).

Particular consideration will also be given to the assessment of sites designated for the temporary storage of drilling wastes at well cluster sites, including the prevention of potential leakages from drilling waste pits.

To the extent that ships' wastes are applicable to the Project, they will also be assessed within the ESIA and the associated Waste Management Plan. Thus, responsible management of ships' wastes, regardless of whether Yamal LNG or Rosmorport has primary responsibility, will be described in the ESIA.

7.2.2 ENVIRONMENTAL IMPACTS DURING THE COMMISSIONING AND OPERATIONAL PHASES

7.2.2.1 ATMOSPHERIC EMISSIONS

During the Operational Phase, main air emission sources will be concentrated in: the accommodation camp (a boiler-house, an incinerator, etc.); the main gas turbine power plant; the LNG Plant site (flare system, gas-turbine generators, tanks for storing methanol, stable condensate, and propane); at the airport (air-engines, a fuel store, a boiler-house, and an electric power plant); and in the seaport area (engines for all types of vessels, engines for reloading machinery, vessel loading, boil off gas etc.). In addition, dedicated waste incinerators will be installed at the landfill facility and the LNG plant for the incineration of solid domestic and industrial wastes. During commissioning, and to a lesser extent during upset/maintenance conditions, emissions from flaring activities will also occur.

Thus, the bulk of air emissions will be associated with fuel combustion operations that will emit NO_x, SO_x, CO, CO_2 , PM and hydrocarbons. Emissions from the waste incinerator will also include dioxins. Fugitive volatile organic compound (VOC) releases will also be associated with LNG

[16] Dedicated waste management facilities will be constructed for the Project including an injection well for disposal of liquid wastes if technically feasible. In the interim period, wastes will be either be recycled, incinerated, temporarily stored or transported to existing landfall sites.

process systems, LNG loading, condensate loading and breathing/working losses from fuel and condensate storage tanks and cargo vessels.

Air emission sources (based on a range of operational scenarios), their locations and impact intensity will be assessed in respect to an impact on sensitive receptors, specifically, residential areas and the most vulnerable natural complexes.

An inventory of all air emission sources will be completed, modelling of dispersion of contaminants will be carried out, and the predicted air quality impacts will be assessed against applicable air quality standards for the protection of human health and sensitive vegetation. In addition, recommendations relating to a sanitary protection zone (SPZ) for each facility will be issued as required under RF regulations. When preparing this section of the ESIA, impact mitigation measures, including application of best available techniques along with air quality monitoring methods will be identified.

Emissions of greenhouse gases (GHG) during commissioning and operation will also be assessed, including CO_2 emissions from combustion of hydrocarbon, and fugitive emissions of other GHG, principally methane (CH_4). Measures to reduce GHG emissions will be optimized through measures such as good housekeeping (minimizing fugitive emissions), a flaring strategy that reduces emission from flaring (and venting), and on-going quantification of GHG emissions during operations.

7.2.3 IMPACTS OF NOISE, VIBRATION AND ILLUMINATION

The main noise and vibration sources at all the facilities during the operational will be:

- The LNG compressor trains.
- Flaring (during commissioning and upset/maintenance conditions).
- Other operational machinery (mobile gas-fired power plants, boiler-houses, etc.).
- Transport - particular consideration will be given to the impact of fixed wing aircraft and helicopter noise on sensitive receptors such as accommodation camps for the personnel and vulnerable terrestrial and marine fauna.

Noise modelling will be completed where necessary to confirm that relevant Project noise standards are met. In the event that the expected impact level exceeds standards applicable to the Project, relevant mitigation measures will be developed. Moreover, approaches to noise/vibration monitoring will be considered for LNG Plant facilities under operation.

The potential impact of lighting at Project facilities on fauna (and in particular migratory bird species) will be considered, and appropriate mitigation measures will be developed, where necessary.

Vibration induced impacts are expected to be negligible once piling activities have been completed.

7.2.3.1 IMPACTS ON SURFACE WATER BODIES

Impacts on surface water bodies will take place in the course of water abstraction from surface water bodies and wastewater discharge to these bodies. During operations this relates to the abstraction and discharge of saline water from/to the Gulf of Ob.

The ESIA will contain a description of all water demand, abstraction sources, abstraction methods and all water treatment plant that will provide treated water quality for domestic and process purposes in conformity with applicable standards. The ESIA will give particular consideration to the protection of aquatic organisms during the abstraction of seawater and subsequent discharge of treated wastewater to the Gulf of Ob.

