South Stream Offshore Pipeline – Russian Sector

Environmental and Social Impact Assessment (ESIA) – Non Technical Summary

July 2014

South Stream
Offshore Pipeline
ENERGISING EUROPE

Non-Technical Summary of the ESIA Report South Stream Offshore Pipeline – Russian Sector

URS

This report has been prepared by URS Infrastructure and Environment UK on behalf of South Stream Transport B.V.

SST-EIA-REP-205775

Preface

This document is the non-technical summary (NTS) of the Environmental and Social Impact Assessment (ESIA) Report for the proposed *South Stream Offshore Pipeline – Russian Sector* ("the Project").

The objective of this document is to summarise the key information and conclusions contained within the ESIA Report, in a way that is accessible and understandable to a broad audience of readers who may not have expertise in the technical and scientific specialties that inform the ESIA, so that all stakeholders and interested parties are able to:

- Understand the nature of the proposed Project;
- Understand the anticipated impacts of the Project, and associated mitigation measures;
- Develop an informed opinion regarding the benefits and adverse impacts of the Project; and
- Use their understanding of the Project to engage in the ESIA review, provide feedback on the Project and facilitate / assist with the decision-making processes.

The ESIA Report

The ESIA Report for the *South Stream Offshore Pipeline – Russian Sector* has been completed in accordance with the financing requirements for the South Stream Offshore Pipeline. These standards and guidelines for environmental and social performance are defined by: the Organisation for Economic Co-operation and Development (OECD) Common Approaches for Officially Supported Export Credits and Environmental and Social Due Diligence; the Equator Principles (EPs), a financial industry benchmark for determining, assessing and managing environmental and social risk in projects; and the Japan Bank for International Cooperation (JBIC) Guidelines for Confirmation of Environmental and Social Considerations; and are underpinned by the International Finance Corporation (IFC) Performance Standards on Environmental and Social Sustainability (PSs).

On behalf of South Stream Transport B.V. (South Stream Transport), the ESIA Report was prepared by independent environmental consultants URS Infrastructure and Environment UK (URS), with local expertise and support from Russian consultancies Brannan Environment and Peter Gaz.

Relationship to other Reports

This ESIA Report for the Russian Sector forms only part of the overall documentation related to the assessment of impacts for the South Stream Offshore Pipeline.

For the Russian Sector, a Scoping Report was disclosed and consulted on in December 2012 and input from this process has informed the scope and content of the ESIA Report. In addition, an Environmental Impact Assessment (EIA) Report was also prepared specifically for the Russian Sector. The EIA was completed in accordance with regulatory and permitting requirements in Russia, and was approved by the State Environmental Expert Review (SEER) in October 2013.

The EIA process in Russia was also supported by a Preliminary EIA (2010) and EIA Terms of Reference (2012) which informed the scope and content of the EIA Report.

Additional impact assessment documentation has been prepared for the South Stream Offshore Pipeline – Bulgarian Sector and the South Stream Offshore Pipeline – Turkish Sector:

- For the Bulgarian Sector:
  - A Scoping Report informed the scope and content of both the EIA and ESIA reports;
  - An EIA Report was prepared in line with Bulgarian requirements; and
  - An ESIA Report was also prepared.
- For the Turkish Sector:
  - An EIA Report was prepared to meet Turkish requirements;
  - The EIA Application File informed the scope and content of the EIA Report; and
  - An ESIA Report was also prepared.

Furthermore, an Environment and Social Overview Report will also be prepared for the entirety of the South Stream Offshore Pipeline, providing a summary view across all three countries.

ESIA Report: Disclosure and Consultation

South Stream Transport welcomes feedback on the Project and the ESIA Report from all stakeholders and interested parties.

The official consultation period for the ESIA Report will run for 30 days from the date of disclosure. During this period, the Report (including NTS and appendices) can be accessed in a number of ways.

- Online at www.south-stream-offshore.com/ru
- Printed copies are available for review at the following locations:
  - **Varvarovka:** Community Centre, Krasnodar Krai, Anapa RT, Supsekhsky RD, Varvarovka, Kalinina str. 69;
  - **Rassvet:** Community Centre, Krasnodar Krai, Anapa RT, Gaikodzorsky RD, Rassvet, Kommunarov str. 41;
  - **Gai-Kodzor**: Community Centre, Krasnodar Krai, Anapa RT, Gaikodzorsky RD, Gai-Kodzor, Shaumyana str. 75;
  - **Sukko**: Krasnodar Krai, Anapa RT, Supsekhsky RD, Sukko, Sovetskaya str. 282-b;
  - **Supsekh**: Administration Building, Krasnodar Krai, Anapa RT, Supsekhsky RD, Supsekh, Frunze str. 72; and
  - **Anapa**: Department of Architecture, Krasnodar Krai, Anapa, Terskaya str. 190.
- Stakeholder engagement events, including roundtable and public meetings, are also planned. A preliminary schedule is provided below. Announcements regarding public meetings and other events will be made in national, regional and local newspapers and online (www.south-stream-offshore.com) in advance of these events.

Summary of Anticipated ESIA Events

Location, type of meeting	Date and Time	Venue
Anapa Drop-in Session	22 July 2014, 12.00 – 14.00	Grand Hotel Valentina Krasnodar Krai, Anapa, Terskaya str. 103
Gai-Kodzor Drop-in session	22 July 2014, 17.00 – 20.00	Gai-Kodzor Community Center Krasnodar Krai, Anapa RT, Gaikodzorsky RD, Gai-Kodzor, Shaumyana str. 75
Varvarovka Open meeting	23 July 2014, 17.00 – 18.00: face-to-face meetings 18.00 – 20.00: presentation, Q&A	Varvarovka Community Center Krasnodar Krai, Anapa RT, Supsekhsky RD, Varvarovka, Kalinina str. 69
Rassvet Open meeting	24 July 2014, 17.00 – 18.00: face-to-face meetings 18.00 – 20.00: presentation, Q&A	Rassvet Community Center Krasnodar Krai, Anapa RT, Gaikodzorsky RD, Rassvet, Kommunarov str. 41

Note: Dates may be subject to change; check local announcements and online (www.south-stream-offshore.com) for updates.

Contacting the Project

Stakeholders are welcome to contact South Stream Transport at any time. Alternatively, communications can also be addressed to the Project's impact assessment consultants in the United Kingdom or their in-country consultants in Russia as shown below.

Contact Details

Project Proponent:	**South Stream Transport B.V.** Parnassusweg 809, 1082 LZ Amsterdam, The Netherlands Email: esia@south-stream-transport.com
ESIA Consultants:	**URS Infrastructure and Environment UK** St George's House, 5 St George's Road, London, SW19 4DR, United Kingdom Email: southstream@urs.com
Russian Consultants:	**Peter Gaz LLC** 117630, Moscow, 25A Profsoyiznaua ulitsa. **Branan Environment:** 125363 Moscow, Business Centre Kaleidoscope, Office 501, Skhodnenskaya ul., building 56.

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1 Introduction

1.1 South Stream Offshore Pipeline

The South Stream Offshore Pipeline is the offshore component of the South Stream Pipeline System that will transport natural gas from Russia to countries of Central and South-Eastern Europe (Figure 1).

Figure 1 South Stream Pipeline System

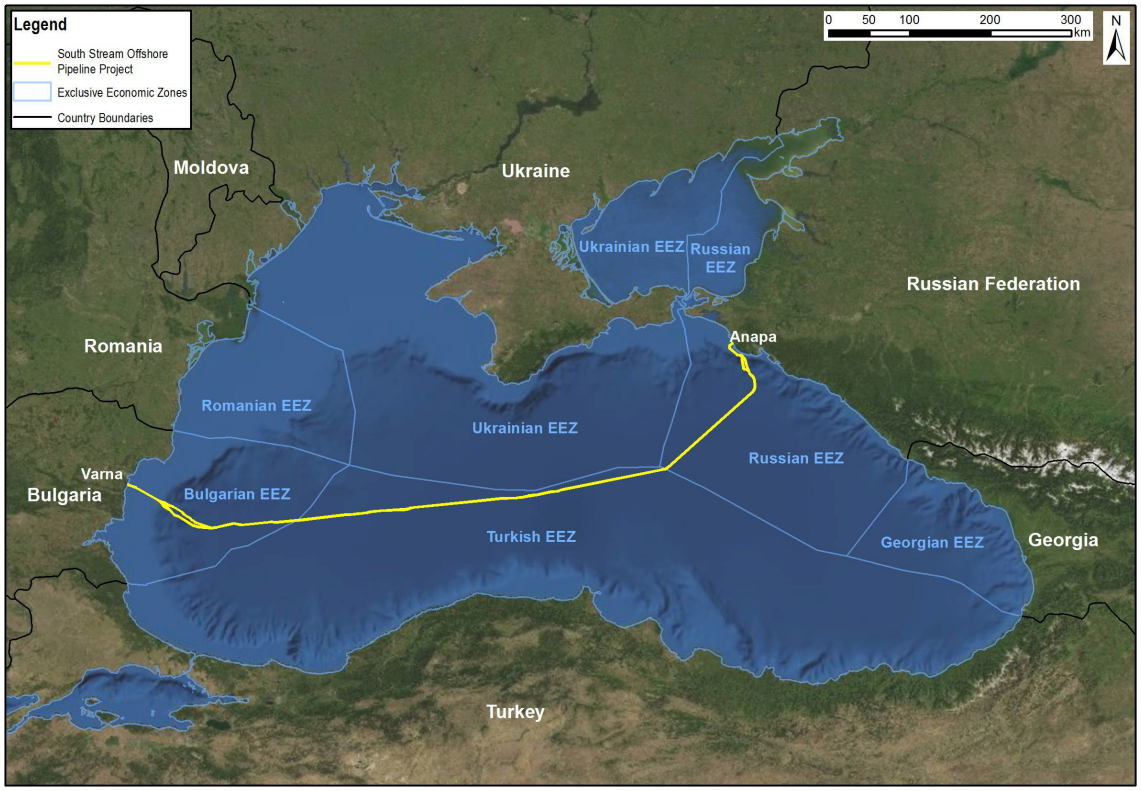
The South Stream Offshore Pipeline will comprise four adjacent pipelines extending approximately 931 kilometres (km) across the Black Sea from the Russian coast near Anapa, through the Russian, Turkish, and Bulgarian Exclusive Economic Zones (EEZ), to the Bulgarian coast near Varna (Figure 2). In addition to the offshore pipelines, the South Stream Offshore Pipeline will consist of short onshore sections in Russia and Bulgaria, with facilities to meter the gas prior to and after transportation through the Black Sea. The South Stream Offshore Pipeline will be able to transport 63 billion cubic metres (bcm) of natural gas annually when fully operational.

The Proponent

The South Stream Offshore Pipeline is being developed by South Stream Transport B.V. (hereafter South Stream Transport), an international joint venture established for the planning,

construction, and subsequent operation of the offshore gas pipeline through the Black Sea. The Russian company OAO Gazprom holds a 50% stake in South Stream Transport, the Italian company Eni S.p.A. has a 20% stake and the French energy company EDF Group and German company Wintershall Holding GmbH (BASF Group) each hold 15%.

Figure 2 South Stream Offshore Pipeline



All geographic boundaries depicted in maps relate to February 2014.

Need for the South Stream Offshore Pipeline

Natural gas plays a significant role in Europe's energy supply. In 2011, approximately one quarter of the energy consumed by the 28 European Union (EU) member states came from natural gas, around a third of which was from domestic sources within the EU (Ref. 1). The EU's traditional suppliers are Russia, Norway and Algeria; however, natural gas is also obtained in the EU from a variety of different sources.

Forecasts by the International Energy Agency (Ref. 1) and other institutes predict that European natural gas production will fall by around a half by 2035. This reduced domestic production means that approximately 80% of the forecasted demand for natural gas in 2035 will have to be met through gas imports.

Based on the scenario forecasts above, at full capacity (63 bcm), the South Stream Pipeline System would be able to contribute to between 11% and 22% of total projected consumption in 2035 (Ref. 1 and 2).

Therefore, the offshore pipeline (as a component of the South Stream Pipeline System) will contribute to improving energy security of supply in Europe in a safe, reliable and environmentally responsible way.

1.2 The Russian Sector

This ESIA Report (and this Non-Technical Summary) specifically addresses the Russian part of the South Stream Offshore Pipeline, which is known as the '**South Stream Offshore Pipeline – Russian Sector**' and referred to as 'the Project'.

The Project extends approximately 230 km in length from a location approximately 10 km south of the town of Anapa, in the Krasnodar Krai (or Region), to the border between the Russian and Turkish EEZs (Figure 2) in the Black Sea. Of the 230 km, approximately 4 km are onshore, 50 km are within the territorial waters of the Russian Federation, plus 175 km within the EEZ of the Russian Federation.

The Project Area

The Project Area is defined as the area in which all Project activities will occur. For the purposes of the ESIA, the Project Area comprises three distinct sections (discussed further in Chapter 4):

- **The landfall section**: approximately 4 km on land, including the permanent landfall facilities, a section of buried pipeline, and four microtunnels that will be used to cross steep cliffs into the sea. The landfall section extends to the end of the microtunnels approximately 400 m from the shore (23 m water depth);
- **The nearshore section**: coastal waters, where the pipelines will be buried for a short distance after they exit the microtunnels, and then laid on top of the seabed as they extend further offshore. The nearshore section ends at 30 m water depth; and
- **The offshore section**: deeper waters, up to 2,200 m below sea level, where the pipelines will be laid on top of the seabed.

For the purposes of the ESIA, the offshore, nearshore and landfall sections combine to make up the Project Area. The Project Area is the geographical area within which all proposed Project activities will occur. It is defined by the

TERMS TO KNOW

The **South Stream Pipeline System** will stretch from Russia to the countries of central and south-eastern Europe.

The **South Stream Offshore Pipeline** is a component of the South Stream Pipeline System. Specifically, the South Stream Offshore Pipeline is the component that travels through the Black Sea. It will traverse waters of Russia, Turkey and Bulgaria, and includes short landfall sections in Russia and Bulgaria.

The **Russian Sector** of the South Stream Offshore Pipeline is the focus of this report. The Russian Sector begins at the landfall facilities south of Anapa, enters the Black Sea via four microtunnels, and travels along the seabed to the border between the Russian and Turkish EEZs.

In this document, "**the Pipeline**" refers to the entire South Stream Offshore Pipeline (Russian, Turkish, and Bulgarian sectors), including all 4 individual pipelines, whereas "**the Project**" refers only to the Russian Sector of the Pipeline.

The **Project Area** is the area within which all proposed Project activities will occur, and is subdivided into the landfall, nearshore and offshore sections.

The **EEZ (Exclusive Economic Zone)** is a seazone for which a state has special rights over the exploration and use of marine resources, including production of energy from water and wind. Its boundary is 200 nautical miles from its coast, or to the border with a neighbouring EEZ.

greatest extent of the physical footprint arising from Project infrastructure, equipment, or machinery, as well as any associated restriction zones.

Associated Facilities

Associated Facilities are defined by the OECD Common Approaches[1] (Ref. 3) as:

"…facilities that are not a component of the project but that would not be constructed or expanded if the project did not exist and on whose existence the viability of the project depends; such facilities may be funded, owned, managed, constructed and operated by the buyer and/or project sponsor or separately from the project."

In the Russian Sector, the following are considered to be the Associated Facilities of the Project:

- The Russkaya compressor station, as well as the four pipelines connecting the compressor station with the Project, which are located immediately upstream of the Project in Russia. The compressor station and connecting pipelines are developed and managed by Gazprom Invest and will provide natural gas to the Project's landfall facilities; and
- Existing quarries that are designated for sourcing aggregate and other material to the Project, if those existing quarries would require significant expansion for the sole purpose of supplying the Project.

Interface with Russkaya Compressor Station

The landfall facilities will be connected to Russian gas network upstream of the Project (specifically the United Gas Supply pipeline system and the Russkaya compressor station). Four onshore pipelines (2.5 km long) will connect the Project with the compressor station. The compressor station and these connecting pipelines are not part of the Project and are being designed and constructed as part of a separate project known as "*Expansion of the UGS (United Gas Supply System) to provide gas to South Stream Pipeline*", which is being constructed by Gazprom Invest.

The upstream gas network and the Russkaya compressor station have followed a separate engineering and approval process, which included the execution of an Environmental Impact Assessment (EIA) and review and approval by Russian authorities. The findings of the EIA are summarised within the ESIA Report, along with a benchmarking of the EIA against international standards.

Jurisdiction

The Project begins on Russian land approximately 10 km south of Anapa, on the Black Sea coast. The landfall section of the Project lies within Krasnodar Krai, which is grouped within the Southern Federal District and within the North Caucasus economic region.

[1] OECD Common Approaches are the primary environmental and social standards applicable to the Project.

The marine sections of the Project Area are located within Russian territorial waters and the Russian EEZ, and are solely within the jurisdiction of the national government of the Russian Federation.

1.3 Schedule

The key phases of Project development are summarised in Box 1 below, and an indicative timeline is shown in Figure 3. These periods have been summarised into three overarching phases that have been used as the basis of assessment for the ESIA Report:

- The **Construction and Pre-Commissioning Phase** includes all Construction Phase and Pre-Commissioning Phase activities;
- The **Operational Phase** includes all Commissioning Phase and Full Operational Phase activities; and
- The **Decommissioning Phase** includes all Decommissioning Phase activities.

As with all large construction projects, the schedule may be subject to change as a result of unforeseen delays. Potential delays may be related to factors such as weather conditions, logistics problems, geological conditions, and/or permitting procedures.

Box 1 PHASES OF PROJECT DEVELOPMENT

The **Feasibility Phase** (2007 to early 2012) involved the development of Feasibility Studies in which a number of gas pipeline routes and landfall options were assessed and a preliminary engineering (conceptual) design was developed. This phase was initiated by Gazprom.

The **Development Phase** (March 2012 to late 2013) undertaken by South Stream Transport. This phase involves engineering and design work together with Russian Project Design Documentation (Proekt) and national EIA for national permitting requirements. This phase includes development of an ESIA and other associated financing requirements. This phase also includes the development of an Environmental and Social Management Plan (ESMP) to meet international standards.

The **Construction Phase** (2014 to end of 2017) will involve all construction activities required to install both the terrestrial and marine portions of the Project. Each of the four pipelines will be constructed individually to allow gas flows to commence as they are completed; however, the landfall section will be constructed for all four pipelines together so as to minimise the duration of disturbance.

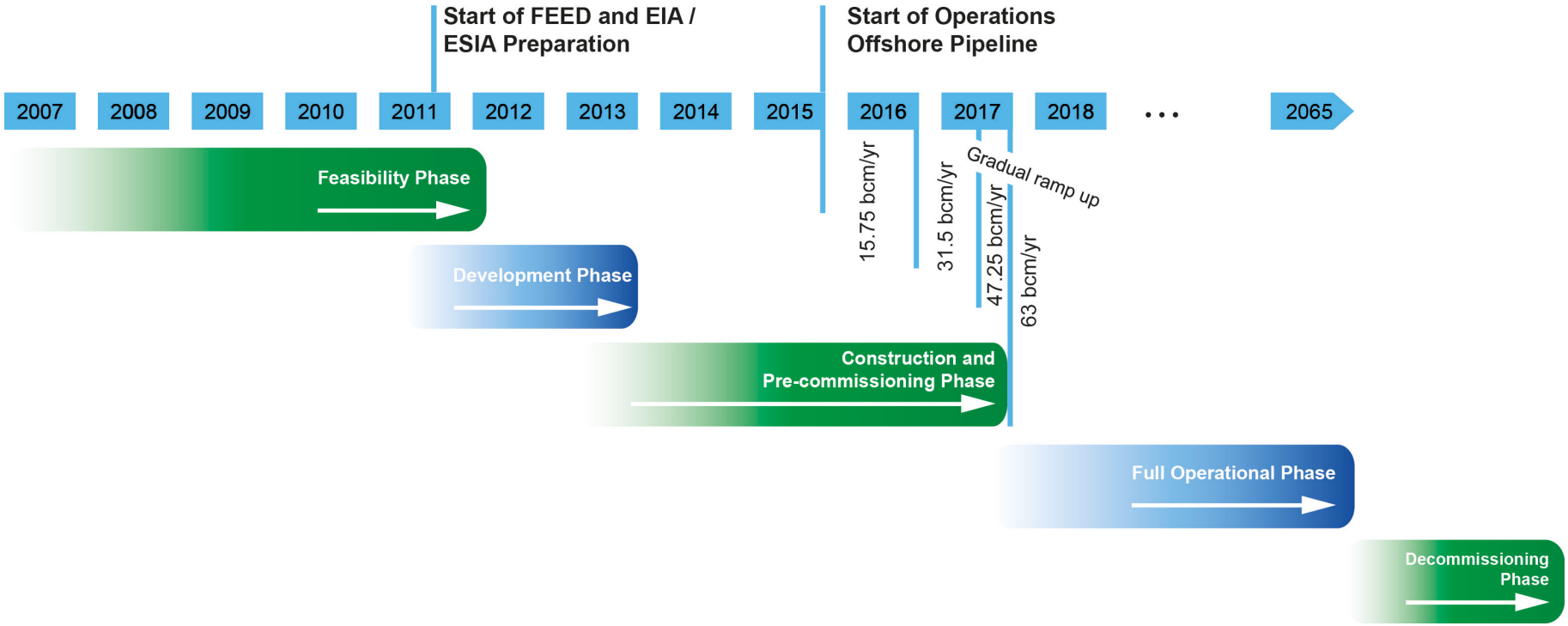
The **Pre-Commissioning Phase** (2015 to end of 2017) will verify that each pipeline has been constructed without significant defects and that it is in a suitable condition to be filled to transport the gas at the anticipated pressure and to deliver the gas to the required specifications. Activities during this phase will not be continuous but will include cleaning, gauging, hydro-testing and drying of each of the four pipelines as they are completed.

The **Commissioning Phase** (2015 to end of 2017) will involve an operational ramp-up so that each pipeline is purged of nitrogen and has sufficient pressure to begin transport. This will be done for each of the four pipelines as they are completed.

The **Full Operational Phase** (end of 2017 to 2065) involves the transport of gas over the Project's operational design life of 50 years.

The **Decommissioning Phase** (2065 onwards) involves the closure and decommissioning of the Project once it has reached the end of its operational life.

Figure 3 South Stream Offshore Pipeline Timeline



2 Impact Assessment Framework

The Project is being carried out to meet the requirements of both Russian legislation and standards related to the Environmental Impact Assessment (EIA) process, as well as international standards and guidelines for financing, which relate to the preparation of an Environmental and Social Impact Assessment (ESIA).

2.1 Russian EIA Process

As the Project (i.e. the Russian Sector of the South Stream Offshore Pipeline) is located within the jurisdiction of the Russian Federation, the Project has undertaken an EIA in accordance with Russian Federation legal requirements. The Russian EIA process and milestones are summarised in Table 1.

Table 1 EIA Process for the South Stream Offshore Pipeline – Russian Sector

Milestone	Date	Description
Notification*	April 2010	The Project Declaration of Intent was submitted to the Krasnodar regional Administration.
Preliminary EIA*	May 2010	The Preliminary EIA Report included a description of the Project and anticipated impacts. Public hearings regarding the pre-feasibility design documentation and Preliminary EIA were held in Gelendzhik and in Anapa.
Terms of Reference	July 2012	Terms of Reference for the EIA Report further defined the proposed scope and content of the Project and the EIA Report, and was disclosed with an advertised period for public comment.
EIA Report	July 2013	EIA Report was disclosed, including a public comment period and public hearing in Anapa. The final EIA Report was submitted to the Russian authorities for approval.
National Approvals	October 2013; March 2014	Positive conclusions on the marine part of the Project were issued by the State Ecological Expert Review in October 2013. This was followed by positive conclusions on the Project (including landfall section) from the State Expert Review for the Project in March 2014.

* The Project Notification and Preliminary EIA were completed by Gazprom before the establishment of South Stream Transport as the company responsible for the development of the South Stream Offshore Pipeline.

Competent Authorities

National level government organisations (ministries, agencies, services) with EIA regulatory functions relating to the Project include the Ministry of Natural Resources and Environment (MNRE), the Ministry of Construction and Public Housing, and the Russian Federal Fisheries Agency (FFA).

As part of the national EIA process, Project and EIA documentation must be submitted for the review, decision and recommendations of the Federal Fisheries Authority (‘*Rosrybolovstvo*’), State Environmental Expert Review (‘*Ecologicheskaia Expertiza*’) and State Expert Review (‘*Glavgosexpertiza*’).

Relationship to the ESIA

Information from the national EIA process preceded and therefore informed the ESIA. Technical specialists coordinated the development of the ESIA and EIA reports to ensure consistency of methodology, approach and content as far as practicable. Where there are differences between the two documents, these are due mainly to the difference between the Russian Federation EIA regulatory requirements and conventional ESIA practice as set out by international guidelines as detailed below.

2.2 ESIA Standards and Guidelines

In addition to seeking national approvals, South Stream Transport, is also pursuing financing for the Project from commercial banks and export credit agencies. Therefore, an Environmental and Social Impact Assessment (ESIA) Report has also been prepared in order to meet international standards and guidelines for financing. These international standards and guidelines provide prospective lenders with reassurance regarding the environmental and social performance of the Project, and have been drawn from:

- The Organisation for Economic Co-operation and Development (OECD) Common Approaches, which apply to export credit agencies;
- The Equator Principles, which apply to commercial banks; and
- The guidance of the Japan Bank for International Cooperation (JBIC).

Both the Equator Principles and the Common Approaches are underpinned by the International Finance Corporation (IFC) Performance Standards. As such, the IFC Performance Standards have guided many aspects of the ESIA, in particular *Performance Standard 1: Assessment and Management of Environmental and Social Risks* (Box 2; Ref. 4).

2.3 ESIA Report

The ESIA Report has been developed in accordance with the standards and guidelines listed above, and in line with good international industry practice. The ESIA process illustrates South Stream Transport’s commitment to develop and operate the South Stream Offshore Pipeline in an environmentally and socially responsible manner.

In accordance with the Equator Principles and the OECD Common Approaches, the objectives of this ESIA are based on those defined in IFC Performance Standard 1 on the assessment and management of environmental and social risks. The ESIA has considered the potential impacts of Project activities over all phases, as associated with:

- Soils, groundwater and surface water;
- Air quality;

- Noise and vibration;
- Terrestrial ecology and biodiversity;
- Marine environment and ecology;
- Landscape and visual amenity;
- Socio-economics;
- Health and safety;
- Ecosystem services;
- Cultural heritage; and
- Waste management.

Box 2 OBJECTIVES OF IFC PERFORMANCE STANDARD 1

As defined by IFC Performance Standard 1, regarding the assessment and management of environmental and social risks, South Stream Transport's objectives in terms of environmental and social performance are:

- To identify and evaluate environmental and social risks and impacts of the project;
- To adopt a mitigation hierarchy to anticipate and avoid, or where avoidance is not possible, minimize, and, where residual impacts remain, compensate or offset for risks and impacts to workers, affected communities, and the environment;
- To promote improved environmental and social performance of clients through the effective use of management systems;
- To ensure that grievances from affected communities and external communications from other stakeholders are responded to and managed appropriately; and
- To promote and provide means for adequate engagement with affected communities throughout the project cycle on issues that could potentially affect them and to ensure that relevant environmental and social information is disclosed and disseminated.

Content of the ESIA Report

The ESIA Report describes the main characteristics of the Project and the measures that will be implemented to avoid and minimise potential environmental and social impacts. The ESIA Report includes descriptions of:

- The activities that will take place during Construction and Pre-commissioning Phase, Operational Phase and Decommissioning Phase of the Project;
- The impact assessment methods that have been used;
- The alternatives that have been considered;
- The existing ("baseline") environmental and social conditions;
- The potential environmental and social impacts associated with the Project;
- The mitigation measures that will be used to avoid or minimize these impacts;

- The impacts that will still remain after mitigation measures (the "residual impacts");
- The potential transboundary (crossing international borders) issues and impacts associated with the Project;
- The potential for unplanned events (such as accidents) and related impacts;
- The potential for cumulative impacts (where Project impacts may be amplified by the impacts of other developments in the area); and
- The environmental and social management system that will be established.

3 Stakeholder Engagement

3.1 Overview

Stakeholder engagement (including dialogue, consultation and the disclosure of information) is a key element of project planning, development and implementation. South Stream Transport is committed to a transparent and respectful dialogue with stakeholders throughout the life of the Project. The engagement approach for the Project includes a range of activities designed to consult stakeholders. It provides opportunities for stakeholders to ask questions, make comments and suggestions and to raise any concerns that they may have. The stakeholder engagement programme for the Project has been developed to align with the national legislative requirements, as well as international standards and guidelines for financing as described above.

Approach

Stakeholder engagement in Russia began in 2010, when consultation was held in the Krasnodar region, including Anapa, in relation to the Preliminary EIA (during the Feasibility Phase). Since then, South Stream Transport has carried out a series of engagements listed below for both the EIA and the ESIA. Although the national EIA and the ESIA processes have been run to separate programmes, engagement activities for both processes are described in the ESIA Report as South Stream Transport has considered comments from stakeholders from both processes when undertaking the ESIA.

South Stream Transport will continue to engage stakeholders throughout the life of the Project, ensuring that stakeholders are able to submit feedback in various ways. All feedback is valued, including questions, concerns, and recommendations. Input from stakeholders on the Project is an important way by which the Project can identify and address issues at an early stage, and identify which areas can be improved.

Stakeholder Engagement Plan

South Stream Transport's Stakeholder Engagement Plan (SEP) for Russia provides a stakeholder engagement framework for all Phases of the Project, from development through to decommissioning. The SEP provides a plan for future consultation and disclosure and is regularly updated. It also provides a record of consultation and disclosure activities that have already been conducted. The latest version of the SEP is available on the South Stream Transport website at www.south-stream-offshore.com.

Stakeholders

South Stream Transport values input from all interested parties, and as such has engaged a broad spectrum of stakeholders who may be affected by, or otherwise interested in, the Project. Some of the stakeholder groups engaged to date include:

- Local, regional and national government authorities;
- Landowners and land users;

- Residents of local communities;
- Local businesses and industry associations;
- People who use the marine area (e.g. for fishing); and
- Non-governmental organisations (NGOs), including local community-based organizations.

ESIA consultations have prioritised local stakeholders who may be affected by the Project. As such, engagement has focused on the communities of Varvarovka, Sukko, Supsekh, Gai Kodzor and Rassvet, as well as the larger centre of Anapa.

3.2 Past Activities

Introductory and Data Collection Meetings

After South Stream Transport was established in 2012 as the company responsible for the development of the South Stream Offshore Pipeline, a series of introductory meetings were held with the relevant government authorities in Moscow and Anapa. Since this time, South Stream Transport has been building relationships with local authorities and other stakeholders in the communities closest to the Project, including Varvarovka, Sukko, Supsekh, Gai Kodzor and Rassvet. These meetings served to provide updates to local stakeholders about the progress of the Project, as well as to gather information about the baseline socio-economic characteristics of the area, fishing and tourism activities, and other topics.

EIA Terms of Reference

South Stream Transport prepared a Terms of Reference for the EIA Report (under the national EIA process). An announcement marking the start of the disclosure and consultation period was published in national, regional and local newspapers; this period ran from 1 to 31 August 2012, during which time stakeholders had the opportunity to read and comment on the draft Terms of Reference, providing input into the structure and content of the future EIA Report.

Copies of the draft Terms of Reference, along with information about the Project, were made available locally in Varvarovka, Gai Kodzor and Anapa. Secure comment boxes were provided for stakeholders to submit comments; stakeholders were also able to access the document online and could submit comments by post, email, telephone, or via the local authorities.

ESIA Scoping Report

The Scoping Report, including a non-technical summary, was disclosed on 22 November 2013 and the consultation period ran until 28 January 2013. Similar to the disclosure of the EIA Terms of Reference, publication of the Scoping Report included a newspaper announcement, distribution of printed and digital copies of the report, and comment boxes in central community locations with copies of the report for public access.

Stakeholders also had the opportunity to attend a series of meetings in December 2012. Meetings included roundtable meetings with specific stakeholder groups, including marine space users, local businesses, NGOs and local authorities in each community. Open-house style

community meetings were also held in Varvarovka, Gai Kadzor, and Supsekh for anyone interested in learning more or commenting on the Project.

These meetings provided an opportunity to introduce the Project and for stakeholders to ask questions and comment in relation to the Project and to identify environmental and social issues to be addressed in the ESIA Report. At the meetings, representatives of South Stream Transport and their consultants presented information about the Project, the Scoping Report and the EIA / ESIA process, and answered questions. Stakeholders were also able to comment by email or post or via secure comment boxes.

EIA Report

The Draft EIA Report was disclosed for public comment on 29 April 2013, and a newspaper announcement was made marking the start of the official disclosure and consultation period. A public hearing was held in Anapa on 31 May 2013 where comments received on the document via comment boxes were summarised and disclosed and a presentation and question-and-answer session on the Project was held.

Printed copies of the Draft EIA Report were available in Varvarovka, Gai Kodzor and Anapa, alongside secure comment boxes where stakeholders could provide comments. Stakeholders were also able to access the document online and could submit comments by post, email, telephone, or via the local authorities.

Other Engagement

South Stream Transport has also met with other key local stakeholders to ensure that such stakeholders are engaged with and informed about the Project. This additional engagement is not tied to a particular regulatory or disclosure milestone, and has included stakeholders such as tourism operators, businesses, fisheries, landowners, museums and all levels of governments and institutions. This engagement has also served as a means to collect environmental and socio-economic baseline information, which supports the development of the impact assessment and mitigation measures, and helps ensure that stakeholders' interests and concerns are addressed. Regulatory stakeholders have also been engaged through permitting processes.

3.3 ESIA Disclosure and Consultation

The draft ESIA Report, including this non-technical summary, has been publicly disclosed, and all interested stakeholders are invited to review and comment on the Project and the Report. South Stream Transport will also be arranging a series of consultation meetings and events to facilitate feedback on the Report. The details of the disclosure and consultation process are provided in the Preface of this document.

3.4 Input from Stakeholders to Date

Comments and feedback from stakeholders to date – including that related to the EIA Terms of Reference, ESIA Scoping Report, EIA Report and on-going engagement activities – have

informed the ESIA Report in many ways. Input from stakeholders has been incorporated into baseline studies, and helped guide the identification and assessment of potential impacts, as well as mitigation and management measures.

The most common issues raised by stakeholders during stakeholder engagement activities included questions about potential impacts on the natural environment, including the marine environment and coastline, as well as habitats on land. Local residents have also requested for gas to be supplied to the local communities; although gas supply is outside the scope of the Project, these requests have been conveyed to the relevant authorities and companies.

Local residents have also enquired about the safety of the pipeline, and how an emergency situation would be managed. Various social-related issues, including traffic and road safety, the quality of local beaches, and potential impacts on fisheries were also highlighted. Some stakeholders were also interested in the availability of Project-related jobs for local residents.

In some cases, input from local stakeholders has resulted in changes to the Project design and approach. Feedback from stakeholders over the impacts of Project traffic on safety, road condition and dust in Varvarovka led South Stream Transport to investigate the potential to construct a bypass road to avoid having to send large amounts of Project heavy goods vehicle traffic through Varvarovka. This investigation involved surveys and consultation with landowners. Following this survey and consultation work, a suitable bypass route was chosen that will significantly reduce the concerns of stakeholders. This example demonstrates how stakeholders have informed the ESIA processes and influenced Project design.

3.5 On-Going Engagement

Stakeholder engagement will continue over the life of the Project, including throughout pre-construction preparations, construction and pre-commissioning activities. Engagement will also continue over the operational life of the Project. Throughout the life of the Project, stakeholders will be able to provide feedback and receive responses to questions and comments. A formal complaints procedure (also known as a Grievance Procedure) is also in place to ensure that complaints are addressed in timely and consistent manner.

Engagement approaches for these later phases are further described in the Russia Stakeholder Engagement Plan (SEP). This plan is available, in English and Russian, on South Stream Transport's website (www.south-stream-offshore.com).

4 Project Description

The Project (i.e. the Russian Sector of the South Stream Offshore Pipeline) starts on land near the Russian Black Sea coast, crosses the shore into the sea, and travels along the sea floor to the border between the Russian and Turkish EEZs. The engineering and construction methods that will be used to build the Project vary considerably between different sections of the pipeline. As such, for the purposes of the ESIA, the Project has been divided into the following three sections, as illustrated in Figure 4:

- The **landfall section** includes the landfall facilities, a section of buried pipeline, and microtunnels crossing from land to sea;
- The **nearshore section** is in shallow waters (up to 30 m deep), where the pipeline will either be buried beneath the seabed, or coated in concrete and laid on top of the seabed; and
- The **offshore section** is in deeper waters, where the pipeline will be laid directly on the seabed.

The following sections describe the landfall, nearshore and offshore sections of the Project, along with a brief description of the construction methods that will be used and the permanent infrastructure that will remain for operation of the Project. The route and layout of the Project is illustrated in Figure 5 (landfall and nearshore sections) and Figure 6 (offshore section). Box 3 lists the main elements of the Project in terms of its permanent infrastructure and exclusion zones. These are the elements that will remain present over the 50 year operational life of the Project.

The most noticeable Project activities will occur during construction, particularly in the landfall and nearshore sections where activities may affect local residents and communities. Construction activities are described below.

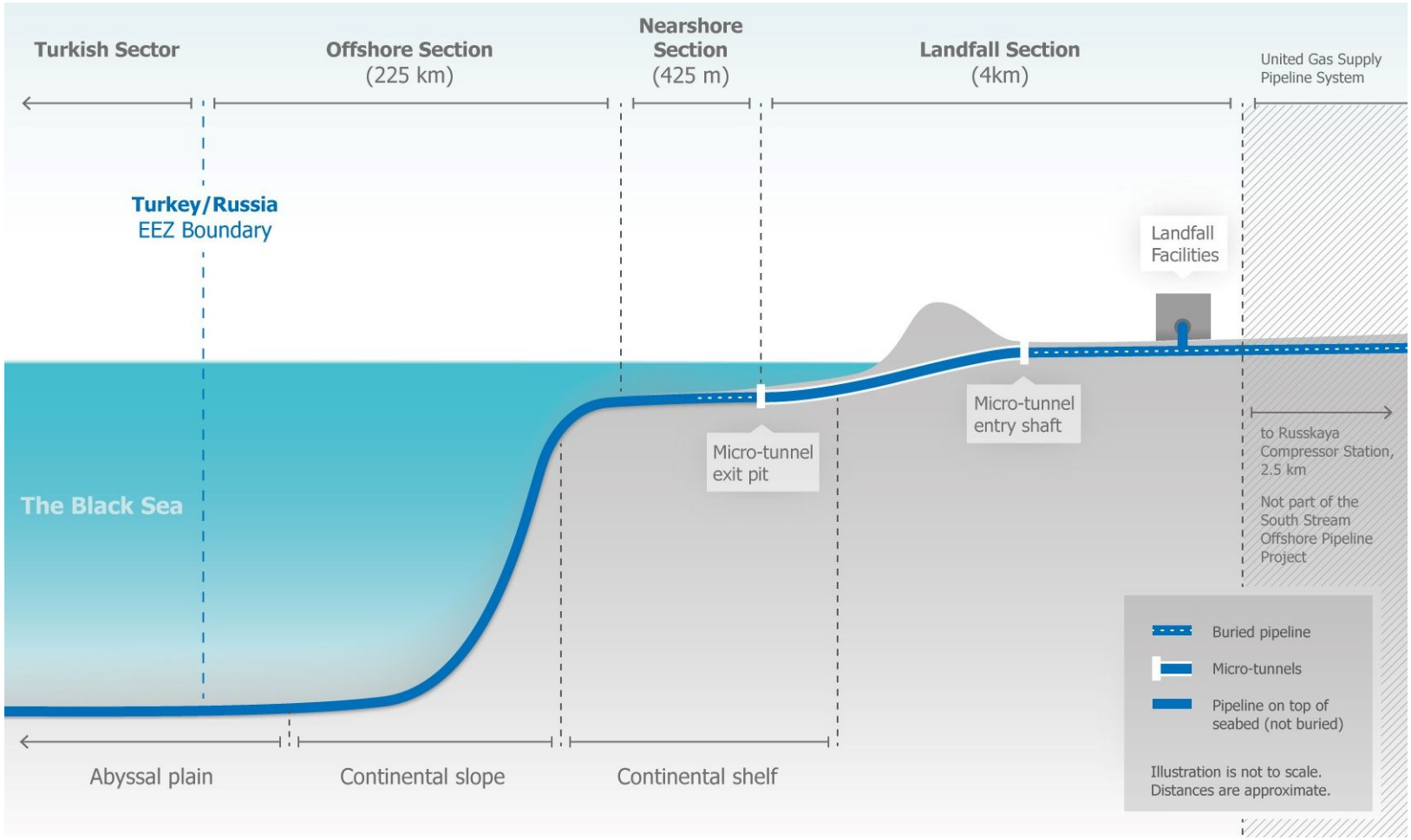
4.1 Overview

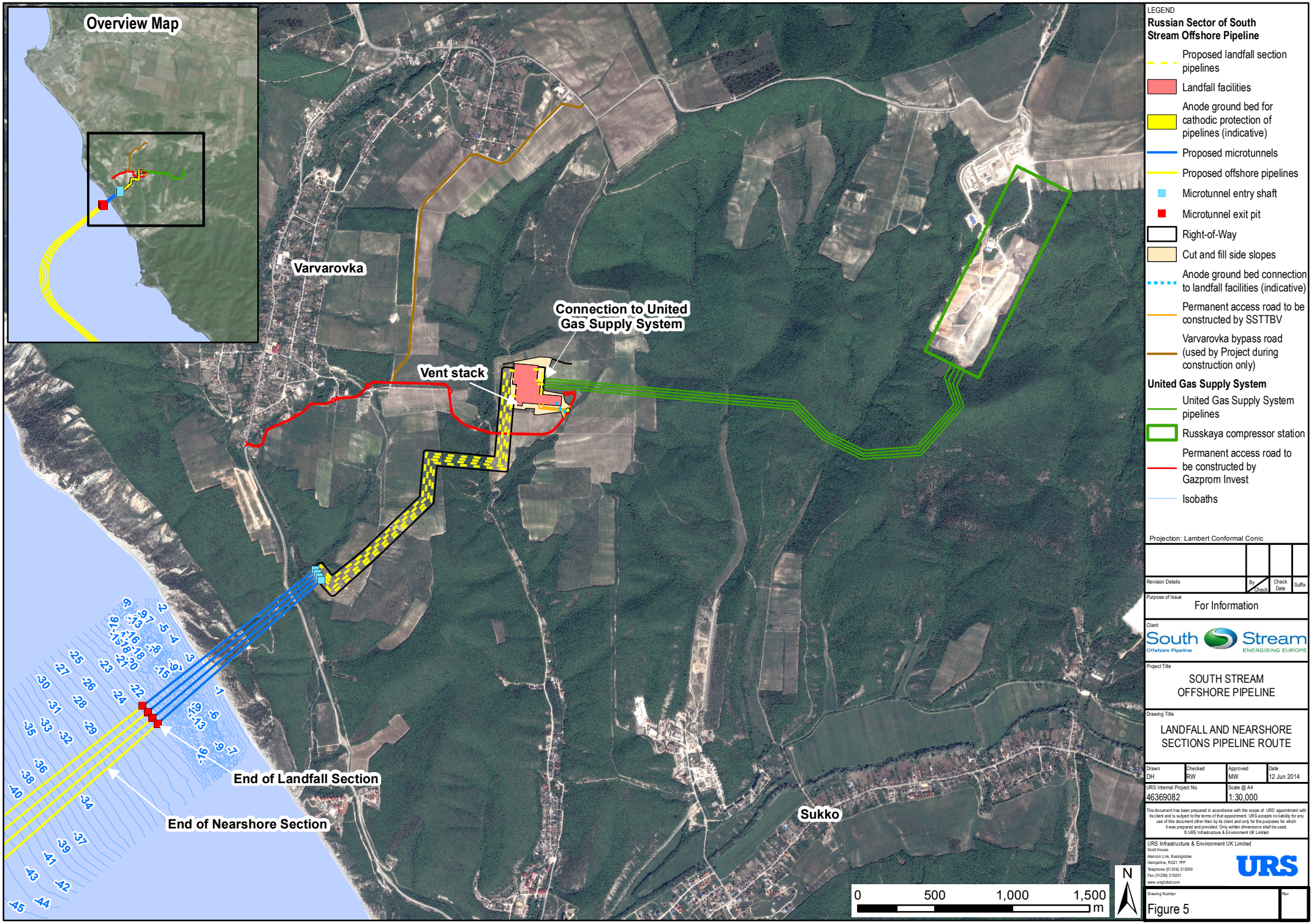
At its easternmost point, the Russian Sector (i.e. the Project) starts where the Project connects to the Russian gas network (connecting to the United Gas Supply system and, by extension, to the Russkaya compressor station). The Project's landfall facilities are located approximately 10 km south of the town of Anapa, near the community of Varvarovka. From here, the Project extends westward to the Black Sea, and continues through Russian territorial and EEZ waters, to the boundary between the Russian and Turkish EEZs.

Landfall Section

The landfall section is approximately 4 km in length, including the landfall facilities, buried pipeline, and the microtunnels. The pipelines in this section will be buried for 2.4 km downstream of the landfall facilities (plus 100 m upstream) using open-cut construction techniques. The pipelines will then transition from land to sea via four microtunnels, each 1.4 km long, which will emerge from the seabed approximately 400 m from the shore. Open-cut and microtunnel construction methods are described further in Section 4.2.

Figure 4 Overview of the Project Area





LEGEND

Russian Sector of South Stream Offshore Pipeline

- Proposed landfall section pipelines
- Landfall facilities
- Anode ground bed for cathodic protection of pipelines (indicative)
- Proposed microtunnels
- Proposed offshore pipelines
- Microtunnel entry shaft
- Microtunnel exit pit
- Right-of-Way
- Cut and fill side slopes
- Anode ground bed connection to landfall facilities (indicative)
- Permanent access road to be constructed by SSTTBV
- Varvarovka bypass road (used by Project during construction only)

United Gas Supply System

- United Gas Supply System pipelines
- Russkaya compressor station
- Permanent access road to be constructed by Gazprom Invest
- Isobaths

Projection: Lambert Conformal Conic

Revision Details	By / Check	Check Date	Suffix

Purpose of Issue: For Information

Client: South Stream Offshore Pipeline — Energising Europe

Project Title: SOUTH STREAM OFFSHORE PIPELINE

Drawing Title: LANDFALL AND NEARSHORE SECTIONS PIPELINE ROUTE

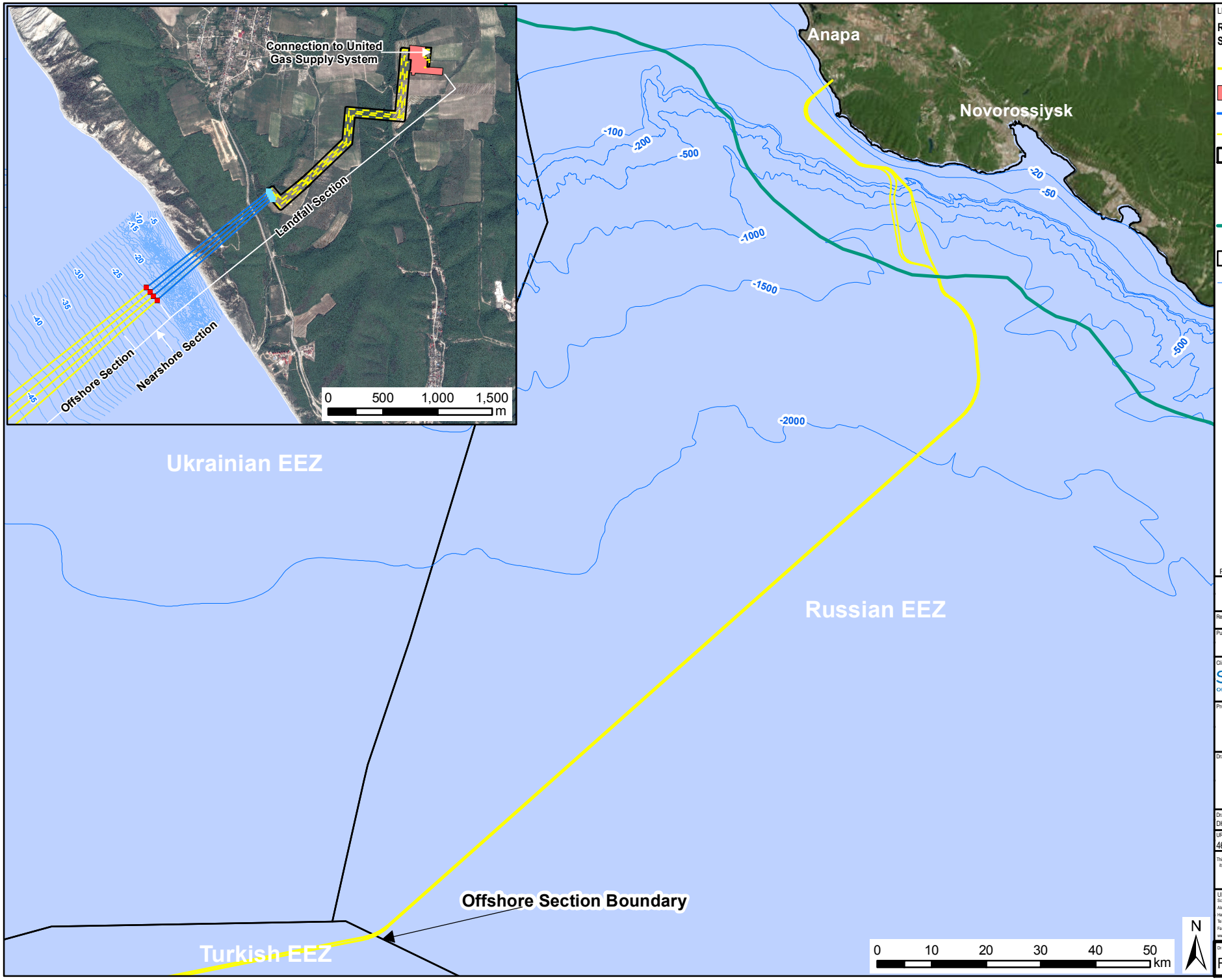
Drawn	Checked	Approved	Date
DH	RW	MW	12 Jun 2014

URS Internal Project No.: 46369082 | Scale @ A4: 1:30,000

URS Infrastructure & Environment UK Limited
Scott House
Alencon Link, Basingstoke
Hampshire, RG21 7PP
Telephone (01256) 310200
Fax (01256) 310201
www.ursglobal.com

Drawing Number: Figure 5 | Rev:

Plot Date: 12 Jun 2014
File Name: I:\5004 - Information Systems\46369082_South_StreamMXDs\Report Maps - Russia\Russian ESIA v2\NTS\Figure 5 Landfall and Nearshore Sections Pipeline Route.mxd



LEGEND

Russian Sector of South Stream Offshore Pipeline

- Proposed landfall section pipelines
- Landfall facilities
- Proposed microtunnels
- Proposed offshore pipelines
- Right-of-Way
- Microtunnel entry shaft
- Microtunnel exit pit
- Russian Territorial Waters boundary
- Exclusive Economic Zone boundary
- Isobaths

Projection: Lambert Conformal Conic

Revision Details	By / Check	Check Date	Suffix

Purpose of Issue: For Information

Client: South Stream Offshore Pipeline — ENERGISING EUROPE

Project Title: SOUTH STREAM OFFSHORE PIPELINE

Drawing Title: OFFSHORE SECTION PIPELINE ROUTE

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DH	RW	MW	12 Jun 2014

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URS Infrastructure & Environment UK Limited
Scott House
Alencon Link, Basingstoke
Hampshire, RG21 7PP
Telephone (01256) 310200
Fax (01256) 310201
www.ursglobal.com

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Plot Date: 12 Jun 2014
File Name:I:\5004 - Information Systems\46369082_South_StreamMXDs\Report Maps - Russia\Russian ESIA v2\NTS\Figure 6 Offshore Section Pipeline Route.mxd

Box 3 MAIN PHYSICAL ELEMENTS OF THE PROJECT

When operational, the Project will include the following permanent elements:

Landfall facility: a fenced landfall facility (approximately 4.85 hectares in area), which will include, among other features:

- Four Pipeline Inspection Gauge (PIG) trap facilities (one per pipeline);
- Eight Emergency Shutdown (ESD) valves (two per pipeline);
- Eight block valves (two per pipeline);
- Equipment for monitoring gas temperatures, pressures, flow rates, etc.;
- A gas heating system;
- A vent stack (21 m high) and associated piping;
- Pre-fabricated buildings housing electrical/instrumentation equipment, and office space;
- Buried fibre optic communication cables connecting to the Russkaya compressor station;
- Rainwater drainage system; and
- Fire and gas detection systems.