Operations of all facilities will result in the generation of process wastewater, sanitary wastewater, and storm water. The ESIA will further contain a description of all wastewater pre-treatment plants (prior to wastewater discharge to the natural environment) and subsequent impacts to receiving water bodies. Particular attention will also be given to:

- The handling of bilge water and ballast water, with consideration of invasive alien species, from transport vessels and the sea port fleet.
- Issues concerning prevention of an adverse impact of de-icing liquids (used for treatment of aircrafts and runways at the airport).
- The design and operability of waste water treatment plant in cold temperatures.

Relevant methods will be proposed to monitor the impacts of both the main Project facilities and supporting infrastructures with the potential to affect the surface water quality and hydrology.

7.2.3.2 IMPACTS ON SOILS AND THE GEOLOGICAL ENVIRONMENT

Similar to the construction phase, appropriate methods for prevention of permafrost degradation and activation of hazardous natural processes will be assessed.

Based on an assessment of expected impacts, methods to monitor detrimental natural processes in areas of their most probable initiation/activation will be proposed.

Significant impacts on the geological environment may occur when implementing design solutions relating to reinjection of process wastewater and drilling waste into deep formations (see also waste management below). Therefore, this impact will be assessed and mitigation measures will be developed.

The management measures initiated during construction will continue in the operations phase. As such, soil management measures developed for the construction phase will also be implemented during operations, albeit with amendments that reflect the different activities associated with the operations phase. Ongoing restoration of previously disturbed areas will be central to the operations phase soil management.

Potential impacts to groundwater during the operational phase may result from drilling activities (where preferential contamination pathways to groundwater horizons may be generated) and deep well injection of liquid/slurry wastes. Such impacts/risks will be assessed in the ESIA and where necessary addition mitigation measures will be developed. Other potential sources of groundwater contamination relate to the risk of hydrocarbon and chemical spills. Pollution prevention measures that reduce the risk of spills occurring and entering the environment will be described in the ESIA.

7.2.3.3 BIODIVERSITY CONSERVATION (TERRESTRIAL INCLUDING FRESHWATER ECOSYSTEMS)

For projects of this nature the construction period will typically present the major risks to biodiversity. However there will remain the potential to impact biodiversity through the operation of the Project, including associated infrastructure, as a result of:

- Ongoing air emissions and wastewater discharges.
- Disturbance of fauna, both intentional and unintentional.
- Transportation including ongoing road and air traffic movements.
- Introduction of scavenging and/or invasive species.
- Noise and vibration.
- Illumination.
- Impacts associated with induced access etc.

The same approach to the assessment and management of ecological impacts described for the construction phase will also apply throughout the operations phase. Thus, based on the findings of existing surveys of flora and fauna in the region, and potentially additional focused surveys as required, the impact of the Project on regional biodiversity will be assessed along with an assessment of ecosystem services of natural complexes.

The ESIA will make recommendations for terrestrial flora and fauna monitoring within the Project's Area of Influence as necessary.

7.2.3.4 BIODIVERSITY CONSERVATION (MARINE ECOSYSTEMS)

The ESIA will consider potential impacts on aquatic biota associated with navigation operations, risks of accidents in water areas and the potential impact of bilge water and ballast water. Based on the results of the impact assessments, methods for monitoring of marine flora and fauna will be described in the ESIA as necessary.

The impacts from any long term maintenance dredging, will be assessed to the extent possible within the ESIA, as an associated facility/activity i.e. recognizing Yamal LNG will not be directly responsible for any maintenance dredging of the operational port but will be able to exert some influence.

Other environmental protection measures applicable to Rosmorport's operation of the port will also be described, with particular reference to international environmental treaties and conventions that will apply, for example, in relation to ballast water management.

The ESIA will identify marine flora and fauna monitoring requirements within the Project Area of Influence as necessary.

7.2.3.5 WASTE MANAGEMENT

Wastes to be generated during the Operations Phase will comprise domestic waste and industrial waste of different hazard classes. To facilitate appropriate waste management, all types of wastes will be identified and a Waste Management Plan will be developed.

The ESIA will describe the waste disposal options available to the Project including dedicated landfill, incineration and use of underground disposal of certain wastes. The latter is intended for the disposal of liquid wastes including drill muds and produced water. The proposed deep well disposal technology will be fully described along with the environmental consequences/risks/benefits for this disposal method.