Buried pipelines: pipelines will be buried on land, connecting the landfall facilities to the United Gas Supply pipeline system (100 m upstream), and connecting the landfall facilities to the start of the microtunnels (2.4 km downstream). The pipelines will be buried using open-cut trenching techniques. In general, the buried pipelines will be spaced approximately 19 m apart, increasing to 26 m apart as they approach the start of the microtunnels.

Microtunnels: the pipelines will cross from land to sea via four microtunnels, each 1.4 km long and 2.5 m in diameter. The microtunnels will emerge in the seabed approximately 400 m from the shore in a water depth of approximately 23 m.

Subsea pipelines: the pipelines will extend approximately 225 km from the microtunnel exit pits to the border of the Russian and Turkish EEZs. They will be buried beneath the seabed for a short distance as they exit the microtunnels, and then laid on top of the seabed. In general, the subsea pipelines will be spaced approximately 100 m apart. However, spacing will range between 50 m (at the microtunnel exit pits) to 4,300 m (where the pipelines must diverge down two canyons on the continental slope).

Buried, microtunnel, and subsea pipelines all comprise four steel pipelines, each 32 inches (813 mm) in diameter.

Transportation: access road (connecting the landfall facilities with Gazprom Invest's permanent access road) and car parking.

Anti-corrosion protection: a buried cathodic protection structure will protect the landfall section pipeline from corrosion. A different corrosion protection system (sacrificial anodes) will protect the underwater pipeline.

Right-of-Way: a permanent corridor approximately 95 m wide above the buried landfall section pipelines. This area will be re-vegetated with grasses and small shrubs, but will be kept clear of deep rooting plants and trees. The Right-of-Way gives certain access privileges to South Stream Transport for the purposes of inspecting and maintaining the pipeline.

Onshore safety exclusion zones: an area extending 410 m around the landfall section pipelines and landfall facilities, where certain types of development will be restricted for the protection of public health and infrastructure.

Marine exclusion zone: an area extending 500 m either side of the outermost pipelines, from the microtunnel exit pits to the boundary of the Russian and Turkish EEZs. This exclusion zone will restrict activities during the operation of the pipelines that could impact the seabed, such as fishing using bottom trawling methods.

Construction activities on land will occur within a 120 m-wide construction corridor, which will be re-vegetated after construction is complete. After construction, this will be reduced to a 95 m-wide corridor above the buried pipelines during operations; this operational Right-of-Way will give certain access rights to South Stream Transport for the purposes of inspecting and maintaining the Project. No trees or deep-rooting plants will be allowed within the Right-of-Way as they could damage the pipelines, though the area will be re-vegetated with natural grasses and small shrubs.

Outside of the Right-of-Way there will be a wider "safety exclusion zone" for the duration of Project operations, which will limit certain types of development within the zone, although people will still be able to access and use the area.

The landfall section of the Project also includes two temporary access roads which will support construction. One road will link the microtunnel construction site to a permanent access road being constructed by Gazprom Invest, and the other will link the public road connecting Varvarovka and Gai Kodzor to Gazprom Invest's permanent access road in order to provide an access road to the landfall facilities construction site.

Nearshore Section

The nearshore section begins at the exit point of the microtunnels, located approximately 400 m from the coast at a water depth of approximately 23 m. From here, the nearshore section extends approximately 425 m further out to a water depth of 30 m.

From the microtunnel exit pits, the pipelines will be buried in trenches for 170 m. The trenches will be dredged in the seabed, and later refilled to bury the pipelines. From this point to the end of the nearshore section, the pipelines will be laid directly on the seabed. The pipelines in the nearshore section will be pre-coated in concrete, which will protect the pipeline from damage, and also stabilise it in regard to sea currents.

The end of the nearshore section marks the place where the offshore and nearshore sections of each pipeline will be joined together; this is known as the "tie-in" location.

Offshore Section

The offshore section extends from the edge of nearshore section at 30 m water depth (i.e. the "tie-in" location) to the border of the Russian and Turkish EEZs in the Black Sea. The pipeline west of the EEZ border is covered in the ESIA for the Turkish Sector.

In the offshore section, the Project passes through 225 km of Russian waters, including 50 km of Russian territorial waters and 175 km within the Russian EEZ. The pipelines will be laid directly on the seabed. They will be coated in concrete out to a water depth of approximately 88 m. There will be a 'marine exclusion zone' extending 500 m either side of the outermost pipelines. This exclusion zone will restrict activities during the operation of the pipelines that could impact the seabed, such as fishing using bottom trawling methods.

This section includes the steep continental slope, and the depths of the abyssal plain at approximately 2,250 m below sea level.

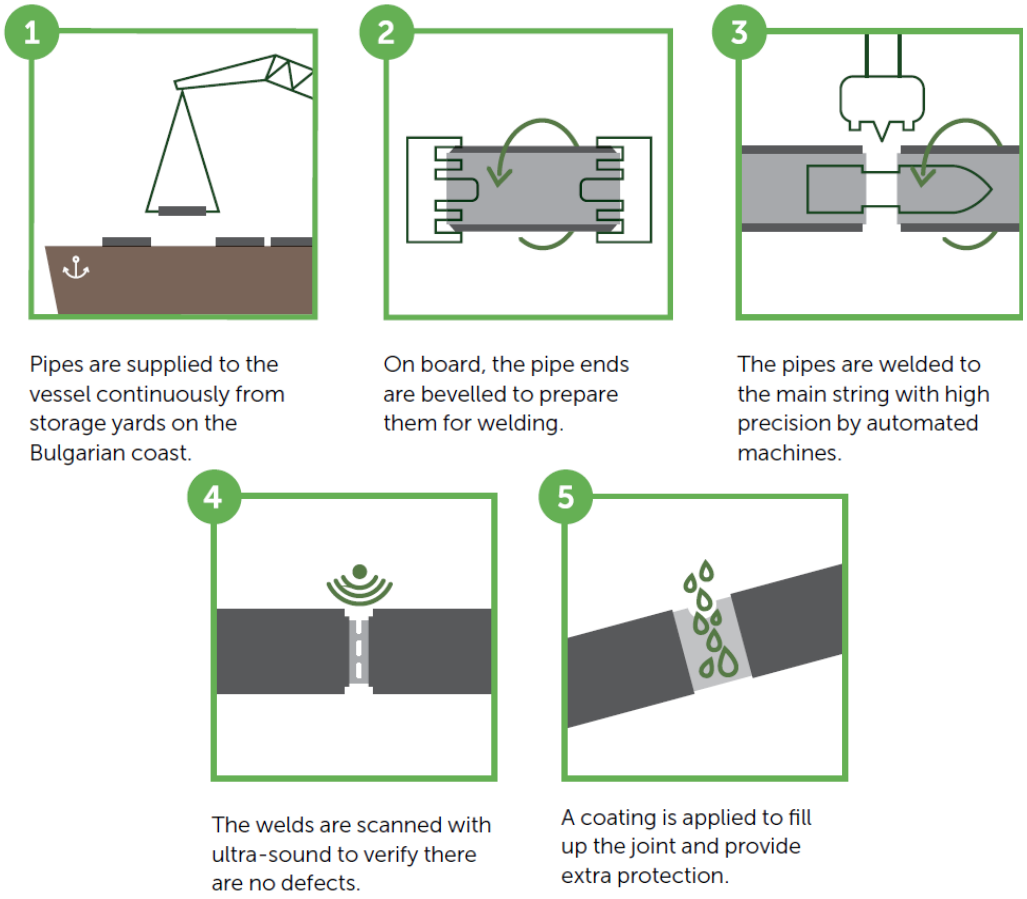
Pipeline Design

The entire South Stream Offshore Pipeline (including the Russian Sector) has been designed for an operational life of 50 years. The design is in accordance with internationally recognised standards for the engineering, fabrication, construction, testing, operation and maintenance of pipeline systems. Furthermore, the design aims to minimise impacts to the environment and communities.

When fully operational, the Project is designed to transport 63 billion cubic metres (bcm) of natural gas per year. Each of the four pipelines will have a capacity of 15.75 bcm. The entire South Stream Offshore Pipeline, including the Russian Sector, is designed to accommodate pressures of 300 bar, although the expected maximum operating pressure is anticipated to be only 284 bar.

The pipelines will be constructed of steel pipes made of 12 m long sections, each with an internal diameter of 32 inches (813 mm), which will be welded together during installation. Each weld will be inspected, tested and approved, and then an additional coating will be applied to each weld (Figure 7).

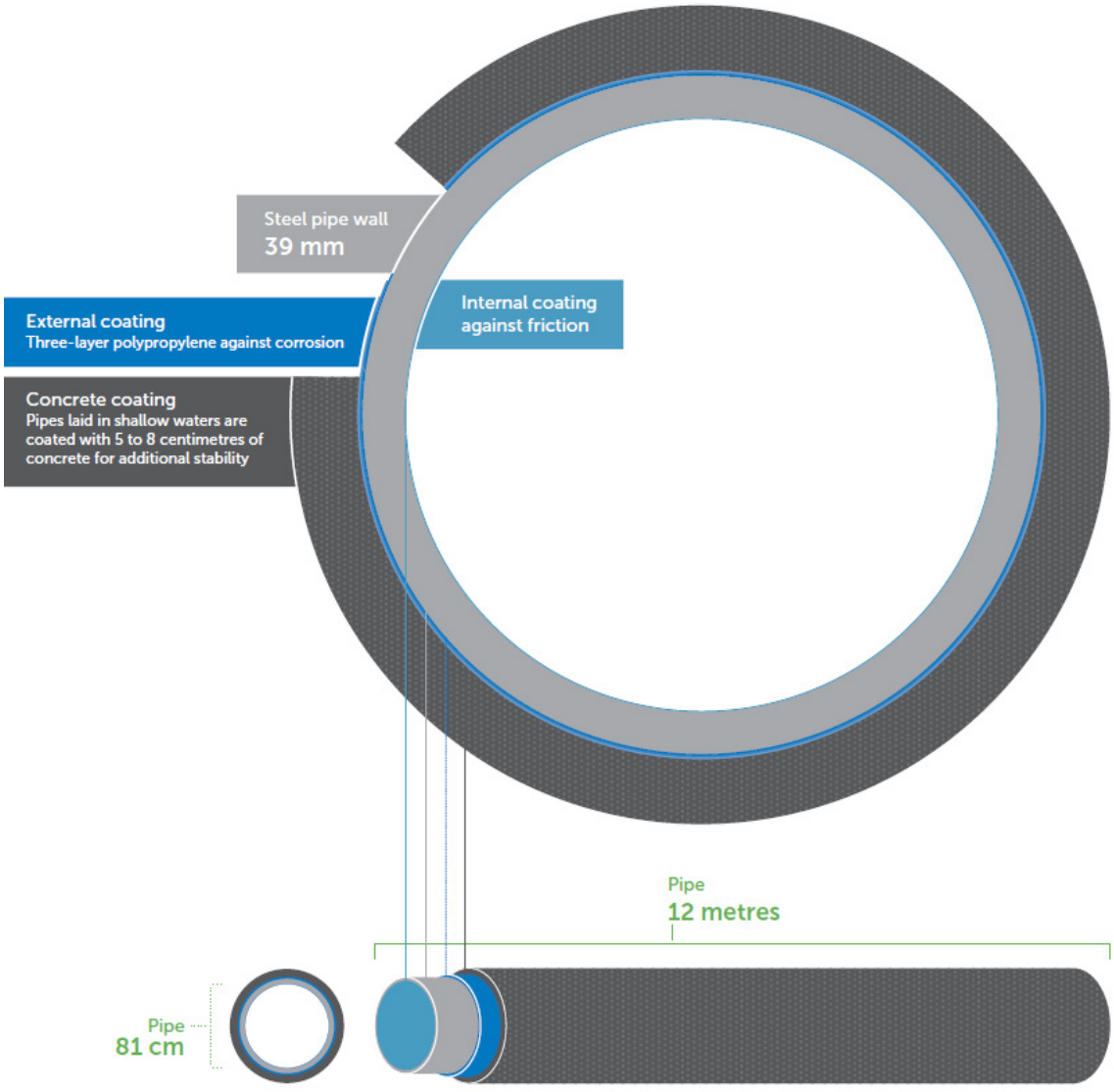
Figure 7 Illustrated Pipe Welding, Scanning and Coating Process



Note: This figure illustrates the welding, inspection and coating process for the marine sections of the Project, based on the pipe-lay vessel. However, steps 2 to 5 also apply to the landfall section.

The pipe sections will be coated with an anti-friction coating on the inside to improve the flow of gas, and an anti-corrosion coating on the outside. In shallower waters (i.e. water depths of less than 88 m) the pipe segments will be additionally coated with reinforced concrete to increase their weight in order to improve stability against sea currents and provide additional protection from external damage. Figure 8 illustrates the pipe sections and cross-sections.

Figure 8 Pipe Section Schematic



The entire Project (landfall, nearshore and offshore sections) will be protected against corrosion using a cathodic protection system. For the landfall section, a buried structure will provide an electric current to protect the buried pipeline from corrosion. In the marine sections, sacrificial anodes will be used to protect the pipeline. Sacrificial anodes are metal components that are

installed for the explicit reason that they have a higher potential for corrosion and thus "attract" corrosion away from the steel pipeline.

4.2 Construction Phase

This section describes the activities that will be undertaken during the construction of the Project. Construction activities are described for each of the landfall, nearshore and offshore sections.

Construction is scheduled to begin in 2014. All four pipelines are expected to be constructed within the landfall and nearshore sections within a relatively short period (approximately 19 months). First gas from Pipeline #1 is scheduled for late 2015, and all four pipelines fully operational by late 2017. However, as with all large construction projects, the schedule may be subject to change as a result of unforeseen delays. Potential delays may be related to factors such as weather conditions, logistics problems, geological conditions, or permitting procedures.

4.2.1 Construction of the Landfall Section

Moving generally from east to west, the landfall section includes: the landfall facilities; temporary construction areas; the construction corridor; and the microtunnels. These elements—as well as road use, utilities and environmental restoration—are described below.

Landfall Facilities

The permanent landfall facilities will take approximately 19 months to construct. Construction will begin with the clearing and levelling of the site, building access roads, and putting up fencing and access gates. Foundations will be developed for the facility buildings, as well as internal roads, walkways and car parking areas. Piping and mechanical works within the enclosed facilities will be welded and fitted, and utilities and electrical and instrumentation systems will be installed.

Construction of the landfall facilities will require a temporary construction area that is slightly larger than the footprint of the facilities. The infrastructure within the completed landfall facilities is listed in Box 3. There will also be 100 m of buried pipeline upstream of the landfall facilities, connecting to the pipelines that tie in to the Russkaya compressor station.

Temporary Construction Areas

A number of temporary construction areas (Figure 9) will be used to store pipe, equipment, and materials, as well as the earth material that is excavated (the "spoil", which will be used for restoration or taken away to landfill). There will also be areas for parking and worker facilities.

There will be a temporary construction area around the landfall facilities, along the construction corridor between the landfall facilities and the microtunnel entry pits, and around the microtunnel entry pits. A summary of the estimated areas of land required for these and other temporary construction areas is shown in Table 2.

Preparation of the Construction Corridor

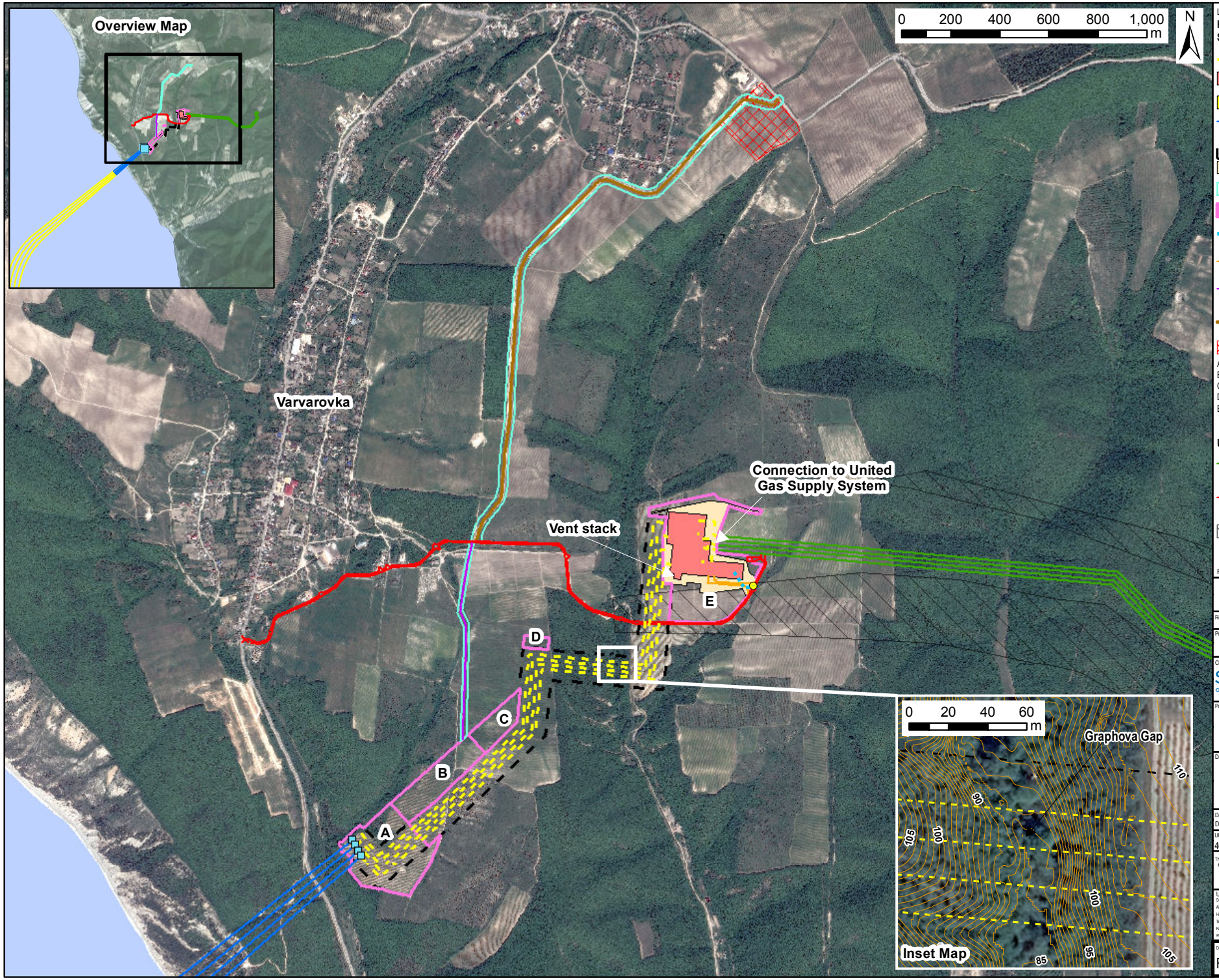
All open-cut pipeline construction activities will be undertaken within a temporary construction corridor. The construction corridor will be 120 m wide. Before open-cut construction begins, the exact route of each pipeline will be surveyed and the centrelines, as well the edges of the construction corridor, will be marked. Environmental specialists will accompany the survey crews to clearly mark sensitive environmental areas. Existing infrastructure (such as overhead power lines or water mains) will be located, marked, and either safeguarded or diverted.

Table 2 Estimated Area Requirements for Temporary Construction Areas

Temporary Site	Area (ha)
Landfall Section Pipeline Construction Corridor	27.43*
Microtunnel Construction Site (Site A)	8.76**
Pipeline String Preparation Area (Site B)	4.61
Landfall Pipeline Construction Site (Site C)	2.24
Temporary Storage Area (Site D)	0.50
Landfall Facilities Construction Site & Pre-Commissioning / Commissioning Spread (Site E)	5.19
Access Road Construction Areas (including temporary access roads in their entirety)	8.54
Potential Transfer Site (only if required by the contractor)	5.38

* 21.72 ha of the Permanent Right-of-Way is located within the Landfall Section Pipeline Construction Corridor, therefore the temporary land take requirement outside the Right-of-Way is 5.71 ha.

** 4.93 ha of Site A is located within the Landfall Section Pipeline Construction Corridor, therefore the temporary land take outside the Landfall Section Pipeline Construction Corridor is 3.83 ha.



LEGEND

Russian Sector of South Stream Offshore Pipeline

- Proposed landfall section pipelines
- Landfall facilities
- Anode ground bed for cathodic protection of pipelines
- Proposed microtunnels
- Microtunnel entry shaft
- Construction corridor
- Cut and fill side slopes
- Temporary construction area for road construction
- Construction sites
- Anode ground bed connection to landfall facilities
- Permanent access road to be constructed by SSTTBV
- Temporary access road constructed by SSTTBV
- Varvarovka bypass road (used by Project during construction only)
- Optional transfer site

A - Microtunnel construction site
B - Pipeline string preparation area
C - Landfall section pipelines construction site
D - Temporary storage area
E - Construction site for landfall facilities and offshore pre-commissioning and commissioning spread and site preparation

United Gas Supply System

- United Gas Supply System pipelines
- Permanent access road to be constructed by Gazprom Invest
- Marfovsky fault (indicative location)

Projection: Lambert Conformal Conic

Revision Details	By / Check	Check Date	Suffix

Purpose of Issue: For Information

Client: South Stream Offshore Pipeline — South Stream ENERGISING EUROPE

Project Title: SOUTH STREAM OFFSHORE PIPELINE

Drawing Title: LOCATION OF TEMPORARY FACILITIES

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URS Infrastructure & Environment UK Limited
Scott House
Alencon Link, Basingstoke
Hampshire, RG21 7PP
Telephone (01256) 310200
Fax (01256) 310201
www.ursglobal.com

Drawing Number: Figure 9
Rev:

Plot Date: 12 Jun 2014
File Name:I:\SD\4 - Information Systems\46369082_South_Stream\MXDs\Report Maps - Russia\Russian ESIA\v2\NTS\Figure 9 Location of Temporary Facilities.mxd

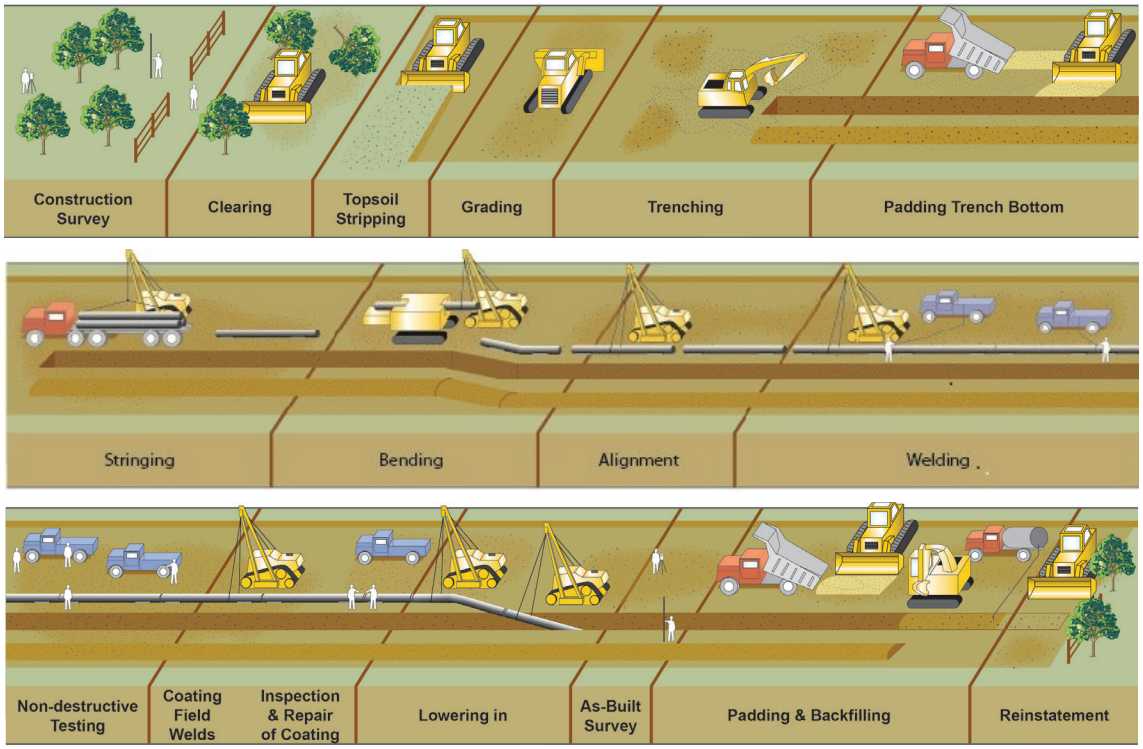
Open-Cut Pipeline Construction

Within the landfall section, there will be two separate sections of buried pipeline: 100 m of buried pipeline will connect the landfall facilities with the upstream gas network (the United Gas Supply System) to the landfall facilities, plus 2.4 km connecting the landfall facilities to the microtunnel entry shafts; these buried sections of pipeline will be constructed using open cut techniques (Figure 10).

Each section will comprise four pipelines laid in parallel. All four pipelines will be laid in one continuous construction period over a period of approximately six months. The general process for open-cut pipeline construction is shown in Figure 10 and includes the following activities:

- **Topsoil stripping and vegetation removal**. Prior to any topsoil removal, any rare or protected plant species (e.g. juniper, *Juniperus sp.*) will be carefully relocated to suitable alternative habitat outside the construction corridor. Other notable plant species will be gathered to be used for the reinstatement work after the pipeline has been laid. The original topsoil will be stockpiled for restoration activities;
- **Trenching**. Each pipeline will be installed in separate, parallel trenches. Trenches will be at least 2.5 m deep so that the completed pipelines will be buried at least 1.5 m below the surface;
- **Pipe delivery, stringing and bending**. The 12 m pipe sections will be transported along the construction corridor to the trenches. If needed, pipe sections will be bent on site. The pre-coated pipe sections will be aligned alongside the trench in preparation for welding;
- **Welding, testing, and joint coating**. The aligned pipe sections will be welded on site within a mobile shelter. The welds will then be inspected and tested, and each weld will be approved before an additional coating is applied and also inspected;
- **Pipe lowering and backfilling**. The welded and coated pipe will be carefully lowered into the trench. This will be a continuous operation aided by booms. Once inside the trench, the pipeline will surveyed once again. The trench will then be filled in; and
- **Reinstatement**. Restoration of the construction corridor will begin after the pre-commissioning tests have been successfully completed. All affected areas will be reinstated and restored to the original landform, contours and condition (as far as reasonably practicable). The original topsoil will be replaced and cultivated to ensure re-vegetation.

Figure 10 Typical Open-Cut Pipeline Construction Technique



Microtunnel Construction

The microtunnels will begin where the open-cut portion of the landfall section ends. A temporary microtunnel construction area will surround the four microtunnel entry shafts (Figure 9). The construction of the microtunnels will include the following main activities:

1. Excavation and construction of the microtunnel entry shafts (on land);
2. Excavation of the microtunnels using a tunnel boring machine (TBM);
3. Excavation of the microtunnel exit pit (in the sea);
4. Recovery of the tunnel boring machine;
5. Installation of the pipelines in the microtunnels; and
6. Grouting of the microtunnels.

Entry Shafts

The construction of the microtunnels will require a temporary construction area which will contain all the plant and equipment required for construction of the microtunnels. This area will also include the location of the microtunnel entry shafts. Each entry shaft will be approximately 12 m deep and 12 m in diameter.

After the microtunnels are constructed, and pre-commissioning tests have been successfully completed, the microtunnel entry shafts will be filled in and closed, and the land over them will be reinstated and revegated. Neither the entry shafts nor the microtunnels will be visible after reinstatement.

Microtunnel Excavation

The microtunnels will be constructed using a remotely controlled tunnel boring machine (TBM) to excavate a tunnel through the earth. The TBM will tunnel from the entry shaft on land, to the exit pits in the sea (approximately 400 m from the shore). A slurry of fresh water and non-toxic additives (primarily bentonite, a clay-like material) is used to lubricate the machine and clean the tunnel.

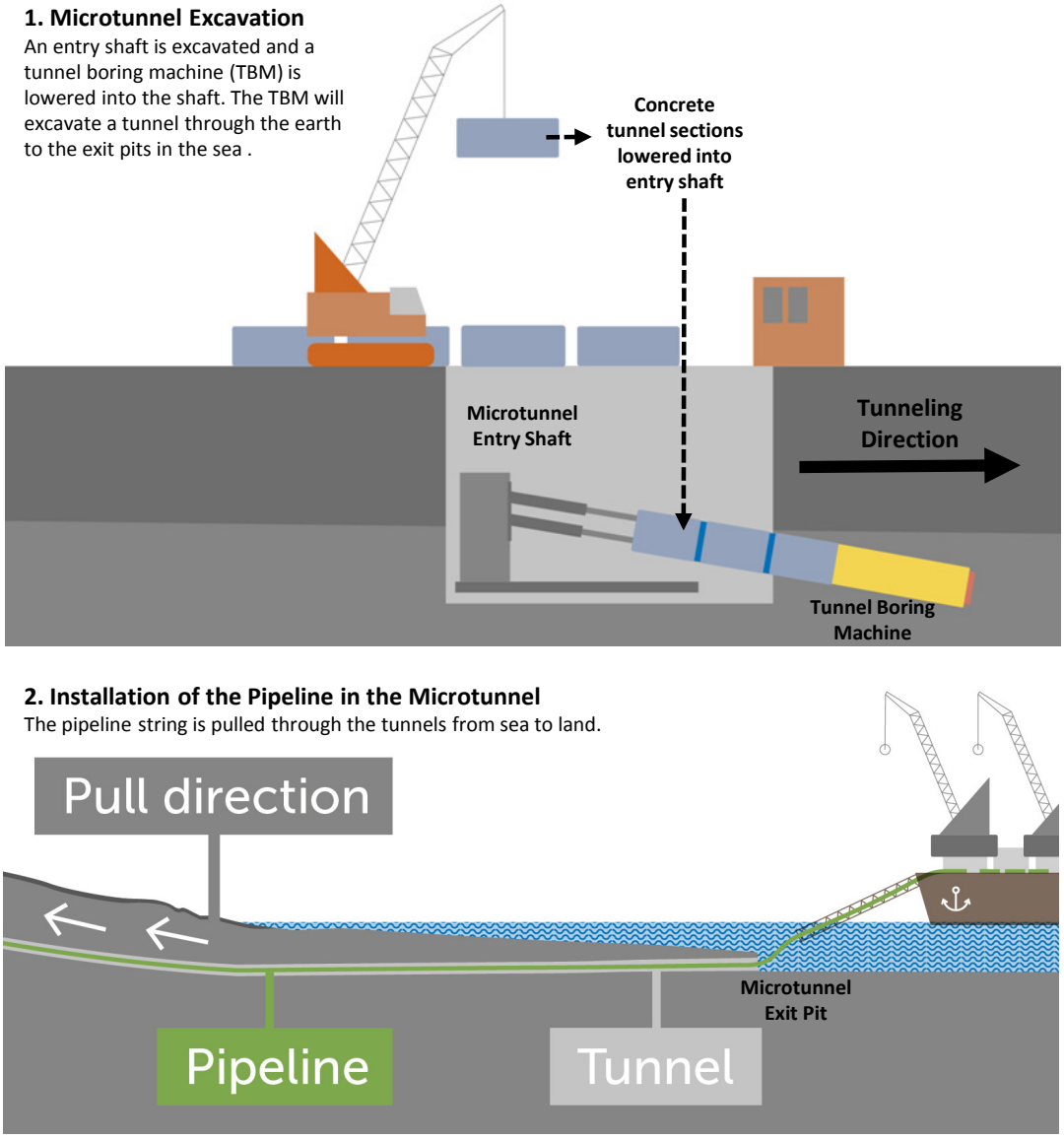
Each microtunnel will have a diameter of approximately 2.5 m. Concrete tunnel sections ("jacking pipes") will be pushed through after the TBM to stabilise the tunnel. Illustrations of typical microtunnel construction are shown in Figures 11 and 12, and the location of the four microtunnels is shown in Figure 9.

Each microtunnel will be approximately 1.4 km long, approximately 400 m of which will be under the seabed. The tunnels will be approximately 10 m beneath the surface at the entry shaft, and will cross under the Varvarovka-to-Sukko road, the Shingar River and the coastal cliffs without disturbance.

Microtunnel construction will occur 24 hours per day, seven day per week. Each microtunnel will take approximately four months to construct[2]. The excavated soil and rock will be removed from the tunnel through the slurry. The slurry will be pumped back to the surface, where it will be filtered, stored and re-used. Waste products will be carefully collected and transported to licensed waste facilities.

[2] The construction schedule assumes that each of the four microtunnels will be constructed one after the other; however, it is possible that the contractor could choose to construct two tunnels simultaneously, which would reduce the overall time for construction of the microtunnels.

Figure 11 Typical Microtunnel Excavation and Pipeline Installation



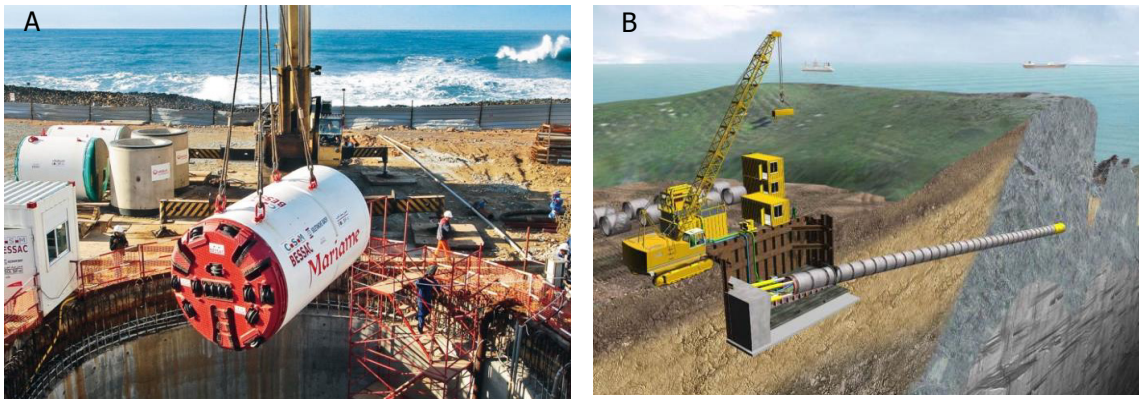
Exit Pits

The TBM will drill through the earth from land to sea, emerging at the microtunnel exit pits. The exit pits will be located approximately 400 m from the shore, at 23 m water depth. Each of the four exit pits will be dredged in the seabed. Once the TBM has reached the exit pit, it will be lifted from the water, and (if applicable) returned to the microtunnel entry shafts for excavation of the next microtunnel.

Installation of the Pipeline in the Microtunnel

After the microtunnels have been constructed, the pipeline will be will be pulled through the tunnels from sea to land, as shown in Figure 11. Once through the microtunnels, they will be joined with the landfall section pipelines.

Figure 12 (A) Typical TBM and Entry Shaft and (B) Typical Microtunnel Construction



Images supplied courtesy of Herrenknecht AG

Access Roads and Routes

The Project will require the construction of the following roads (shown in Figure 9) to provide access during construction of the buried pipelines, microtunnels and landfall facilities:

- Permanent access road (200 m, shown in orange) connecting Gazprom Invest's permanent access road (shown in red) to the landfall facilities. This road will be utilised throughout the Operational Phase of the Project to provide access to the landfall facilities and pipeline;
- Temporary access road (800 m, shown in purple) connecting Gazprom Invest's permanent access road (shown in red) to Site B (a temporary construction area);
- Temporary access road (2.6 km, shown in brown) connecting Gazprom Invest's permanent access road (shown in red) to the existing Gai Kodzor-to-Varvarovka road. This temporary access road is referred to as the Varvarovka Bypass Road; and
- Temporary access roads (2.5 km) which will be located within construction corridor (outlined in black) and temporary construction areas, connecting the landfall facilities to the microtunnel construction site.

In addition to the temporary and permanent access roads described above, the Project will also use local roads for the delivery and movement of materials, heavy equipment and personnel. Average daily construction traffic travelling to site is anticipated to peak in the second half of 2014 with approximately 520 return trips per day.

Utilities and Security

Freshwater will be required for certain construction activities (e.g. microtunnel excavation) as well as for pre-commissioning tests, dust suppression at construction sites and roads, and for drinking and other domestic uses. Freshwater will be obtained from an existing well located near Sukko, and will be transported by tanker truck to the construction site. Water will be stored on site during the summer months when extraction from the well is not available.

Power will be supplied using diesel generators. Temporary toilets will be located throughout the construction area, and sewage will be contained and removed by a licenced waste disposal company.

For health, safety, and security purposes, temporary fences will be established to control entry to active construction areas and protect the wellbeing of workers, residents and animals. Signs will be erected to raise awareness of site hazards, and to notify of any road or trail closures.

Restoration of the Landfall Section

After pre-commissioning tests are completed, the construction corridor, temporary construction areas and temporary access roads will be reinstated and restored to their original landform and condition, as far as reasonably practicable. Construction of the landfall and nearshore sections of the Project is expected to be completed in approximately 19 months.

Within the construction corridor, a permanent Right-of-Way will be established above the pipelines; this area will be re-vegetated with grasses and small shrubs, although deep-rooting vegetation such as trees will be avoided. The Right-of-Way will be 95 m wide (19 m between each pipeline and outside of the outermost pipelines).

The construction contractor will survey the construction corridor prior to the start of works, and will document and photograph the area and topography. Landowners will also be engaged in this process. These records will be used to guide reinstatement efforts and to judge the effectiveness of the restoration upon completion of the works.

The original topsoil (which preserves the natural seed bank and natural soil materials) will be cleared and stored at the start of construction, and will be used during restoration. This will encourage natural processes and natural re-vegetation using the native plant species found on the site.

4.2.2 Construction of the Nearshore Section

The nearshore section of the Project begins at the microtunnel exit pits (i.e. at the end of the landfall section, described above), in a water depth of approximately 23 m. The nearshore section extends further out to sea, to a water depth of approximately 30 m. This is where the nearshore construction will end, and each of the four pipelines will later be joined (the "tie-in") with the offshore sections.

The main construction activities in the nearshore section include:

- Surveys of the pipeline route prior to, during and after the pipe-laying process;

- Dredging of the microtunnel exit pit and transition trench;
- Recovery of the tunnel boring machine (TBM);
- Installation of the pipelines in the microtunnels;
- Pipe-laying from the exit pits to 30 m water depth;
- Backfilling of the microtunnel exit pit and transition trench; and
- The connection ("tie-in") between the nearshore and offshore sections.

Boats and Barges

Construction of the nearshore section pipelines and microtunnels will require use a number of vessels. The main vessel will be the pipe-laying vessel, a barge upon which pipe segments will be welded and lowered into the water. Other vessels will also be involved to support activities such as dredging, surveying, dive support, recovery of the TBM, and transport of supplies (e.g. pipes, fuel and provisions).

Surveys

Surveys of the pipeline route will be conducted before, during and after installation of the pipelines to ensure they avoid any obstacles, are laid along the correct route and are laid without defect. These surveys will be undertaken throughout the nearshore and offshore sections.

Pre-construction surveys will investigate the exact route of each pipeline before any dredging or pipe-laying begins. These surveys will help to optimise the route; identify boulders, rocks or potential unexploded ordnance (UXO)[3], which may need to be removed; avoid cultural heritage objects such as shipwrecks; and minimise disturbance of sensitive habitats. Remotely operated vehicles (ROVs) fitted with cameras will provide a real-

[3] Any identified UXO will either be avoided through re-routing, or cleared according to a UXO clearance plan developed in close conjunction with national authorities.

TERMS TO KNOW

Pipe-lay vessel: construction of the subsea pipelines will be done using a large vessel, upon which pipe sections will be welded together and lowered into the water.

Vessel spread: the network of ships and other vessels that will be located in the vicinity of the marine pipe-laying activity. This includes the pipe-lay vessel as well as supporting and supply vessels. In shallower waters it will also include anchor-handling tugs.

Safety Exclusion Zone: during construction, vessels not related to the Project will be restricted from accessing the area around the pipe-lay vessel. This is for safety reasons.

ROV: A Remotely Operated Vehicle (ROV) is a submersible vessel that helps investigate the underwater environment. These vessels can travel very deep, and may include cameras, as well as sensors for measuring properties of seawater. May also be a Remotely Operated Towed Vehicle (ROTV).

UXO: Unexploded ordnance (or UXOs) are explosive items (such as bombs, shells, grenades, mines, etc.) that did not explode when they were originally deployed. As such, these items may still pose a risk of detonation and need to be carefully identified and addressed.

PIGs: Pipeline Inspection Gauges (PIGs) are specialised equipment inserted into the pipelines during cleaning and inspection. They travel through the inside of the pipeline without stopping the flow of gas.

time view of the underwater area; other survey methods, such as sonar, will also be used.

Some of the vessels working in the nearshore section will use anchors. Therefore, an anchor corridor survey will also be carried out to ensure that any hazards or sensitive areas are avoided.

During and after the pipe-lay process, surveys and monitoring will seek to verify that sensitive underwater areas have been avoided and the pipeline has been installed correctly and without defect. This will include visual inspections using ROVs to watch the pipeline and the seabed environment in real-time as the pipeline is laid.

Exit Pits and Transition Trenches

The TBM will drill through the earth from land to sea, emerging at the microtunnel exit pits (approximately 400 m from the shore, at 23 m water depth). Each of the four exit pits will be dug in the seabed approximately 5 m deep, and spaced 50 m apart. Once the TBM has reached the exit pit, it will be lifted from the water using a crane (stationed on a barge) with support from divers.

When the TBM emerges into the exit pit, a small amount of the tunnel slurry will also emerge. However, the amount of mixing with the marine environment will be controlled by reducing the pressure of the slurry, and by the depth of the exit pits which will capture and contain any discharge. Since bentonite is denser than seawater, the slurry will settle in the exit pit where it will be collected and disposed of onshore.

Along with the exit pits, a transition trench will also be dredged in the seabed. Transition trenches will be approximately 170 m long, and will provide a gradual transition from the exit pits (5 m below the seabed) to where the pipeline will start to be laid directly on the surface of the seabed. After the pipeline is constructed and pre-commissioning tests have been completed, the trenches will be backfilled.

Dredging Equipment

A Cutter Suction Dredger (Figure 13) or grab crane will likely be used to dredge much of the exit pits and trench. A Trailing Suction Hopper Dredger (Figure 14) is an alternative option depending on the conditions encountered.

Temporary Storage of Dredged Materials

Material removed from the dredged trenches will be stored in a designated temporary storage area for the duration of the dredging works. The storage area is located to the north of the microtunnel exit pits and transition trenches. After the pipelines are installed in the trenches, the stored material will be used to backfill the microtunnel exit pits and transition trenches.

Figure 13 Schematic of a Cutter Suction Dredger

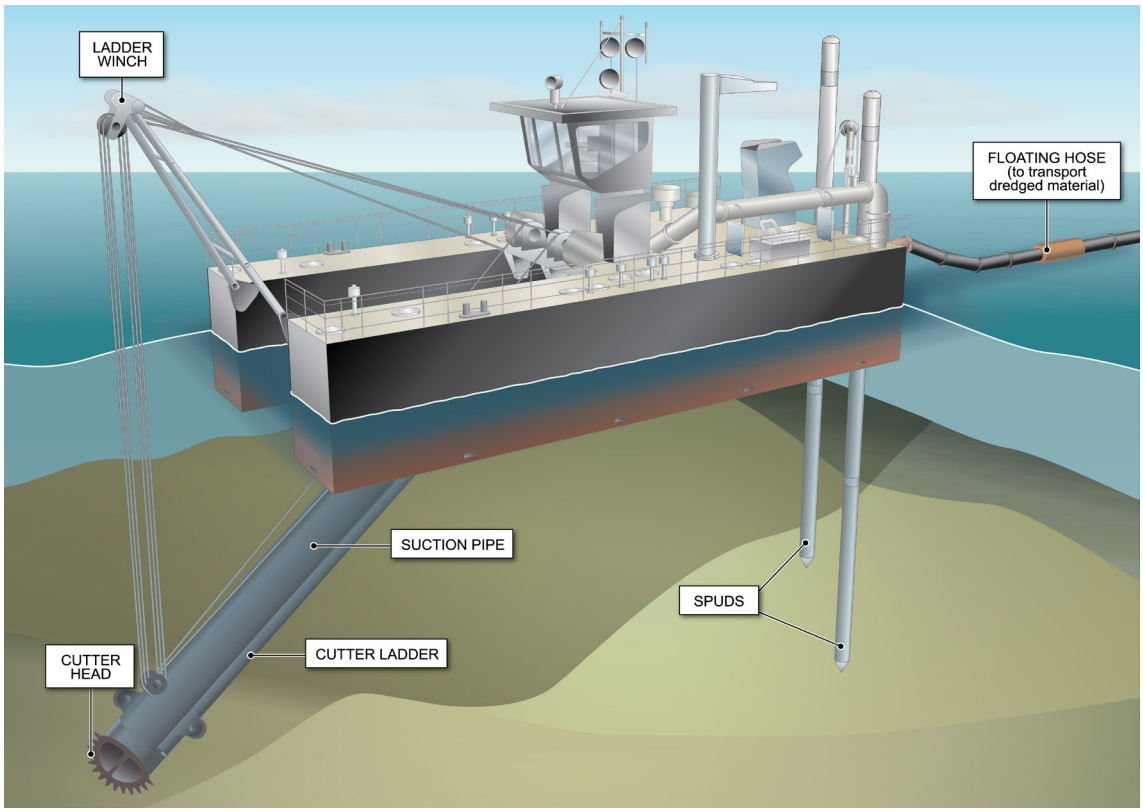
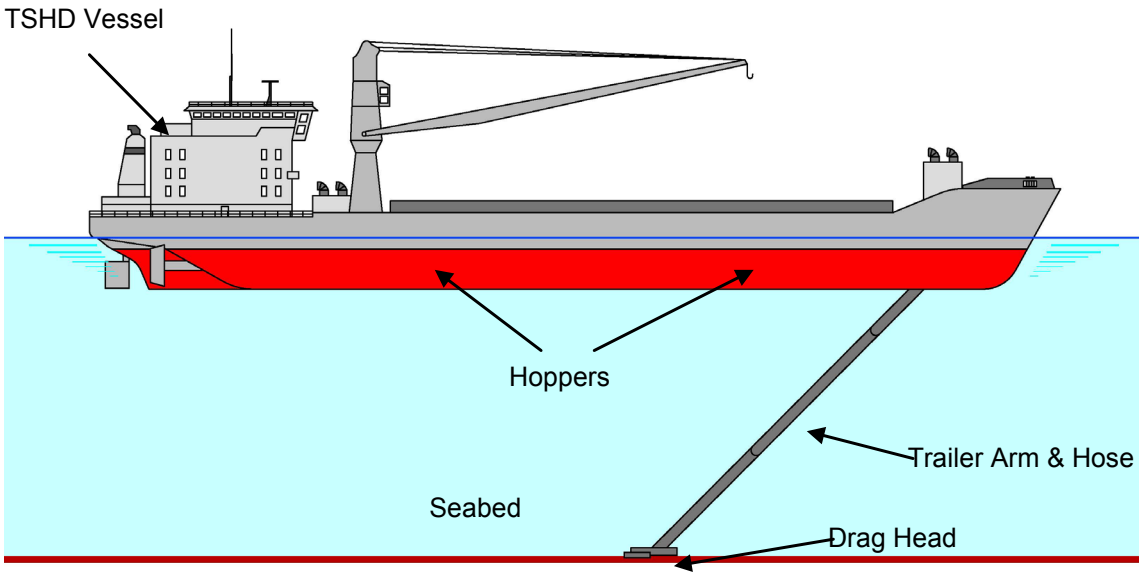


Figure 14 Schematic of Trailer Suction Hopper Dredger



Pulling Pipelines Through the Microtunnels

Once the microtunnels are complete, the pipeline string will be pulled through the tunnels from sea to land using a winch located at the microtunnel construction site. Pipe sections will be welded together on an anchored pipe-laying vessel located near the microtunnel exit pits, and then pulled through the microtunnels to land where they will be joined with the landfall section pipelines.