The waste management facilities will be designed and operated in accordance with good international industry practice. The design of the various waste management facilities and waste management practices, relevant to environmental protection, will be described in the ESIA. Monitoring and inspection requirements will also be described.

When commissioning the Project facilities, obligatory permits for waste disposal will be obtained on the basis of waste stream data as required by the Russian legislation.

7.2.3.6 ENVIRONMENTAL RISKS

The ESIA will consider spills of hydrocarbons at storage sites and risks of collision/grounding of vessels in the sea port boundary area and in the Gulf of Ob. The findings to be obtained will be used when preparing an Emergency Spill Response Plan.

The ESIA will also consider the consequences of natural events such as flood risk and seismic activities. The risks to the Project posed by climate change, for example sea level rise, will also be discussed.

7.3 CUMULATIVE IMPACTS

Cumulative impacts are described as those impacts from other existing, planned or reasonably defined developments that will result in the incremental impact on areas/resources also used or directly affected by the Project.

The ESIA will seek to identify other existing or planned projects that have the potential to result in incremental impacts. Other projects will be described and cumulative impacts assessed at a qualitative level, based on an understanding of any such projects at the time the ESIA is prepared.

7.4 ENVIRONMENTAL AND SOCIAL MANAGEMENT

Yamal LNG will establish management programmes that describe mitigation and performance improvement measures and actions that address the potential environmental and social risks and impacts identified through the ESIA process. These programmes will include procedures, practices and plans to ensure that all environmental and social aspects of the Project are managed in a comprehensive and systematic way. The programmes will apply across the Project, including both Yamal LNG and the contractors over which it has control.

In particular, Yamal LNG will produce the following as part of the ESIA package:

1. Environmental and Social Management Plan (ESMP)

An ESMP comprising a suite of individual environmental and social management plans (MPs) will be developed that define the Project's environmental and social requirements and how these requirements are to be managed throughout the Project development. In particular, the MPs will describe:

- The organisational approach to environmental and social management, including definition of roles and responsibilities.
- The environmental and social standards to be applied.
- The specific management, mitigation and monitoring measures to be implemented.

Recognizing the dynamic nature of the Project, the MPs will be responsive to changes in circumstances, unforeseen events, and the results of monitoring and review.

2. Environmental and Social Action Plan (ESAP)

The ESAP will describe and prioritise any additional actions needed to enable the development and implementation of further relevant mitigation measures, corrective actions and/or monitoring measures necessary to manage the environmental and social impacts and risks identified in the ESIA. Additional actions captured in the ESAP will typically be those actions that require additional time for their full development after the finalisation of the ESIA.

These plans will sit within the Project's overarching management systems, including Yamal LNG's Environmental Management System (EMS) that is being developed to the international ISO14001 standard.

8 ESIA WORK PLAN

8.1 WORK PLAN

As described in Chapter 3, engagement with interested stakeholders is required during the ESIA process. This includes disclosure of appropriate information and consultation with stakeholders at various stages of the process. Disclosure and consultation of ESIA materials will be undertaken in compliance with the Lenders' policy requirements. The main disclosure materials are listed below.

Stakeholder Engagement Plan (SEP) – this plan will be disclosed in the public domain in accordance with Lenders' requirements. The SEP will be revised periodically during the course of the Project.

Scoping Report – this report is produced to give stakeholders an understanding of a proposed project during the planning stage. The Scoping Report will be made available to legitimate stakeholders in the manner described in the SEP and form the basis for continuing consultation activities.

ESIA Report – the report will amongst other matters, provide a comprehensive Project description, outline the applicable legislative framework, baseline environmental and social setting, assessment of potential impacts and mitigation measures to minimise or avoid adverse impacts and maximise benefits. In addition to the main ESIA report, the overall ESIA package will also include:

- A Non-Technical Summary (NTS - this is a standalone document that will provide a simplified summary of the key findings of the ESIA report).
- The ESMPs (see also Chapter 7.4).
- The ESAP (see also Chapter 7.4).

The ESIA package will be disclosed for public consultation.

8.2 TIMEFRAMES

Indicative timeframes are provided below.

Disclosure of Scoping Report and Stakeholder Engagement Plan	January 2013
Disclosure of ESIA package for consultation including: • ESIA Report • NTS • ESMPs • ESAP • SEP	Anticipated Q4, 2013
Finalisation of ESIA Package	To commence after the disclosure period (typically 60 days at the discretion of Lenders)

Annex A

Figure A1. Yamal LNG Project Plot Plan