Laying Pipe in the Nearshore Section

After the pipelines have been installed in the microtunnels, pipe-laying in the nearshore section will move away from the Russian coast towards the tie-in location at 30 m water depth.

The pipe-laying process involves aligning the pipe sections and welding them together on-board the pipe-laying vessel. Welds will be tested, inspected and coated, and then the pipe will be lowered into the water. A shallow water S-lay vessel will be used in the nearshore section; S-lay and J-lay pipe-laying techniques are described further in Section 4.2.3 (Construction of the Offshore Section).

Anchoring and Exclusion Zones

Shallow water pipe-lay vessels are generally outfitted with anchors and anchor wires. Typically, these vessels utilise 8 to 12 anchors, which will be re-positioned by anchor handling tugs. The anchor tugs continually re-locate the anchors to allow the pipe-lay vessel to move forward without delays. Anchors may be positioned as far as 1.5 km from the pipeline centreline, depending on the vessel and the water depth.

To safely accommodate the pipe-lay activities and anchor movements and to avoid incidents with other marine traffic, a safety exclusion zone will be enforced around the pipe-laying vessel. This zone will extend approximately 3 km around the anchored pipe-lay vessel, moving with the vessel as construction moves out to sea, and will restrict access for non-Project vessels. Restrictions will be temporary and will be coordinated with the appropriate maritime authorities.

Inspection and Quality Assurance

All critical processes on-board the pipe-lay vessel(s)—including welding—will be inspected by a quality assurance crew, and thereafter inspected by representatives of an independent certification company and South Stream Transport. This applies to the nearshore section and the offshore section.

Pre-Commissioning and Tie-In

When pipe-laying reaches the start of the offshore section (at 30 m water depth), a temporary cap (a "test head") will be fitted to the end of each pipeline. This will enable pre-commissioning tests to be undertaken for the landfall and nearshore sections. Pre-commissioning tests are described further in Section 4.3.

For the tie-in of the nearshore and offshore sections, the nearshore end of the pipeline will be carefully raised above the water and welded to the offshore end. The connected pipeline will then be lowered back to the seafloor.

Reinstatement of the Nearshore Section

Following successful pre-commissioning tests of each nearshore and landfall section pipeline, the dredged sections will be backfilled. It is anticipated that it will take approximately four days to backfill and reinstate each of the four exit pits and trenches.

4.2.3 Construction of the Offshore Section

Construction of the offshore section will include the following activities:

- Surveys of the pipeline route prior to, during and after the pipe-laying process; and
- Offshore pipe-laying, including seabed intervention works at specific locations.

The tie-in of the completed nearshore and offshore sections is described above (Section 4.2.2).

Offshore Construction Vessel Spread

The main vessel required will be the pipe-lay vessel. In addition, other vessels will be involved in the pipe-laying activities, such as support vessels (survey and crew change) and supply vessels (pipes, fuel and provisions).

Laying Pipe in the Offshore Section

Similar to the nearshore section, the offshore pipe-laying process involves aligning, welding and lowering the pipe from the pipe-laying vessel. Offshore pipe-laying may be performed using S-lay or J-lay techniques, depending on factors such as water depth, cost and the availability vessels. The techniques are named for the shape they make in the water. Box 4 summarises these two techniques, which are illustrated in Figures 15 (photos showing typical vessels) and 16 (schematics).

Figure 15 (A) Typical S-Lay Vessel (used in shallow and intermediate water depths) and (B) Typical J-Lay Vessel (used in deep water depths)

Image supplied courtesy of Allseas, Switzerland

Image supplied courtesy of Saipem

Box 4 S-LAY AND J-LAY PIPE-LAY TECHNIQUES

S-Lay: can be used in shallow or deep water. This method involves horizontally welding the pipe sections, and continuously moving the welded sections off the back of the vessel as the vessel moves forward. In this way, the pipeline forms an "S" shape from where it leaves the vessel, to where it touches down on the seafloor.

In the offshore section, the average pipe-lay rate for S-Lay technique is expected to be around 4 km per 24-hour period, depending on weather conditions. In the nearshore section, the rate is expected to be around 1.5 km per 24-hour period.

J-Lay: the J-lay method was developed for laying pipe in for laying pipe in deep waters. The pipeline sections are assembled and welded vertically in a tower erected on the pipe-laying vessel. In this way, the pipeline forms a "J" shape as it descends to the seabed.

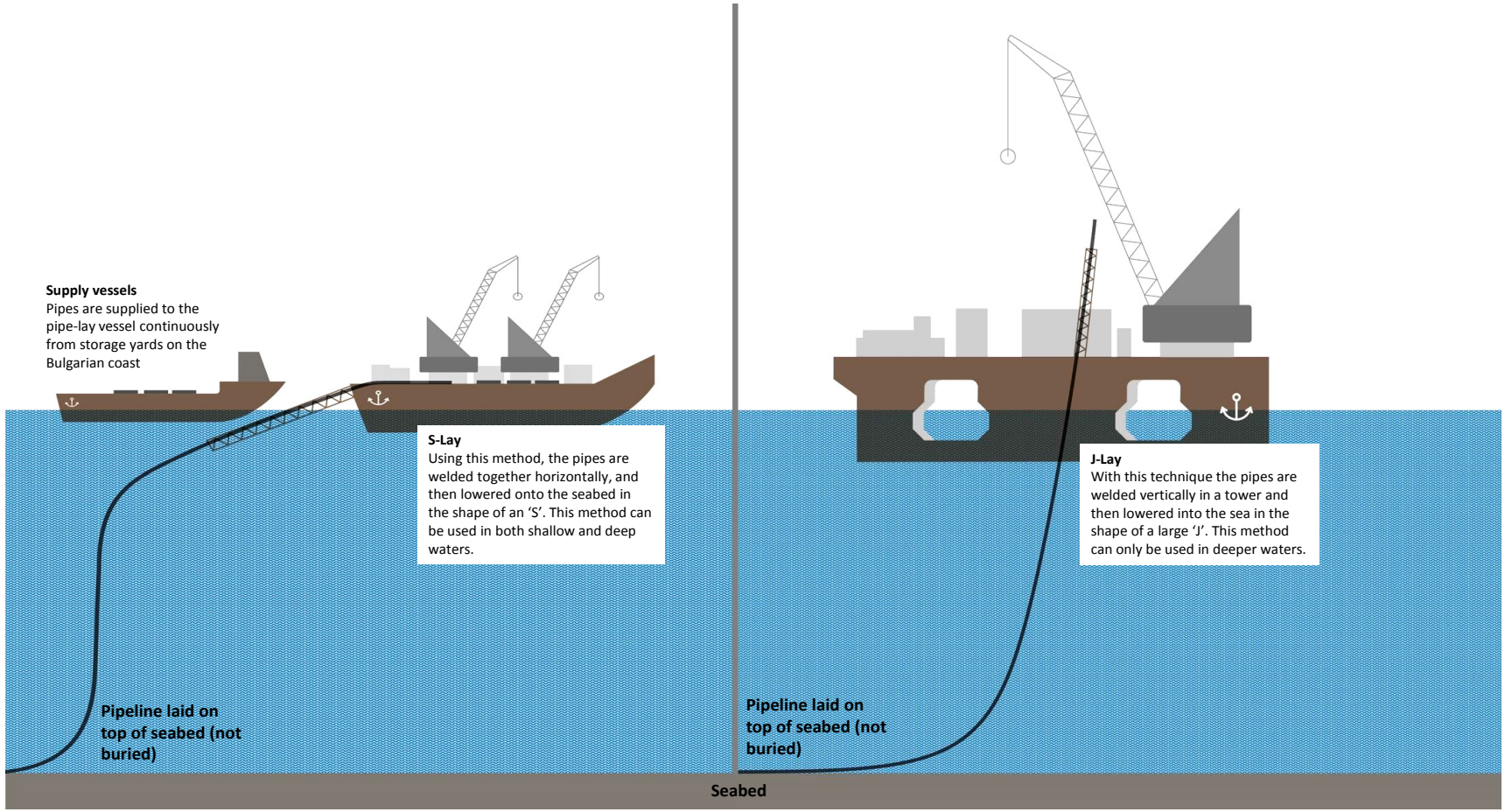
The average pipe-lay rate using J-Lay technique is expected to be around 2.75 km per 24-hour period, depending on weather conditions. The J-lay method is suitable from a minimum water depth of approximately 300 m.

Anchoring and Exclusion Zones

For the majority of offshore pipe-laying work the pipe-lay vessel will be manoeuvred along the pipe-lay route using dynamic positioning (DP), therefore no anchors will be required. Anchored vessels may be used in water depths of up to 600 m.

As discussed in Section 4.2.2, the safety exclusion zone around an anchored pipe-laying vessel will be approximately 3 km in radius. The zone around a DP pipe-laying vessel will be approximately 2 km in radius. Agreement with the appropriate maritime authorities will be obtained regarding the exact exclusion distances.

Figure 16 Schematic of S-Lay and J-Lay Pipe-Laying Methods



Note: supply vessels from the ports in Bulgaria will support both S-lay and J-lay pipe-lay vessels.

Seabed Intervention

In the offshore section, the pipeline will be laid directly on the seabed. This technique will minimise seabed disturbance over most of the 225 km section, as most areas will not require any change to the seabed. However, although the route of the pipelines has been designed to avoid challenging areas of the seabed as much as possible, some intervention will be required in specific areas, either before or after pipe-laying.

Seabed intervention will be used to limit free span lengths (i.e. an area where the pipeline is suspended across two high points of the seabed, for example in areas where the seabed is rough and uneven); to protect the pipeline from geo-hazards such as rockfall in steeply sloping areas (e.g. on the continental slope); and to protect pipelines and cables at cable crossing locations. Seabed intervention methods can be divided in two main categories:

- Modifications before the pipe is laid, including removing material (dredging) from the seabed or adding supports using gravel or concrete "mattresses" on which the pipeline will be laid; and
- Modifications after the pipe is laid, including adding support underneath the pipeline, adding small stones / gravel on top ("rock dumping") for stability or protection, or other means.

ROVs are often used to support seabed intervention activities.

4.3 Pre-Commissioning Phase

The landfall and nearshore sections of each pipeline will be tested in order to ensure that they are suitable to transport gas. The pipeline must pass these pre-commissioning tests before any natural gas is introduced into the pipeline.

Pre-commissioning includes cleaning, gauging, hydro-testing, and drying of the pipelines. Hydro-testing involves filling the pipelines with water to a pressure in excess of the design pressure (i.e. the highest intended gas pressure) of the pipelines in order to test the strength of the pipeline and confirm that there are no leaks.

Hydro-testing will only be undertaken for the landfall facilities, landfall section, and nearshore section pipelines (i.e. to 30 m water depth). The offshore section of the South Stream Offshore Pipeline (i.e. between 30 m water depth in Russia and approximately 36 m water depth in Bulgaria) will not be hydro-tested, although it will still undergo cleaning, gauging and drying after tie-ins are complete.

4.3.1 Landfall and Nearshore Sections

Pre-commissioning of the nearshore and landfall sections of each pipeline will be undertaken as each pipeline is completed (i.e. the landfall and nearshore sections of Pipeline 1 will be tested after Pipeline 1 is constructed, while construction of the other pipelines is still underway). Approximately four weeks will be required to test each pipeline, with an estimated three months between testing each pipeline. During testing, an offshore support vessel will be stationed at the tie-in location at 30 m water depth.

The first step of the pre-commissioning process is cleaning and gauging. Pipeline inspection gauges (PIGs) are inserted into the pipelines to clean and gauge them and remove any construction debris. After successful cleaning and gauging of the pipelines, hydro-testing will begin.

Hydro-testing will re-use the seawater from the cleaning and gauging activities (which will be stored and treated), plus additional seawater as needed to raise the pressure in each pipeline. Once the results of the hydro-testing have been validated and accepted, the pressure will be lowered. If a leak is detected, it will be repaired and retested. After successful hydro-testing, the pipeline will be dewatered and dried. Drying will be done using a chemical drying agent (Monoethylene Glycol, or MEG). Compressed air will push the MEG and PIGs through the pipeline, using a series of air compressors. MEG will not be disposed in the sea, but will be pumped to the support vessel for disposal through an approved waste management company.

4.3.2 Landfall Facilities

The landfall facilities will undergo pre-commissioning tests separately from the landfall and nearshore section pipelines. All piping that will be installed at the landfall facilities, regardless of its diameter, will be tested with a process similar to that described for the main pipelines. Freshwater will be used for these hydro-testing activities, and will be brought to site by road tankers.

Following successful hydro-testing, the pipeline will be dewatered and dried. One high pressure air compressor will be used for pre-commissioning tests at the landfall facilities. The pre-commissioning process for the landfall facilities is anticipated to take approximately 23 days.

4.3.3 Offshore Section

Cleaning, gauging and drying of each of the four pipelines, in their entirety (i.e. over 930 km between the landfalls in Russia and Bulgaria), will be undertaken following completion of the pre-commissioning tests of the landfall and nearshore sections of the pipelines in both Bulgaria and Russia, and the subsequent pipeline tie-ins between the nearshore and offshore pipeline sections in Russia (30 m water depth) and Bulgaria (approximately 36 m water depth).

As for the landfall and nearshore sections, cleaning, gauging and drying of the pipelines will be undertaken simultaneously using cleaning and gauging PIGs and batches of MEG to dry the pipelines. Water, MEG and any debris from the pipelines will be captured in temporary onshore water tanks at the landfall section in Bulgaria[4], to allow the debris to separate from the water and MEG. It is anticipated that approximately 18 tonnes of debris will be collected by the cleaning PIGs for each pipeline. The water, MEG and debris will be disposed of by an approved waste disposal company.

[4] This assumes that this stage of pre-commissioning will progress from Russia to Bulgaria; however, the construction contractor may choose to run these activities from Bulgaria to Russia, in which case waste will be gathered and disposed at the Russian landfall.

It is anticipated that these pre-commissioning activities, from the Russian landfall facilities to the Bulgarian landfall facilities, will take approximately seven weeks for each pipeline.

Upon the successful completion of all pre-commissioning tests, the remaining pipeline connections will be made. This includes connections to:

- The Russian gas network upstream of the landfall facilities in Russia (i.e. the United Gas Supply pipeline network and the Russkaya compressor station being developed by Gazprom Invest); and
- The receiving terminal of the *South Stream Pipeline System on the Territory of the Republic of Bulgaria* (i.e. the pipeline and facilities being developed by South Stream Bulgaria AD).

4.4 Operational Phase

This section summarises the activities that will be undertaken during the Commissioning Phase and the Full Operations Phase of the Project.

4.4.1 Commissioning

The South Stream Offshore Pipeline will be brought into service by the introduction of natural gas from the Russian gas network only after all control and monitoring systems are operational at both ends of the Pipeline (i.e. at the Russkaya compressor station in Russia, and the South Stream Bulgaria Receiving Terminal in Bulgaria). Each of the four pipelines will be commissioned and come into operation separately after they complete offshore pre-commissioning activities.

During the Commissioning Phase, natural gas will be injected at the Russian end and the pipeline will be gradually pressurised. It is anticipated that each pipeline will take approximately ten days to fill with gas and commissioning activities will take approximately two weeks to complete.

4.4.2 Full Operations

During normal operations, the main valves at the landfall facilities will be open and the landfall facilities will effectively only serve to transport the gas from inlet to outlet. Gas will flow through the pipeline from Russia to Bulgaria, and will be monitored from control rooms in Amsterdam. Some routine inspections and maintenance will be conducted, but the overall level of visible activity will be low.

Landfall Facilities

The main components of the landfall facilities include monitoring systems, customised pre-fabricated containers and a system of valves and vents. During normal operation, workers will only be present at the landfall facilities during maintenance activities. Facilities will be controlled from a central control room and back-up control room located in Amsterdam.

Monitoring equipment will continuously measure temperatures, flow rates, gas composition and pipeline pressure. Emergency shut-down (ESD) valves will be installed for each pipeline, which will be remotely operated from the control rooms; there will also be an automated shut-down

process which will be triggered if non-standard operating conditions are detected. Each pipeline will be further equipped with block valves, which allow segments of the pipeline to be isolated for maintenance.

The landfall facilities will include PIG traps for each pipeline, where PIGs can be launched and received during maintenance inspections. A gas heating system will be employed, as required, to heat the gas to meet operational requirements. A venting system will also be present, although venting will only occur during maintenance or shutdown activities. There will not be any flaring from the vent stack.

A fire and gas detection system will be installed at the landfall facilities, including a number of gas, flame and smoke detectors. In the event of a fire or gas incident, the affected parts of the pipeline will be rapidly isolated.

Utilities and Security

During operation, the landfall facilities will be provided with electrical power from the Russkaya compressor station. A diesel generator will provide emergency power supply in the event that normal power supplies are unavailable.

Potable water for domestic consumption will be provided. No sewerage connection is required.

The landfall facilities will be fenced for security, and security cameras will be monitored from the central control room. Operational staff at the neighbouring Russkaya compressor station will be alerted to security incidents if needed.

Monitoring, Maintenance and Repair

The condition of the underwater pipeline will be monitored on a regular basis using inspection technologies. Regular inspections will occur annually, and a survey of the entire route will be undertaken every five years. The inside of the pipelines will also be monitored using PIGs approximately every five years.

Each pipeline will also be monitored remotely. Should there be an irregularity or deviation, this information will be transmitted to the central control room in Amsterdam, the Russkaya Compressor Station in Russia, and the Receiving Terminal in Bulgaria where the operators can adjust gas flows as needed, or shut down the pipeline remotely. Safety systems will be designed to automatically shut down the pipeline in certain circumstances.

The chance that a properly designed and installed deep-water pipeline will experience a failure is small. However, South Stream Transport will have an overall Emergency Pipeline Repair Strategy for the South Stream Offshore Pipeline in the event of damage to any of the pipelines.

4.4.3 Land Use and Exclusion Zones

Land will be acquired for Project infrastructure and to allow for operations, maintenance and emergency access during the operational life of the Project. Table 3 summarises the areas of permanent land use.

The permanent pipeline Right-of-Way (Figure 17) will be approximately 95 m wide (19 m either side of the outermost pipelines) and 2.5 km long (0.1 km upstream and 2.4 km downstream of the landfall facilities).

Table 3 Permanent Land Use Requirements

Component	Permanent Land Take Area (ha)
Landfall facilities	4.85
Pipeline Right-of-Way	23.75
Engineered slopes surrounding the Landfall Facilities	4.83*
Varvarovka bypass road (used only during the Construction Phase of the Project)	2.6
Anode bed	0.05

* 1.3 ha are located within the pipeline Right-of-Way, therefore the total additional area is 3.53 ha.

The Right-of-Way will be maintained as a cleared corridor during operations. Deep rooting trees or permanent crops will not be allowed to grow; however, bushes and other shallow rooted vegetation will be allowed to grow naturally or will be planted. A vehicle track (unsealed and suitable for 4x4 vehicles only), will run along the Right-of-Way to enable access to and inspection of the pipelines.

Safety Exclusion Zones (Landfall Section)

In addition to the permanent Right-of-Way there will be three Safety Exclusion Zones for the protection of public health and infrastructure. These zones will not affect the ability of people to access these areas, but will restrict certain types of future development. Distances are defined from the centreline of the outermost pipelines, and are in accordance with regulatory requirements and industry standards. The proposed exclusion zones are as follows:

- Within 260 m: no isolated buildings, dachas, agricultural farms, etc.;
- Within 345 m: no communities, settlements, apartments of three levels or more, residential developments, etc; and
- Within 410 m: no airports, railways stations, developments or buildings with population of more than 100 persons, etc.

Marine Exclusion Zones

To ensure that the underwater pipelines are not damaged by other activities (e.g. dragged anchors, fishing gear, oil and gas exploration, etc.), marine exclusion zones will be put in place during pipeline operation along the route of the Project through the Black Sea. These zones will restrict activities that may damage the pipelines, and where the pipeline may damage other

equipment (such as fishing gear). However, boating and other activities that will not affect the seabed will be unaffected by the marine exclusion zones.

The boundaries of the exclusion zones will be agreed in consultation with the appropriate authorities. It is anticipated that the exclusion zone will extend to 500 m (0.3 nautical miles) either side of the pipelines from the microtunnel exit pit to the boundary between the Russian and Turkish EEZs, as illustrated in Figure 18.

4.5 Labour and Procurement

4.5.1 Construction Phase

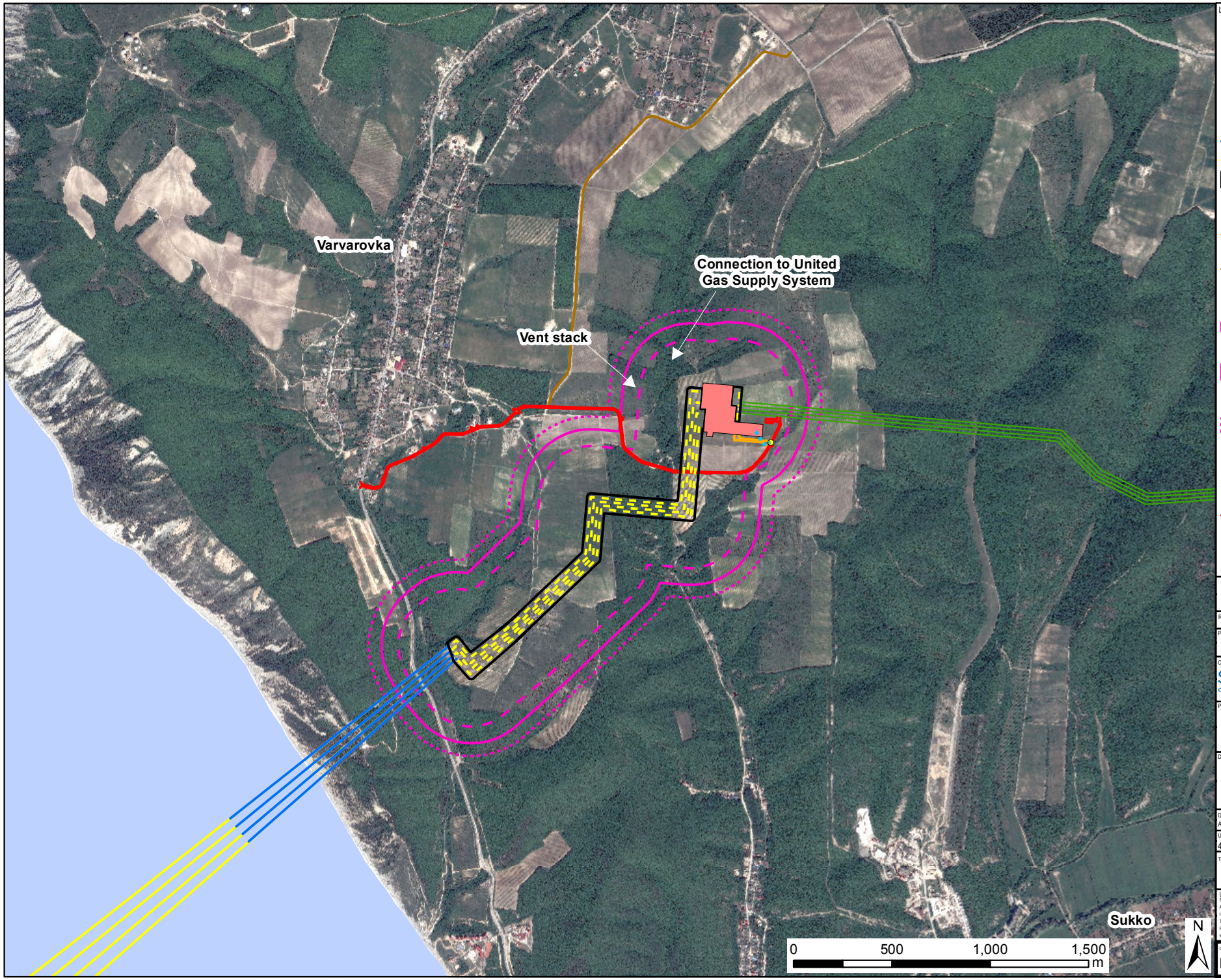
The maximum numbers of workers anticipated to be working on the Project during peak times of construction activity are presented in Table 4. More precise information will become available as the detailed design is completed.

Table 4 Estimated Employment Levels during the Construction Phase

Project Section	Peak Worker Numbers
Landfall	330
Nearshore	544
Offshore	1,211

Due to the specialised nature of offshore pipeline construction, the majority of the construction work force required will be highly skilled and is anticipated to come from outside the local area. All offshore and nearshore workers will be accommodated on vessels at sea and will only transit through the local area.

Occupational health and safety for procurement, construction, installation and operations will be managed by South Stream Transport and the respective contractors. Internationally established procedures to ensure the health and safety of the workforce will be adopted along with the necessary equipment and training to make these effective.



LEGEND

Russian Sector of South Stream Offshore Pipeline

- Proposed landfall section pipelines
- Landfall facilities
- Anode ground bed for cathodic protection of pipelines
- Proposed microtunnels
- Proposed offshore pipelines
- Right-of-Way
- Anode ground bed connection to landfall facilities
- Permanent access road to be constructed by SSTTBV
- Varvarovka bypass road (used by Project during construction only)

Safety Exclusion Zones

- C- and E-class: no isolated buildings (1-2 levels), dachas, agricultural farms
- B-class: no cities, settlements, apartments of 3 levels or more, no developments/buildings with less than 100 people
- A-class: no airports, railways station, no developments/ buildings with population of more than 100 persons

United Gas Supply System

- United Gas Supply System pipelines
- Permanent access road to be constructed by Gazprom Invest

Projection: Lambert Conformal Conic

Revision Details	By / Check	Check Date	Suffix

Purpose of Issue: For Information

Client: South Stream Offshore Pipeline — Energising Europe

Project Title: SOUTH STREAM OFFSHORE PIPELINE

Drawing Title: PERMANENT RIGHT-OF-WAY AND SAFETY EXCLUSION ZONES – PROJECT OPERATIONAL PHASE

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URS Infrastructure & Environment UK Limited
Scott House
Alencon Link, Basingstoke
Hampshire, RG21 7PP
Telephone (01256) 310200
Fax (01256) 310201
www.ursglobal.com

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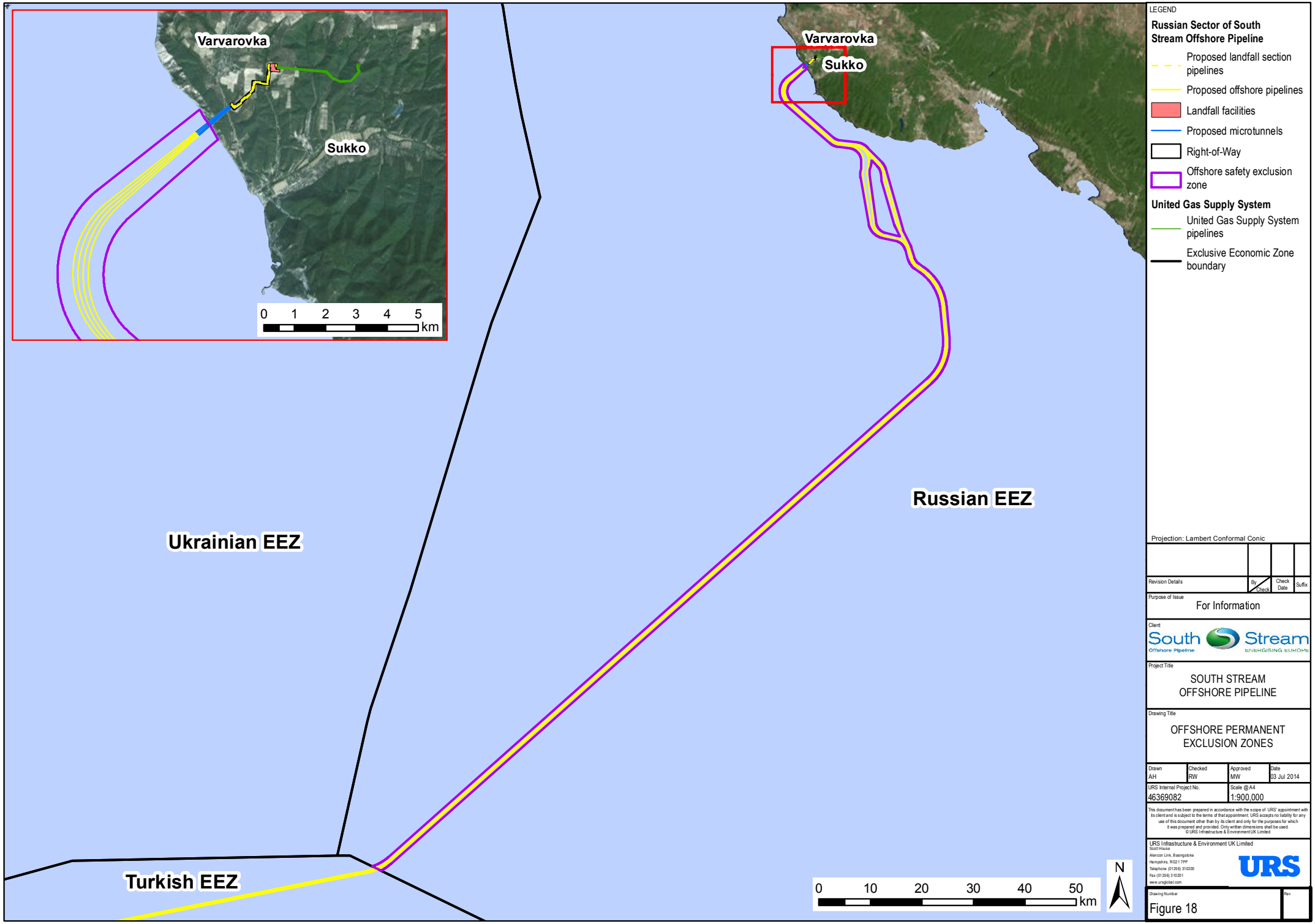
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LEGEND
Russian Sector of South Stream Offshore Pipeline
Proposed landfall section pipelines
Proposed offshore pipelines
Landfall facilities
Proposed microtunnels
Right-of-Way
Offshore safety exclusion zone
United Gas Supply System
United Gas Supply System pipelines
Exclusive Economic Zone boundary
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South Stream
Offshore Pipeline
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Project Title
SOUTH STREAM OFFSHORE PIPELINE
Drawing Title
OFFSHORE PERMANENT EXCLUSION ZONES
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Date 03 Jul 2014
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Scott House
Alencon Link, Basingstoke
Hampshire, RG21 7PP
Telephone: (01256) 310200
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4.5.2 Operational Phase

There will be no full time workers employed during the Operational Phase of the Project, with only occasional periods when workers will be onsite for inspection and maintenance. However, there will be a workforce stationed permanently at the central and back-up control rooms (in Amsterdam) to operate the South Stream Offshore Pipeline.

Inspection activities (i.e. using PIGs and ROVs) will be undertaken by specialist contractors. It is anticipated that more general maintenance of electrical and monitoring systems will be undertaken by workers from the nearby Russkaya compressor station (being developed by Gazprom Invest).

4.6 Decommissioning

The expected service lifetime of the South Stream Offshore Pipeline is 50 years. At the end of its service lifetime, the Pipeline will be decommissioned, meaning that gas transport will end and the pipeline infrastructure will be deactivated and/or removed. The decommissioning programme will be developed during the Operational Phase of the Project. It is likely that the technological options and preferred methods for decommissioning of such gas transportation systems as the South Stream Offshore Pipeline will evolve over the next 50 years. The choice of decommissioning methods will also depend on the status of the South Stream Offshore Pipeline at the time of decommissioning.

Under all circumstances, decommissioning activities will be undertaken in accordance with the international and national legislation and regulations prevailing at that time, and in liaison with the relevant regulatory authorities.

A review, and relevant studies if necessary, will be undertaken during the later years of the Operational Phase to confirm that the planned decommissioning activities utilise good international industry practice and are the most appropriate to the prevailing circumstances and future land use. This will provide an outline of management controls and demonstrate that the decommissioning activities will not cause unacceptable environmental and social impacts. The decommissioning activities will also be subject to all relevant federal and other approvals and authorisations at the time.

4.7 Project Alternatives

In designing and planning the Project, a range of technically and financially feasible alternatives have been examined in order to achieve the Project objective of developing a new gas supply route via the Black Sea. These alternatives were considered during the Feasibility and Development Phases of the Project. The alternatives have been described as part of previous stakeholder engagement activities, and input from stakeholders has also informed changes in the Project design.

The analysis of various Project alternatives started with consideration of high-level strategic options (e.g. the zero alternative, and alternative means of transporting gas) and progressively

focused in on more detailed Project-specific alternatives considered as part of more detailed engineering and design processes (e.g. refining the route, and defining specific construction techniques).

Decisions related to the route of the pipeline and the location of the landfall facilities considered a broad spectrum of engineering, environmental, socio-economic and cultural heritage factors. The Project description, as described in the previous sections, is the result of this analysis. The other options which were considered are described below.

4.7.1 The 'Zero' or 'No Project' Alternative

The zero alternative would mean that the Project would not be constructed, thus avoiding the Project's potential environmental and social impacts as described in the ESIA Report. However, should the Project (and therefore the entire South Stream Pipeline System with its Black Sea pipeline crossing) not proceed, the objective to provide a new supply route to Central and South-Eastern Europe via the Black Sea would not be achieved. This would also mean that the objective of providing a means of diversifying existing supply routes and delivering additional supplies of natural gas to meet growing energy demands would not be met. The zero alternative was thus rejected.

4.7.2 Alternative Means of Gas Transportation

Based on the premise that gas will be exported to Central and South-Eastern Europe via a new route across the Black Sea, other means of transporting gas were also considered. In this respect, the main alternative to pipelines for is the liquefaction of natural gas at a Black Sea port in Russia, and transportation of Liquefied Natural Gas (LNG) using LNG tanker ships, destined for a port on the Western Black Sea coast or—beyond the Bosphorus Strait—in Southern Europe.

However, this alternative was not considered further for a number of reasons. The liquefaction and transportation of LNG to gas markets is usually undertaken for 'stranded gas' deposits where the source of gas is so distant and isolated from its markets as to make transportation by pipeline uneconomic. Liquefaction would also require the construction of a liquefaction plant on the Russian coastline and a regasification plant on the shores of the receiving country. The onshore environmental impacts associated with the construction and operation of an LNG plant would be greater than those of a pipeline and associated compressor station. This alternative would also require approximately 600 to 700 LNG carrier (i.e. tanker ship) movements per year to export 63 bcm of natural gas per year. If the regasification plant was located in Southern Europe, this number of vessel movements would introduce an additional (and potentially unacceptable) safety risk to the Bosphoros Strait.

For these reasons, the LNG option was rejected and further alternatives focused on pipeline options.

4.7.3 Pipeline Alternatives

After eliminating the zero alternative, and determining that a subsea pipeline is the optimal way to transport natural gas across the Black Sea (and on to Central and South-Eastern Europe), the

analysis of alternatives looked to optimise the location and routing of the Project, and the techniques for construction.

Alternative Landfall Locations

Following the decision to construct a pipeline system across the Black Sea, potential landfall sites on the Russian Black Sea coast were investigated and selected. The selection of the landfall site took into account the requirement for a compressor station close to the coast. At this stage Gazprom divided the pipeline project into three distinct components: i) a pipeline system in Russia terminating at the compressor station; ii) an offshore pipeline system (the South Stream Offshore Pipeline); and iii) an onshore distribution system to central and southern Europe. These three components became distinct projects with separate management companies, engineering and permitting.

Gazprom then compared two potential landfall locations in Russia: the Russkaya site near Anapa, and the Beregovaya site near Gelendzhik (Ref. 5). This study determined that the Russkaya site had fewer potential environmental impacts. This included lower levels of air and noise emissions, lower potential for sedimentation in runoff water, the use of less petroleum products, lower potential for impacts on marine biological resources, and greater distances from protected areas. As a result, the Russkaya site was selected as the preferred option, meaning that the pipeline would cross the shore (the 'landfall') southeast of Anapa.

Further technical evaluation was then undertaken to define the details around this landfall.

Alternative Offshore Routes

Before the Russkaya site was selected as the preferred location of the compressor station, eight potential offshore pipeline corridors were considered across the Black Sea: four of these corridors were based on a shore crossing at Beregovaya, and four at Russkaya.

With the selection the Russkaya site as the preferred shore crossing location, the Beregovaya options were discarded. The four remaining route options included two options crossing the Turkish EEZ and two options crossing the Ukrainian EEZ.

Various landfall site alternatives were considered on the Western Black Sea coast, including Bulgaria and Romania. This process identified two preferred shore crossing areas; one near the Bulgarian port of Varna and one near the Romanian port of Constanta. After strategic transit agreements were made with Bulgarian entities, the Varna option was selected. Thus, the offshore route from Anapa to Varna was selected as the preferred option.

Shore Crossing Technique (Open Cut vs. Microtunnelling)

There are high cliffs along the shoreline near the landfall. As such, the best technical option for crossing the shoreline is microtunnelling, which will use tunnels to carry the pipelines under the cliffs. Due to the steepness and rockiness of the slope, open-cut techniques (where the pipeline is laid in a trench and then buried) were not considered to be feasible. An added advantage of microtunnelling is that it will ensure than many impacts on the coastal environment are avoided.

Onshore Routing

When defining the onshore route of the pipeline, through the landfall section, the aim was to minimise impacts on the environment, communities, and the existing land uses in the area. The Project design and pipeline route aims to avoid and minimise potential environmental and social impacts upon identified sensitive land uses. The route of the onshore pipeline sections was chosen to maximise the use of "modified habitats" such as existing vineyards (many of which are abandoned or unmaintained), thereby minimising impacts on natural habitat.

The routing also considered the potential for operational safety exclusions zones and associated impacts on landowners and residents, and the need to keep a safe distance from residential and recreational areas.

5 ESIA Approach and Methods

Environmental and Social Impact Assessment (ESIA) is a systematic approach to identifying the potential impacts of a project, and describing the mitigation, management and monitoring measures that will be implemented to address these impacts. Ultimately, the results of the ESIA allow relevant organisations to make informed decisions about development proposals, and allow potentially affected stakeholders to participate in the process.

This section describes the main features of the impact assessment and how it was conducted.

5.1 Overview

The impact assessment process can be summarised with the following steps:

- **Understand the Project**: including what will happen at various times in all phases of the Project. Assessors need to understand physical activities (e.g. clearing ground, dredging) as well as supporting activities (e.g. transportation, use of diesel generators) and socio-economic activities (e.g. employment);
- **Understand the existing environment**: including the physical, biological, socio-economic and cultural heritage baseline conditions;
- **Predict impacts**: using the knowledge about the existing environment, and the proposed Project activities, assessors can then predict what impacts are likely to occur. They also predict what / who the receptors of these impacts will be; and
- **Develop mitigation measures:** to address impacts. Mitigation measures are designed to avoid, reduce, manage and/or offset adverse impacts, or enhance benefits. This is one of the most important elements of the ESIA Report as it focuses on managing impacts so that adverse changes are minimal, and benefits are enhanced.

The above steps are simplified but convey the general approach to an environmental and social impact assessment. The following sections describe how these steps have been applied for the Project using a number of interrelated ESIA stages (Box 5).

It is important to understand that the ESIA process is not just a process for minimising impacts, but also a tool for decision-making. The goal of the ESIA process is to avoid or reduce all adverse impacts of a Project; however, in practice this is rarely possible. In the end, the ESIA process should clearly highlight what the impacts of the Project will be, so that decision-makers can make an informed judgement about the future of the Project.

Value of Stakeholder Engagement

Stakeholder engagement is recognised as an important part of the ESIA process, from start to finish, and beyond the ESIA into the construction and operation of the Project.

Formal stakeholder engagement periods have been structured around the disclosure of the Scoping and ESIA Reports. However, stakeholder input is sought and considered throughout the development of the ESIA, including baseline data collection and discussions with government

agencies, and other interest groups such as non-governmental organisations (NGOs), fisheries and the public, as discussed in Section 3 of this NTS.

Box 5 ESIA STAGES

Screening – An early exercise to identify how the Project might interact with the environment (including terrestrial and marine environments, people, and cultural heritage), ensure that the ESIA is focusing on the most likely interactions and sensitive receptors and assist in incorporating environmental, social and cultural heritage considerations into Project planning and design.

Baseline Studies – Understand the existing environment through desk-based and field-based research so that impacts can be more accurately predicted, and to provide a baseline against which changes can be measured.

Scoping – Utilise more detailed engineering data along with some preliminary baseline data and feedback from stakeholders, to frame the scope and content of the ESIA. Scoping asks: What adverse impacts might occur as a result of the Project? What benefits might the Project have? How significant might these impacts be? What can we do to mitigate them?

- **Output**: ESIA Scoping Report.
- **Stakeholder Engagement**: the results of the scoping stage are presented to stakeholders for feedback, in order to ensure the ESIA is addressing issues of interest and relevance and to identify any further data gaps along with potential impacts and mitigation measures.
- **Baseline Studies**: continue during this stage.

Impact Assessment – Predict and assess the expected impacts of the Project, based on the Project Description, the baseline studies, feedback from stakeholders, and professional expertise. The impact assessment categorises potential impacts based on their significance, rated as either **Not Significant**, or of **Low**, **Moderate**, or **High** significance. This stage includes the development of mitigation and enhancement measures to address impacts, and the re-evaluation of the residual (i.e. post-mitigation) impacts.

- **Outputs**: ESIA Report, Environmental and Social Management Plan (ESMP).
- **Mitigation, Management, and Monitoring**: commitments relating to proposed mitigation measures to avoid, reduce, or offset adverse impacts, and enhance beneficial measures, will be contained in the ESIA Report and associated ESMP.
- **Stakeholder Engagement**: the results of the impact assessment are presented to stakeholders for feedback, including public hearings and written comments. Where needed, stakeholder feedback will be used to refine the impact assessment and mitigation measures.

Cumulative, Transboundary and Unplanned Events

In addition to the core assessment and management of the potential impacts of the Project, the ESIA Report also assesses cumulative and transboundary impacts, and impacts that could arise from unplanned events.

- **Cumulative impacts**: While an impact may be relatively small when considering the Project on its own, the impact may be magnified in combination with impacts from other future developments; these combined impacts are known as "cumulative" impacts. Hence, in assessing the overall acceptability of a project, it is important that potential cumulative impacts, both geographic and time based, are considered. The significance of cumulative

TERMS TO KNOW

Baseline conditions are the environmental or socio-economic characteristics that exist before the Project. Baseline conditions are studied and documented so that future changes can be measured against them.

Impacts are defined as a change to a receptor, whether adverse or beneficial, wholly or partially arising from the Project.

Receptors are environmental components, people and cultural heritage assets that may be affected (adversely or beneficially) by the Project.

Impact significance is a measure of how important or consequential an impact is, based on its magnitude, and the sensitivity of the affected receptors.

Mitigation measures are strategic ways of avoiding, minimising, managing and/or offsetting adverse impacts, or enhancing benefits.

Design Controls are measures intended to avoid or mitigate impacts, which have been integrated into the design of the Project. They are considered a part of the Project and not an "added" mitigation measure.

Residual impact is the impact that remains after mitigation measures have been applied.

Cumulative impacts result when the impacts from one project interact with those of another project or development.

impacts is evaluated qualitatively using the same methodology as for the impact assessment.

- **Transboundary Impacts**: Some of the Project's impacts may not be confined by international borders and thus may affect countries other than the host country (in this case, other than Russia). The assessment of potential transboundary impacts is evaluated qualitatively using the similar method as the impact assessment.
- **Unplanned events**: Impacts may also arise as a result of unplanned events (i.e. activities or events that are not anticipated to occur in the normal course of operations of the Project, including accidents and malfunctions). These impacts are also assessed as part of the ESIA process, along with measures to manage risks and respond to unplanned incidents.

5.2 Assessing Impact Significance

The impact assessment methodology takes into consideration an impact's nature (adverse or beneficial), type (direct, secondary or cumulative) and magnitude, and the sensitivity of the affected receptors, to yield a prediction of the impact's overall 'significance'.

After the potential impacts have been identified and a preliminary assessment has been conducted, strategies to avoid or mitigate the impacts are then developed. This may also include measures to enhance or optimise potential benefits of the Project.

Next, the significance of the impacts is then re-evaluated based on these mitigation measures. The resulting impact is known as the 'residual' impact, and represents the impact that will remain following the application of mitigation and management measures, and thus the ultimate level of impact associated with the Project.

The process for assessing potential Project impacts is illustrated in Figure 19.

Impact Magnitude

The magnitude of a given impact is a measure of the degree of change from the baseline conditions, and is

determined through the consideration of the following factors:

- **Extent**: the spatial extent (e.g. the area impacted) or population extent (e.g. proportion of the population / community affected) of an impact;
- **Duration**: how long the impact will interact with the receiving environment;
- **Frequency**: how often the impact will occur; and
- **Reversibility**: the length of time for baseline conditions to return (e.g. reversible in the short-term or long-term, or irreversible).

The magnitude of an impact may be rated as Negligible, Low, Moderate, or High. The criteria for each of these ratings is tailored for each study topic, and defined in the ESIA Report.

Receptor Sensitivity

Receptors may be people, ecological and physical components of the environment, or cultural sites. Receptor sensitivity considers how a particular receptor may be more or less susceptible to a given impact. More sensitive receptors may experience a greater degree of change, or have less ability to deal with the change, compared with less sensitive receptors that may be more resilient or adaptable. As with magnitude, the concept of receptor sensitivity is based on multiple characteristics, namely:

- **Vulnerability**: the degree to which a receptor is vulnerable to change (i.e. higher sensitivity) or resilient to change (i.e. lower sensitivity); and
- **Value**: the degree to which a receptor is valued or protected, with higher value receptors (based on ecological, cultural, social, economic, or other grounds) having a higher sensitivity.

The sensitivity of a receptor may be rated as negligible, low, moderate or high. The criteria for each of these ratings is tailored for each study topic, and defined in the ESIA Report.

Impact Significance

Once the receptor sensitivity and impact magnitude have been rated, the overall significance of the impact is determined according to the impact assessment matrix (Table 5) and the impact significance definitions (Table 6). The significance matrix provides basic guidance for the determination of impact significance. However, the resulting significance level was also interpreted based on professional judgement and expertise, and adjusted if necessary; in these instances, explanation is provided in the assessment.

Figure 19 Impact Identification and Assessment Process

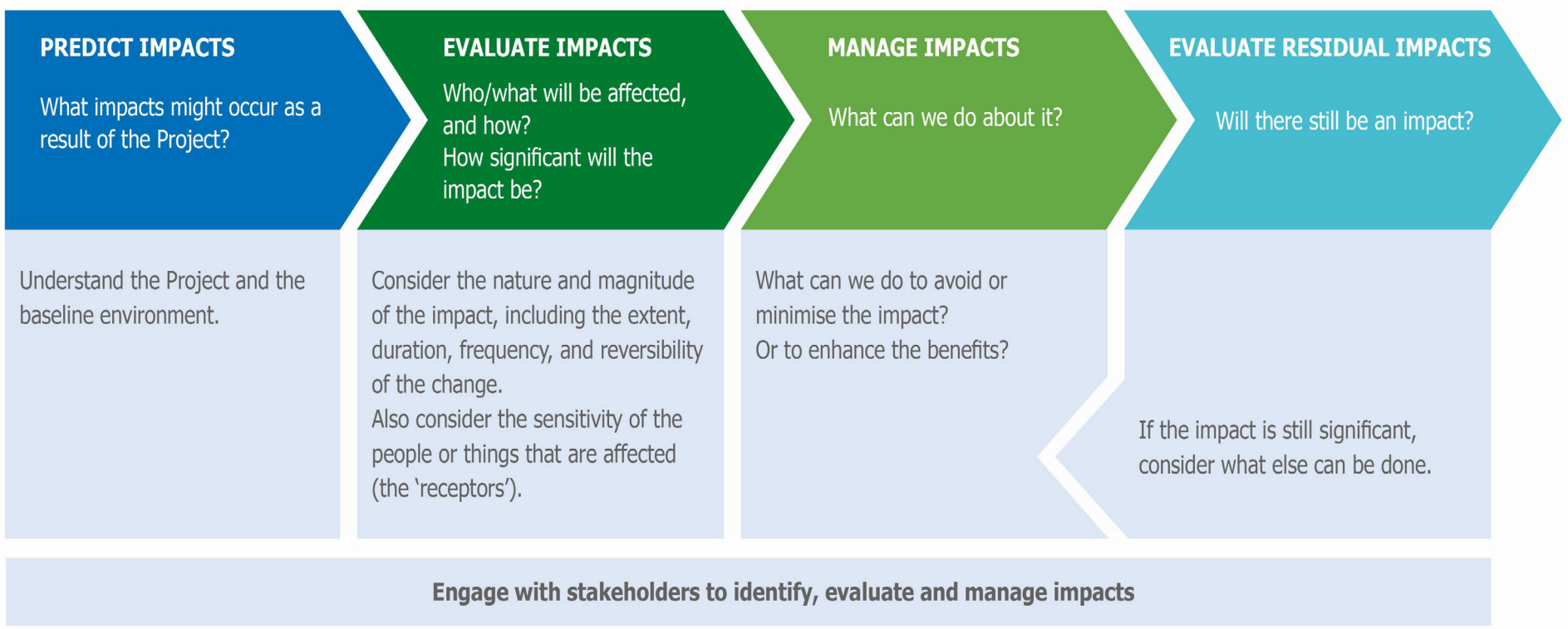


Table 5 Impact Significance Matrix

		Receptor Sensitivity (Vulnerability and Value)			
		Negligible	**Low**	**Moderate**	**High**
Impact Magnitude (Extent, Frequency, Reversibility, Duration)	**Negligible**	Not significant	Not significant	Not significant	Not significant/Low*
	Low	Not significant	Low	Low/Moderate†	Moderate
	Moderate	Not significant	Low/Moderate†	Moderate	High
	High	Low	Moderate	High	High

* Professional expertise will determine if impact significance is Not Significant or Low.
† Professional expertise will determine if impact significance is Low or Moderate.

Table 6 Impact Significance Definitions (Adverse Impacts)

High	**Significant**. Impacts with a "High" significance are likely to disrupt the function and value of the resource / receptor, and may have broader systemic consequences (e.g. ecosystem or social well-being). These impacts are a priority for mitigation in order to avoid or reduce the significance of the impact.
Moderate	**Significant**. Impacts with a "Moderate" significance are likely to be noticeable and result in lasting changes to baseline conditions, which may cause hardship to or degradation of the resource / receptor, although the overall function and value of the resource / receptor is not disrupted. These impacts are a priority for mitigation in order to avoid or reduce the significance of the impact.
Low	**Detectable but not significant**. Impacts with a "Low" significance are expected to be noticeable changes to baseline conditions, beyond natural variation, but are not expected to cause hardship, degradation, or impair the function and value of the resource / receptor. However, these impacts warrant the attention of decision-makers, and should be avoided or mitigated where practicable.
Not Significant	**Not Significant**. Any impacts are expected to be indistinguishable from the baseline or within the natural level of variation. These impacts do not require mitigation and are not a concern of the decision-making process.

The matrix and significance definitions have been used to assess adverse impacts of the Project. Significance ratings have not been determined for beneficial impacts; instead these are described in qualitative terms and, where applicable, measures to maximise benefits have also been described.

5.3 Mitigation and Management

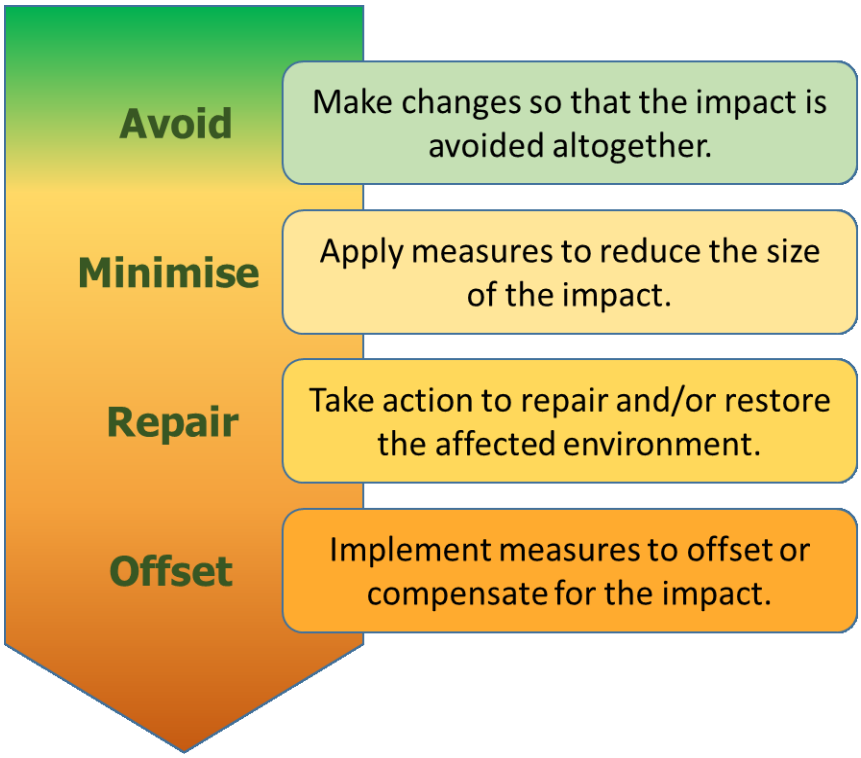
Where an adverse impact is identified, efforts have been made to develop strategies to primarily avoid or minimise the impact. The selection of mitigation measures has considered a standard mitigation hierarchy (Figure 20) whereby preference is given to avoiding impacts altogether and subsequently to minimising the impact, repairing its effects, and/or offsetting the impact through actions in other areas.

When this document refers to "mitigation" it is referring to measures identified during the ESIA process that may be applicable to any of the steps in the mitigation hierarchy. Additionally, mitigation measures may also include strategies designed to enhance potential benefits. Measures incorporated into the Project design, known as 'design controls' are considered a part of the Project, not an "added" mitigation measure and are considered to be in place during the pre-mitigation impact assessment.

After suitable mitigation measures have been identified, the significance of each impact is re-evaluated to predict the post-mitigation ('residual') significance. It is this residual significance that is used to support decision making and conclusions about the Project.

The mitigation measures developed during the ESIA process feed into the Project's Environmental and Social Management System (ESMS) which includes an Environmental and Social Management Plan (ESMP). This captures all mitigation, safeguards and environmental and social commitments made within the ESIA Report and associated documentation. Further information on the ESMP can be found in Chapter 10 of this document.

Figure 20 Mitigation Hierarchy



6 Impact Assessment Summary

The following sections summarise the key impacts that have been identified and assessed in the ESIA Report. This includes:

- A summary of the relevant baseline characteristics;
- Identification of key receptors and assessment of potential impacts;
- Identification of the design controls and mitigation measures that will be implemented in order to avoid or mitigate potential Project impacts; and
- A summary of the residual impacts and conclusions.

Project Phases

Impacts have been assessed for the Construction and Pre-commissioning Phase and the Operational Phase of the Project. Potential impacts arising from the Decommissioning Phase of the Project have been considered but have not been assessed in detail in the ESIA Report as the planned Project lifetime is 50 years. Within this time period there may be changes to statutory decommissioning requirements, as well as advances in technology and knowledge so at this stage the full extent of the decommissioning requirements are not known. The approach to decommissioning and its potential impacts will be assessed in the later years of the Operational Phase.

The following sections are organised by topic, and focus on the more important or interesting results of the ESIA process.

6.1 Soils, Groundwater and Surface Water Resources

The soils and water assessment examined potential changes to the physical environment of the landfall section, including soils, geology, groundwater, and surface water.

Baseline Conditions

Soils in the vicinity of the Project are alkaline with limited variation in soil salinity, and are typically of the 'loam' soil type (a rich soil made of sand, silt and clay). Baseline measurements showed elevated concentrations of arsenic, copper, lead, zinc, benzo(a)pyrene, polychlorinated biphenyls (PCBs) and pesticides in a number of isolated areas.

Regarding groundwater, the hydrogeology of the area is characterised by local shallow alluvial aquifers overlying a carbonate aquifer within the bedrock. In the lower reaches of the narrow river valleys of the Shingar River, the groundwater supplies the surface water bodies and creates ephemeral springs during periods of high rainfall. The groundwater is generally fresh and mineralised, although elevated concentrations of iron, oil, surfactants and pesticides have been detected during surveys.

Two watercourses (the Shingar River and an unnamed tributary of the Sukko River that drains the Graphova Gap), will be crossed by the proposed pipeline route. There are no known licences in this area for the use of surface water as a drinking water supply; however, it is understood

that local watercourses may be used as an unlicensed source of freshwater, mainly for agricultural purposes and upstream of the Project Area. The Supsekh municipal water supply system provides water to the vineyard operations of Agrifirm Kavkaz, and the community of Varvarovka.

Impacts and Receptors

Soil receptors include the different soil types within the area, particularly soils used for agricultural purposes (which predominantly consist of the arenosals, abrazem and regosols soil types). These soils are considered an important resource to local land users. Construction workers, who would be exposed to soils, are also considered to be a potential receptor of soil impacts.

Groundwater receptors include the aquifers in the vicinity of the Project and existing groundwater abstraction (withdrawal) points. The nearby vineyard of Agrofirma Kavkaz, and the residential area of Varvarovka, both source the majority of their water from the Supsekh municipal water supply system and are therefore not considered to be potential receptors of groundwater impacts. There is an existing groundwater well at the Russian Ministry of Defence site in Sukko about 2 km south of the landfall facilities; this well will be used during the construction of the landfall section.

Surface water receptors include the Shingar River, the unnamed tributary of the Sukko River in the Graphova Gap, and existing surface water abstraction points.

The Project's potential impacts on soil, groundwater and surface water are all primarily tied to the Construction and Pre-Commissioning Phase when activities will include earthworks, the use of machinery and the transportation of materials and wastes. During the Operational Phase, the pipeline and landfall facilities will be present, though the degree of activity will be much lower.

The following potential impacts and impact pathways were considered:

- Soil erosion may occur as a result of land clearance, earthworks and the storage of materials.
- Soil, groundwater and surface water may be polluted by spills or leaks of fuel, slurry or wastewater from machinery, or existing pollutants may be mobilised;
- Groundwater levels may decrease, flow regimes may be altered and water quality may deteriorate as a result of earthworks, hydro-testing and the presence of the Pipeline;
- Slope stability may be diminished, particularly in areas that are already unstable, and could present a risk of slope collapse;
- Soil characteristics may be affected by soil stockpiling, compaction, and mixing; and
- The health and safety of construction workers could be affected if pre-existing areas of soil contamination are encountered during construction.

Mitigation

In order to protect soil and water, spill prevention measures will be put in place, and spill kits will be kept in accessible locations at all times. Site workers will be trained in spill response and

emergency response procedures for all chemicals, fuels and oils that will be used by the Project. Materials and wastes stored on site will be contained within appropriate storage facilities and containers, and activities will be restricted in close proximity to sensitive locations such as drains and soil storage areas. Certain activities will also be limited during periods of heavy rainfall. Procedures to ensure the safe handling, storage, transport and transfer of materials and wastes will be implemented to minimise the potential for leaks or spills.

Due to seasonal constraints, water will not be sourced from the existing Sukko well during summer months. Instead, water will be stored on site during these months.

If contamination is identified in the course of construction activities, works will be suspended in order to deal with the contaminated material. There will also be strict procedures in place to stop work immediately in the event that spills or other problems are detected during construction or hydro-testing, in order to minimise the potential for groundwater contamination. The health risk to workers will be reduced through the use of appropriate personal protection equipment.

Additional soil protection, erosion, and drainage controls will be implemented at all construction areas, in line with good international industry practice. Efforts will be made to limit the total area of ground to be excavated and the areas of exposed soil, in order to reduce the potential for erosion. Any discharges to local watercourses (e.g. drainage from access roads) will be discussed with local authorities and will be subject to the applicable permits and approvals. Appropriate protection measures (e.g. sediment filters) will be implemented.

Residual Impacts and Conclusions

During construction, impacts are associated with potential contamination of the soil through the use and storage of materials, increased susceptibility to erosion, changes in soil properties and unstable ground. With the identified mitigation measures in place, the residual significance of the impacts are assessed as being of **Low** significance. Impacts on soils during the Operational Phase are primarily associated with the potential for contamination caused by leaks and spills from operation of the landfall facilities. With mitigation measures in place, the residual significance of these impacts are considered to range from **Not Significant** to **Low**.

During the Construction and Pre-Commissioning Phase, impacts on groundwater are primarily associated with potential contamination of the groundwater through use and storage of materials, groundwater control measures causing the mobilisation of existing contamination and leaks of discharge water during hydro-testing activities. With mitigation measures in place, the residual significance of the impacts is considered to be **Not Significant** to **Low**. During the Operational Phase, the assessment considered the potential for contamination of groundwater and changes to the groundwater flow regime as a result of the physical presence of the buried pipeline. With mitigation in place, the residual significance of this impact is **Not Significant** to **Low**.

Potential impacts to surface water are primarily associated with possible contamination of water bodies by the use and storage of materials, as well as the potential for increased surface water run-off from access roads to affect water quality. Surface water flows may also be affected indirectly by impacts on groundwater, for example if groundwater flows are inhibited or altered.

With mitigation (e.g. design of drainage systems to avoid poor quality water directly entering watercourses) in place, the residual significance of the impacts are reduced to **Not Significant** to **Low**. During the Operational Phase, the impacts are primarily associated with the potential for surface water quality to be contaminated from surface water run-off at the landfall facilities and from access roads. Surface water flows could also be affected as a result of changes to the groundwater regime, for example if the presence of the Pipeline or access roads leads to changes in groundwater flows. With mitigation, the residual significance of the impacts during the Operational Phase is reduced to **Not Significant** to **Low.**

6.2 Air Quality

The air quality assessment examined potential impacts related to changes in air quality as a result of the Project, including the potential for adverse impacts on human health, the deterioration of habitats, and nuisances (such as increased dust) for neighbouring residents.

Baseline Conditions

Baseline conditions for air quality were established by using background data provided by Krasnodar Regional Centre for Hydrometeorology and targeted monitoring. Air quality in the study area is generally good. Levels of sulphur dioxide, carbon monoxide and nitrogen oxides measured at monitoring stations in Anapa, Varvarovka and Gostagaevskaya are generally low. Higher concentrations of nitrogen dioxide (NO_2) and total particulate matter (dust) were reported, and these are likely due to emissions from road traffic.

Impacts and Receptors

As part of the assessment, twelve human health receptors were identified which included residential dwellings and towns near the Project. In addition, the closest designated habitat site is the Utrish State Nature Reserve, located approximately 3.2 km southeast of the microtunnelling location, which was considered an ecological receptor.

During the Construction and Pre-Commissioning Phase, air emissions will include combustion gases from construction vehicles and equipment, diesel generators and marine vessels. There will also be dust generated from earthworks and vehicle movements.

During the Operational Phase of the Project, there may be occasional small gas releases from pipeline vents during maintenance activities.

Mitigation

A series of good practice measures will be implemented to manage the impacts. These include measures to reduce emissions from construction equipment and vehicles, such as installing speed limits for construction vehicles and switching off machinery when not in use. Measures to prevent dust emissions will include ensuring loose material loads entering and leaving the site are covered where practicable, and watering the ground to suppress dust during dry weather. Vessels used will comply with national and international legislation regarding type of fuel used. A monitoring programme will also be established throughout the Construction and Pre-

commissioning Phase to track emissions and measure pollutant concentrations at sensitive locations in the vicinity of the Project.

Residual Impacts and Conclusions

The majority of the potential impacts on air quality are related to the Construction and Pre-Commissioning Phase, due to emissions associated with the increase in vessel movements, use of construction equipment and machinery, and traffic. However, these impacts will be short-term and temporary. No significant air quality impacts are anticipated during the Operational Phase.

Overall, given the distances between the working areas and the nearest receptors, and the good working practices and mitigation measures that will be adopted to reduce vehicle emissions and dust generation at the construction sites, the overall significance of air quality impacts is considered to be **Not Significant** to **Low**.

6.3 Noise and Vibration

The noise and vibration assessment examined the potential sources of noise related to the Project, and how noise and vibration could affect the health and wellbeing of people living in the area.

Baseline Conditions

Baseline noise levels were measured at a number of locations. The results indicate that the existing noise profiles are typical of urban, semi-urban and rural areas. At a number of locations within Varvarovka and near to Sukko, the baseline noise levels were found to exceed Russian Federation noise standards (which are slightly more stringent than international guidelines) during the day and night, primarily due to road traffic noise. The main pre-existing sources of noise include:

- Road traffic;
- Ecological (e.g. bird song); and
- Meteorological (e.g. wind in vegetation).

Baseline vibration levels were also monitored. Most vibration is also caused by road traffic. At monitoring locations located in proximity to some residential areas (including Rassvet and the southern boundary of the proposed residential development south of Varvarovka), vibration levels already reach or exceed the Russian Federation vibration criteria.

Impacts and Receptors

Key Project activities with the potential to generate noise and vibration include the construction of the microtunnels, use of construction equipment and machinery on land, and movement of construction vehicles. During the daytime, no significant noise impacts are identified for the majority of receptors, with the exception of a number of residences located at the northeast end of Varvarovka. Construction vehicles using the Varvarovka bypass road may also contribute

to increased noise levels above Russian daytime standards for a number of residences located in northeast Varvarovka.

Pre-commissioning pipeline pressure testing (anticipated to occur for a maximum of 45 days) will utilise diesel air compressors and has the potential to exceed Russian standards for night-time noise levels at most of the receptors around the landfall section.

Noise levels will also exceed Russian standards at a proposed residential development site (known as Lesnaya Polyana) adjacent to Varvarovka. However, it is anticipated that this location will not be developed and ready for occupancy until after the Construction and Pre-Commissioning Phase has concluded, and therefore no residential receptors are likely and the impact at this location is not considered to be significant. If occupation does occur during the Construction Phase, adequate mitigation measures will be investigated to reduce noise levels to meet applicable noise limits.

In addition to the residential receptors, the assessment also examined potential impacts on two coastal holiday complexes (Shingari and Don) as well as sites of cultural heritage importance including the Varvarovka cemetery and the Gai Kodzor war memorials. Significant impacts related to night-time noise emissions during pre-commissioning apply to these sites as well, although other sources of noise will not be significant. Ecological receptors were identified in the baseline, but are assessed in the Terrestrial Ecology assessment (Section 6.4).

No significant noise impacts were identified during the Operational Phase, and no perceptible vibration impacts are identified for any of the receptors.

Mitigation

A series of design controls and good practice measures are included in the Project design.

To reduce noise impacts experienced by residents in northeast Varvarovka as a result of construction vehicles using the Varvarovka bypass road, a three metre high noise barrier ("acoustic screen") will be installed along the boundary of the properties and the Varvarovka bypass road to reduce the noise impact on residents so that daytime noise is below the Russian legislative standards of 55 decibels (dB(A)). The precise specifications of this screen will be determined based on the number of vehicle movements on the road and in consultation with the owners of adjacent properties.

In terms of the pre-commissioning noise impacts on residences and other receptors in proximity to the landfall section, mitigation measures will include the selection of inherently quiet equipment where possible, careful siting and orientation of air compressors and other equipment, and the use of earth berms and temporary acoustic barriers to control noise emissions.

Other measures to reduce noise and vibration impacts include:

- Equipment will be throttled to a minimum or switched off when not in use;
- Internal access roads will be well-maintained to minimise noise impacts generated by vehicles travelling over difficult terrain;

- Drop heights of materials will be minimised which will reduce the noise levels generated by the collision of materials with the ground or other materials;
- As far as reasonably practicable, sources of significant noise will be enclosed;
- Machinery and equipment will be used and maintained regularly in accordance with manufacturers' instructions; and
- Where possible, equipment and loading and unloading activities will be located away from noise-sensitive areas.

Residual Impacts and Conclusion

With the mitigation measures in place, the noise and vibration impacts caused by the Project are not expected to be significant at existing sensitive receptors neighbouring the Project, with two exceptions. The first relates to a cluster of residential dwellings on the north-eastern part of Varvarovka, which will be mainly affected by road traffic noise from construction vehicles using the Varvarovka bypass road. An acoustic barrier will reduce the noise but there will be an impact of **Low** significance during periods when the greatest vehicle movements will occur.

The second exception is the impact generated by the pre-commissioning activities (i.e. cleaning, gauging and drying of the pipeline, including use of air compressors) which are expected to increase night-time noise levels for the majority of receptors in the study area. However, through careful selection, siting and orientation of the compressors and other equipment, and the use of acoustic bunds and barriers, the temporary noise impacts expected during the pre-commissioning activities can be reduced to a **Low** significance.

There will be no significant noise and vibration impacts during the Operational Phase.

6.4 Terrestrial Ecology

The terrestrial ecology assessment examined potential impacts of the Project on ecological components of the terrestrial environment (including coastal and freshwater habitats), including flora, fauna, and habitat characteristics.

Baseline Conditions

A range of natural and modified habitats are located in and around the landfall section of the Project. Natural habitats in the study area include *shiblyak*[5] woodland, mesophilic meadow[6], tomillyar[7], rocky outcrops, and coastal shingle. Modified habitats in the area include steppefied

[5] These woodlands are diverse in structure, floristically rich and dominated by woody species including pubescent oak, oriental hornbeam, and juniper.

[6] These are grassland and herb communities which are located on a river floodplain. They comprise vegetation communities typical of moist and more nutrient rich environments.

[7] This habitat type is comprised of plant communities with a prevalence of species associated with dry, hot environments.

meadow [8] as well as urban and agricultural areas. Most of the agricultural habitats are vineyards.

The habitats in the study area support a range of protected species, as defined by the International Union for Conservation of Nature (IUCN) as well as the Red Data Book of the Russian Federation (RDB RF) and Red Data Book of the Krasnodar Krai region (RDB KK). These include:

- Twenty-six plant species listed within the RDB KK, including six assessed as Endangered within the Krasnodar Krai;
- Potentially up to 38 species of terrestrial invertebrates listed within the RDB KK, including three that are assessed by the IUCN to be Vulnerable at an international level;
- A notable assemblage of reptiles and amphibians, including 12 species included within the RBD KK, and including Nikolski's tortoise (*Testudo nikolskii*, which is assessed by the IUCN as Critically Endangered);
- Six species of birds listed within the RDB KK that may breed within the study area, of which two species—European roller and red-footed falcon—are assessed by the IUCN as Near Threatened;
- Twelve species of bat listed by the RDB KK, of which four are assessed by the IUCN as Near Threatened; and
- A range of other mammal species of which one (Caucasian wildcat) is assessed by the RDB RF as Rare.

Other species such as aquatic invertebrates, fish, phytoplankton and zooplankton are present within the Study Area, but not thought to be of notable conservation value.

The area supports land that is considered to represent critical habitat[9] due to the presence of four endangered and endemic species: namely the plants *Rindera tetraspis* and fern-leaved speedwell, the Levantine Skipper butterfly and Nikolski's tortoise (Figure 21). The presence of two specific habitat types (Mesophilic forest and Tomillyar) also triggers classification as critical habitat. There are also designated ecological sites in the broader vicinity of the Project, including the Utrish State Nature Reserve, Kuban River Delta Ramsar Site, and the Delta of the Kuban River Important Bird Area, although the footprint of the Project does not intercept any of these areas.

[8] These are meadow areas dominated by grasses and herbaceous species that were previously agricultural land (former vineyards, orchards, fields), which are now derelict.

[9] Critical habitats are areas with high biodiversity value, including: habitat of significant importance to Critically Endangered and/or Endangered species (as listed on the IUCN Red List); habitat of significant important to endemic and/or restricted-range species; habitat supporting globally significant concentrations of migratory species and/or congregatory species; highly threatened and/or unique ecosystems; and/or areas associated with key evolutionary processes.

Figure 21 Selected Photos from Field Surveys

(A) Nikolski's Tortoise (Section 6.4 Terrestrial Ecology); (B) Submerged Ceramic Amphora (Section 6.9 Cultural Heritage); (C) Black Sea Bottlenose Dolphin with Calf (Section 6.5 Marine Ecology); and (D) View of Varvarovka (Section 6.7 Socio-Economics).

Impacts and Receptors

The terrestrial ecology assessment considered the potential impacts of the Project on ecological receptors, including terrestrial habitats and protected species (including Nikolski's tortoise, an internationally Critically Endangered species). Impacts upon terrestrial ecology are likely to occur during the Construction and Pre-Commissioning Phase due to direct use of land,

disturbance of two watercourses due to the pipeline crossing (the Shingar River and an unnamed tributary of the Sukko River), increased traffic and vehicle movement, and increased noise and dust levels.

Potential receptors include birds, mammals (including bats), reptiles and amphibians, freshwater species, and invertebrates (e.g. insects), as well as rare plants. Individual plants and animals could be disturbed, injured or killed. Construction activities may also disturb birds, which is a particular concern if migratory birds are disturbed or displaced during breeding seasons. Construction activities also have the potential to result in habitat loss and degradation, and could also lead to habitat fragmentation or severance. The assessment also considered potential impacts on designated ecological sites such as the Utrish State Nature Reserve, primarily related to the introduction of invasive species.

During the Commissioning and Operational Phase, impacts are anticipated to be relatively limited. The pipeline will be buried and activity will be minimal. However, routine maintenance activities will include regular cutting of the vegetation along the permanent Right-of-Way above the pipelines, and will also involve vehicles accessing the landfall facilities and Right-of-Way. There is potential for significant impacts if routine maintenance activities were to cause mortality or injury to Nikolski's tortoise and other species.

Mitigation

Many potential impacts to habitats and species have been avoided through the design of the Project, primarily in selecting the location of the landfall facilities and pipeline to avoid sensitive or protected areas. A suite of mitigation measures has also been developed to reduce the magnitude of potential impacts that cannot be avoided. The mitigation approach comprises a number of elements described below.

A number of overarching mitigation measures are designed to address potential terrestrial ecology impacts. This includes employment of an Ecological Clerk of Works to monitor construction activities. The Ecological Clerk of Works will be a qualified and independent specialist who will ensure that mitigation measures are properly applied and that construction is compliant with the relevant management plans. In addition, construction personnel will be trained to ensure they appreciate the importance of ecological sites and values, know the specific species and habitats of concern, and understand the mitigation measures that are applied. A Construction Management Plan (CMP) further encompasses the Project's commitments for environmental protection, the application of the mitigation measures, and the responsibilities of contractors and subcontractors.

Specific mitigation measures have also been identified with respect to the protection of reptiles and amphibians, and are coordinated through a Herpetile Mitigation Strategy. These mitigation measures will protect key ecological receptors such as Nikolski's tortoise. Notable features of this strategy includes finding and relocating tortoises and other species outside of construction areas before the start of construction, and establishing specially designed tunnels to allow for the continued safe passage of tortoises across (under) access roads. Rare plants and other species of ecological importance, as well as birds' nests, will also be identified and relocated prior to construction.

Furthermore, areas affected by construction (with the exception of the permanent landfall facilities) will be reinstated and revegetated after the successful completion of pre-commissioning tests. A Habitat Reinstatement Plan will provide detailed specifications for the restoration of habitats. A Biodiversity Action Plan will also describe how the Project will meet the Project's objectives (based on international standards) for no net loss of biodiversity within natural habitats, and net gain requirements for components of critical habitat.

During the Operational Phase, potential impacts on Nikolski's tortoise, birds and other animals will be minimised by implementing strict controls on vehicle speeds, and restricting vegetation clearance in the Right-of-Way to winter months only.

The implementation of the management plans will be monitored by the Environmental and Social Monitoring Programme for the South Stream Offshore Pipeline.

Residual Impacts and Conclusion

In summary, the majority of the impacts predicted will occur during the Construction and Pre-Commissioning Phase, as a result of vegetation clearance and disturbance stemming from construction activities. Construction activities have the potential to adversely impact animals (including reptiles and birds), plants, and habitats in and around the Project Area. Of particular concern are potential impacts on protected species including Nikolski's tortoise, migratory birds, and rare plants, as well as critical habitat areas.

Mitigation includes a series of overarching measures designed to minimise impacts and ensure the construction process is undertaken in accordance with all mitigation measures and South Stream Transport's commitment to environmental protection. Specific actions and strategies are also in place to address particular issues of concern, including the establishment of under-road tunnels to enable the safe passage of the critically endangered Nikolski's tortoise through the area. In addition, construction areas will be surveyed prior to the start of activities in order to identify species of concern and relocate them to suitable sites outside of construction.

As a result of these and other mitigation measures, nearly all residual impacts for the Construction and Pre-Commissioning Phase are anticipated to be **Not Significant**, including potential impacts on critical habitat and protected species. The one exception is the potential impact on migratory birds (including seasonal breeding and over-wintering), which is assessed to be a **Low** significance residual impact.

Operational Phase impacts include the potential for routine maintenance activities to cause mortality or injury to Nikolski's tortoise, and to disturb migratory birds. Mitigation measures include vehicle restrictions and seasonal limits on activities, which reduce the impact significance to **Not Significant**.

6.5 Marine Ecology

The marine ecology assessment addressed potential impacts on both marine species (including fish, mammals and birds) and habitats.

Baseline Conditions

Baseline studies identified three distinct marine habitats in the vicinity of the Project. On the continental shelf (i.e. shallower waters) there are seaweed stands and soft substrate benthic habitats, while the abyssal plain is characterized by anoxic[10] sediments. The Project Area lies within a wider zone that meets the requisite criteria for critical habitat, identified according to international criteria for endangered, migratory and congregatory species (e.g. certain fish, seabirds and cetaceans).

This environment includes species of plankton, benthic communities, fish, seabirds, and marine mammals. A summary of the baseline conditions for each of these groups is provided below:

- **Plankton –** Plankton are very small organisms that live in the water column. The community observed in Russian waters was found to be composed of typical marine species including phytoplankton, zooplankton (including copepods and the larva of fish and larger animals such as jellyfish).
- **Benthic Communities –** Benthic organisms live on, in or near the seabed. Shallow water habitats are characterised by rock, cobbles and pebbles which support seaweed stands and attached animals such as mussels. In water depths greater than about 30 m the seabed is made up of muddy sediments and benthic communities here are dominated by polychaetes (marine worms) and bivalves (shellfish). In deeper waters, over about 150 m in depth, there is no benthic life because of the anoxic conditions, and no significant bacterial communities were encountered. There were no species benthic fauna of commercial or conservation importance recorded in the study area, although two species of seaweed, listed in the Red Data Book of Krasnodar Krai, were observed.
- **Fish –** The Russian coastal area of the Black Sea supports around 103 species fish. Commercial fishing data confirm the presence of several commercially important species, particularly anchovy and sprat, in the Project study area. Two species of fish of conservation importance [11] (the thornback ray and the leaping grey mullet) were also recorded. A further seven protected species, whilst not observed in the study area, have been recorded in nearby locations.
- **Seabirds –** The Caspian gull and the Mediterranean shearwater were the most abundant species observed. During some surveys, there were also high numbers of grebes and cormorants, species likely to be migrating through the area at particular times of the year. The density of birds is generally highest closer to the shore. Three species of conservation interest were encountered: the Mediterranean shearwater, the blackthroated diver (or arctic loon) and the Mediterranean gull.

[10] Anoxic waters or sediments are lacking oxygen and cannot typically support life (other than anaerobic bacteria). The deep waters and sediments of the Black Sea are anoxic below approximately 150 m water depth.

[11] As listed in the IUCN Red List and/or the Red Data Books of the Russian Federation and Krasnodar Krai, and/or the Black Sea Convention.

- **Marine Mammals –** Three cetacean species (the harbour porpoise, bottlenose dolphin and the common dolphin), all of conservation concern, are known to inhabit the Black Sea. Surveys indicated that the common dolphin was more widespread and considerably more abundant than the bottlenose dolphin and porpoise. Harbour porpoise are more commonly observed closer to the shore than the common and bottlenose dolphin. Figure 21 shows two bottlenose dolphins observed during field studies.
- **Protected Areas –** The designated area known as the 'Anapskya Bank' or 'Anapa Bank' extends over approximately 730 km^2 and is located in the Kerch-Taman region. This area is designated as an important fishing ground. The pipeline crosses the south-eastern part of the Anapa Bank. The Utrish State Nature Reserve extends over 51 km^2, and is not crossed by the Project. Around 25 km^2 of the Utrish reserve are offshore (to a water depth of 40 m) and provide habitat for a number of flora and fauna species. Although pipeline route does not cross marine reserve, it is likely that areas crossed by the pipeline will host some of the protected marine species found in the nearby reserve.

A number of other protected fish species and one seabird, whilst not observed directly in the study area, have been reported from nearby areas. It is possible, therefore, that these species may be present in the vicinity of the Project.

Impacts and Receptors

Both marine habitats and the main groups of marine species (plankton, benthic organisms, fish, marine mammals and seabirds) are considered to be receptors of potential impacts on marine ecology.

Construction activities that have the potential to impact on marine ecology include the movement of vessels, discharge from vessels, dredging of microtunnel exit pits and laying the offshore section of the Pipeline. These activities could lead to disturbance, injury or mortality of marine species, changes in water quality (especially turbidity when seabed sediments are stirred up), and noise and light emissions. During the Operational Phase, Project activity in the marine environment will be very limited, although impacts could arise in relation to Pipeline inspection (including surveys using ROVs, etc.) and underwater maintenance.

Benthic organisms will be affected by seabed disturbing activities such as dredging, which could result in the displacement or loss of affected individuals. Suspended sediments could smother some organisms, and may also prevent photosynthesis of seaweeds.

Fish may also be affected by increased turbidity (suspended sediments) in the water, which could affect respiration as well as visibility. Certain construction activities will also generate underwater noise and vibration, which could lead to short-term behavioral changes in fish. Fish may also be attracted to the lights of ships during vessel operations. During pre-commissioning, seawater will be collected to pressure test the pipeline, and fish may be caught in the seawater intake which could lead to distress or mortality.

The main impacts with regard to seabirds is the potential for physical collision with construction vessels. Birds on the surface of the sea could collide with moving vessels. Collisions could also occur if birds are attracted to lights on the ships.

Collisions with vessels are also a concern with respect to the three protected species of dolphin and porpoise. Underwater noise could also result in behavioral changes in marine mammals.

Mitigation

Built-in mitigation measures (design controls) include undertaking an anchor corridor survey to identify sensitive ecological areas prior to construction, and implementing an anchor management plan to avoid using anchors in sensitive areas to minimize the level of disturbance to benthic habitats. In order to minimise water and sediment contamination and maintain water quality, pre-commissioning and drilling activities will use low toxicity substances where possible. Potentially hazardous chemicals (including MEG, the cleaning and drying agent used during pre-commissioning) will be collected and disposed through an approved waste handling company, and will not be discharged into the sea.

A Dredging Management Plan will optimise dredging activities to minimise levels of turbidity and sediment dispersion. To reduce the risk that stored dredge material may be stirred up and dispersed during winter storms, storage over winter will be within the deepest parts of the temporary storage area.

In addition to the above, a number of other mitigation and monitoring measures will be employed. Vessel speeds will be reduced when mammals or seabirds are present on or in the water, and engines will be ramped-up slowly to allow marine mammals to leave the area. Dedicated "marine mammal observers" will monitor the behaviour of marine mammals in the vicinity of the Project during construction. Seabirds will also be monitored by ornithologists who will also advise on additional management measures if needed. Light emissions from vessels will be reduced and shielded.

In sensitive locations, the turbidity of the water (i.e. levels of suspended sediments), dissolved oxygen and phytoplankton will also be monitored. If acceptable thresholds of water quality are exceeded, corrective measures will be adopted. In addition, important or vulnerable habitats will be avoided during anchoring of the pipe-lay vessel to prevent physical damage, and will be further addressed in a Biodiversity Action Plan.

Residual Impacts and Conclusion

All residual impacts during the Construction and Pre-Commissioning Phase are assessed to be of **Low** significance following appropriate Project design and implementation of defined mitigation measures (including strict adherence to relevant environmental standards, choice of technology and construction phase environmental management and monitoring). This includes impacts upon marine mammals from underwater noise and dredging. Impacts will be temporary and limited to the duration of construction and pre-commissioning activities.

Potential ecological impacts during the Operational Phase relate to the presence of the pipeline on the seabed directly and indirectly affecting habitat structure, as well as habitat disturbance due to inspection and maintenance activities. By ensuring the stability of the Pipeline on the seabed and through the control of vessel activities during inspection and maintenance, residual impacts during this phase are assessed to be of **Low** significance.

Overall, the potential impacts to marine habitats and species are predicted to be short-term and very localised within the Project Area. With low significance impacts, it is expected that the marine environment and the existing fish, bird, marine mammal and other populations will recover without lasting effects.

The assessment has demonstrated that there will be no reduction in biodiversity, beyond very localised and temporary impacts (which will be avoided for critical habitat features). There will be no substantial change to ecological processes, and the Project will not have population level impacts to protected or rare species. The Project has committed to a programme of comprehensive ecological monitoring including for critical habitat species. The Project will also aim to provide a net biodiversity benefit through implementation of the Biodiversity Action Plan.

6.6 Landscape and Visual

The landscape and visual assessment considered the potential impacts of the Project on the character and value of the landscape or seascape, as well as the views of the people who enjoy the area, including residents, tourists and recreational users.

Baseline Conditions

Existing views in the vicinity of the Project are characterised by open, gently undulating landscapes, with panoramic views across the woodland canopies and fields, and vast open flat panoramic views of the Black Sea. This area includes the foothills of the Caucasus Mountains, the lowands of Abov-Kuban, and the Black Sea coast. The study area has thus been divided into one Landscape Character Area (LCA) and one Seascape Character Area (SCA).

The **Undulating Plateau LCA** comprises the rolling, extensively wooded, rural landscape extending inland away from the coast, and made up of forest, wooded valleys and cultivated land including open vineyards, orchards and meadows (see Figure 22).

Figure 22 View from the Coastal Path Along the Cliff Top Facing Inland

The **Black Sea Coastal SCA** comprises the open sea and the line of characteristically coastal geomorphology and vegetation along the Black Sea coast, made up of coastal slopes and the shoreline (see Figure 23).

Figure 23 View from Sukko Beach

Within the study area is the town of Anapa, a popular holiday destination in Russia noted for its beaches, warm climate and the presence of sites of historical and natural interest. Other towns and villages include Varvarovka, Sukko, Supsekh, Gai Kodzor and Rassvet. Of particular note is the Utrish State Nature Reserve, a protected area southeast of the Project (although the Project does not intersect the reserve). Much of the land in the vicinity of the Project is agricultural—particularly vineyards, many of which are not actively cultivated—and the area is well known for its wine.

Impacts and Receptors

The landscape and visual assessment examined the potential impacts of the Project on the following receptors:

- **Landscape:** The receptor is the LCA or SCA. Impacts relate to the degree of change to the physical characteristics or components of the landscape or seascape, which are integral to defining its character.
- **Visual Amenity:** The receptors are the people who appreciate a view of the landscape of seascape, including residents and recreational users. Impacts relate to how existing views will change. The degree of change relates not just to the view itself, but also to its pleasantness.

Potential landscape and visual impacts of the Project include alterations to landscape through loss of vegetation in the Right-of-Way and the permanent presence of the landfall facilities. Construction activities will also have impacts on landscape and visual amenity, including the mobilisation of construction equipment, machinery and vehicle movements, and lighting of construction areas. Activities during construction will be temporary but will cover a larger area relative to the permanent facilities during the Operational Phase, although much of the affected land will be reinstated following construction. Temporary alterations to the seascape are also expected as a result of the transient presence of vessels and pipe-laying activities within view of the shore.

Mitigation

The majority of adverse effects on views and landscapes were reduced or eliminated through design controls integrated in the Project description, although some additional mitigation is proposed for specific impacts. This includes avoidance of night-time construction onshore as far as practicable, and directional shielding for lights when night time work cannot be avoided. Construction areas will also be subject to tidy working conditions, and dust on roads and construction sites will be controlled.

A landscape restoration plan will be implemented to allow the progressive reinstatement of the Right-of-Way following installation of the Pipeline, so that the duration of disturbance is minimised overall. This includes the planting of native vegetation which will compensate for vegetation which has been cleared or disturbed. Vegetative screening will be applied around areas such as the landfall facilities to limit the extent to which these facilities disrupt the existing landscape.

The total area of disturbed ground at any one time will be minimised by phasing excavation and restoration activities. Temporary installations such as the noise barrier along the Varvarovka bypass road will be removed as soon as possible.

To minimise the impact of the permanent landfall facilities, the colour scheme for the above-ground structures will be sympathetic with the surrounding landscape. The selection of surrounding tree and plant species will also help to integrate the visibility of the infrastructure into the surrounding environment during the Operational Phase.

Residual Impacts and Conclusions

During the Construction and Pre-Commissioning Phase, a number of residual impacts of **Moderate** significance may occur as a result of the fact that equipment and machinery will be working to install infrastructure in a relatively peaceful and rural area. However, these impacts will be short-term and reversible after construction activities have concluded. This includes temporary changes to the landscape character of the Undulating Plateau LCA, as well views from the seashore, boats, coastal paths, Varvarovka cemetery, and northeastern areas of Varvarovka. The potential impact on the Black Sea Coastal LCA during construction is anticipated to be of **Low** significance, as is the impact on views from other locations.

Impacts on both landscapes / seascapes, and views, are predicted to be either **Not Significant** or of **Low** significance during the Operational Phase, and are mainly related to the presence of the permanent landfall facilities and the Right-of-Way above the pipeline corridor (which will be vegetated but subject to regular cutting to maintain access).

6.7 Socio-economics

The socio-economic assessment considered both potential beneficial impacts (such as the creation of local employment and business opportunities) and adverse impacts (such as temporary amenity-related impacts on recreational users of Sukko Beach and Shingari and Don holiday complexes).

Baseline Conditions

The onshore socio-economic study area includes the area within 2 km of the landfall section of the Project and also a 300 m zone either side of the proposed access roads. The landfall section of the Project is located within the Anapa Resort Town (ART) municipal district on the Black Sea coast. The town of Anapa (estimated population 59,000) is the nearest large urban settlement, approximately 8 km north of the landfall section.

The ART municipal district is a designated 'resort town' which provides for a regime of measures intended to safeguard the district's important tourism attraction features. Tourism is one of the most important industries in the ART municipal district (alongside the retail and services sector) and visitor numbers and the number of accommodation facilities have displayed continuing strong growth over recent years. The municipal district has experienced comparatively high population growth in recent years compared to the wider Krasnodar Krai region and the Russian Federation. The growth in population has occurred alongside growth in the tourism industry, and together this growth appears to have been associated with changes in a number of other socio-economic indicators.

With the exception of Anapa, the surrounding area is largely rural and includes a number of smaller communities near the landfall section of the Project. These are set among rolling hills leading to the cliffs at the shore of the Black Sea. Local communities within the vicinity of the Project, and that may or may not be affected by the Project, include Gai Kodzor, Rassvet, Sukko, Supsekh and Varvarovka. Varvarovka (Figure 21) is the closest community to the Project Area.

Impacts and Receptors

In terms of the potential receptors of socio-economic impacts, the groups that may be affected by the Project can be broadly divided into two categories:

- Those that would be affected economically or financially (including workers, businesses, residents, landowners, land users, and users of utilities and telecommunications); and
- Individuals and groups within local communities that could be affected either socially or in terms of their physical and mental well-being, or in terms of their enjoyment of the area for recreation.

Stakeholders have expressed a broad range of interests and concerns related to the construction and operation of the Project, including those related to traffic, environmental protection, and economic opportunities.

In terms of economic impacts, the Project will result in limited temporary beneficial economic impacts as a result of additional employment and increased demand for goods and services at the local level during the Construction and Pre-Commissioning Phase. Construction activities will be the responsibility of the overarching construction contractor, and due to the specialized skills required it is likely that much of the workforce will be hired internationally; however, some limited local labour and business contracts are anticipated.

During the Operational Phase, beneficial economic impacts are predicted at the national level in terms of increased demand for (and revenues from) Russian natural gas exports. However,

activities related to the Project will be limited to occasional maintenance and monitoring, and there will be no notable employment or procurement during this phase.

The socio-economic assessment also considered the potential for adverse impacts on local businesses, particularly in relation to the local tourism industry. For example, the potential impacts of construction activities—with respect to the views of construction vessels at sea, and the turbidity in the water at the shore, and how these impacts may affect business revenues—was assessed for the coastal Shingari and Don holiday complexes. Additionally, the assessment evaluated potential impacts due to land take at the Agrifirm Kavkaz vineyards, including the potential for displacement of vineyard activity and how this could affect vineyard workers. However, it is considered unlikely that there would be any loss of employment as the vineyard operator is expected to redeploy workers to other areas and tasks within the vineyard.

Potential impacts on recreation and other types of land use, including the use and enjoyment of the Sukko and Shingari beaches, and the Varvarovka village cemetery, were also assessed. Residents of the area were also considered in terms of what they are likely to experience (e.g. the combined effects of noise, vibration, visual and cultural heritage impacts) as a result of the construction and operation of the Project. In particular for residents of northeast Varvarovka, residential impacts during the Construction and Pre-Commissioning Phase are expected to include night-time noise (as described in Section 6.3) as well as a temporary visual impact as a result of the noise screen along this road.

Potential impacts associated with restrictions on access to construction areas (on land and at sea, for safety reasons) were also considered, including how these restrictions might affect fishing and navigation, as well the use of trails in the Project Area.

There would be no significant adverse socio-economic impacts associated with the Project during the Operational Phase.

Mitigation

Socio-economic mitigation measures aim to minimise or avoid potential adverse impacts of the Project as much as practicable, and also to enhance local benefits throughout the life of the Project. Many of the mitigation measures described in other sections of the assessment will also mitigate impacts on residents and land users in the vicinity of the Project. This includes measures designed to avoid or reduce impacts on air quality, visual amenity, noise and vibration.

In order to manage potential impacts of construction activities on Sukko and Shingari beach users and the Shingari and Don holiday complexes, environmental monitoring results will be published and will be discussed with stakeholders as part of on-going stakeholder engagement activities. This includes monitoring related to air quality; noise; landscape and visual amenity; and seabed sediment and marine water quality. Information about access and safety restrictions on land and at sea will also be shared with the applicable stakeholders and authorities.

On-going stakeholder engagement is a fundamental principle of South Stream Transport's activities in Russia, and—to some degree—will help to mitigate a wide range of impacts (including impacts assessed under other topics). On-going stakeholder engagement will not only allow South Stream Transport to share information about Project activities and monitoring

results, but also enable the early identification of issues and concerns so that they can be proactively addressed. Stakeholder engagement will continue throughout the Construction and Pre-Commissioning Phase, and through the rest of the life of the Project.

A Grievance Procedure will also be a core part of the Project's stakeholder engagement process, providing stakeholders with a formal means of communicating concerns and complaints to South Stream Transport. Appropriate compensation mechanisms, if required, will be implemented to compensate affected parties for economic losses that arise as a result of the Project.

With respect to the Varvarovka village cemetery, one of the temporary construction access roads was re-routed so that it is further away from the cemetery thus reducing noise impacts at this site. In addition, a Construction Traffic Management Plan includes provisions related to traffic in the vicinity of the cemetery.

Residual Impacts and Conclusions

Residual adverse impacts on local businesses and workers—including the Shingari and Don holiday complexes, and the broader tourism sector—are predicted to be **Not Significant** in accordance with the proposed plans, management, and stakeholder engagement throughout the Construction and Pre-Commissioning Phase. It is expected that mitigation, including on-going stakeholder engagement, the Grievance Procedure and the provision for compensation if appropriate, will effectively address these impacts.

In terms of the amenity of local land use, residual impacts on visitors to Sukko and Shingari beaches, as well as the Varvarovka cemetery, are considered to be of **Low** significance. Potential impacts on vineyard workers are also predicted to be of **Low** significance.

For residents of northeast Varvarovka, the residual impact on the amenity of these residences is predicted to be of **Moderate** significance during the Construction and Pre-Commissioning Phase, and is related to the anticipated visual and night-time noise impacts. However, these impacts will be temporary.

While employment and business opportunities were identified as a potential **Beneficial** impact during the Construction and Pre-Commissioning Phase, it is important to note that these construction activities (onshore and offshore) will be highly specialised, and short-term, and locally available opportunities will be limited.

No significant adverse residual impacts are predicted during the Operational Phase.

6.8 Community Health, Safety and Security

Baseline Conditions

In 2010, in Krasnodar Krai, the life expectancy for men was 65.8 years and the life expectancy for women was 76.5 years. Life expectancy depends on the mortality rate and 60% of mortality rate in Krasnodar Krai is associated with social factors, including healthcare, alcohol and smoking.

The birth rate was consistently higher and the death rate and infant mortality rate was consistently lower in the Anapa Resort Town (ART) municipal district compared to regional and national levels.

ART municipal district has been given the status of a health resort town since 1957 and is a specially protected natural area (SPNA) at the federal level. The SPNA is categorized as "health improving (spa) resort area". Linked to this status there are recreational uses of the beach at Sukko, Shingari and Don holiday complexes and other nearby waters, including swimming, fishing, paragliding, jet skiing and diving. During consultation, stakeholders raised the issue of potential environmental damage that may affect fishing and recreation.

Stakeholder engagement also identified that road traffic and road safety are issues of interest for the community of Rassvet which is spread either side of a main north-south road. The adjoining small community of Zarya lies immediately to the east. To the west, separated by a thin strip of open land, is the much smaller community of Tarusin. This layout suggests that high traffic volumes could cause community severance.

Impacts and Receptors

The following social, environmental and institutional factors were identified as potentially giving rise to community and population level health, safety and security impacts during the Construction and Pre-Commissioning Phase:

- *Conduct of workforce in the community:* It is anticipated that the onshore construction workforce will be housed in their own homes (if local to the area) or in the town of Anapa. In this situation, interactions with the local community are likely to be normalized and they are likely to be regarded as community members. A limited risk remains of isolated incidents such as anti-social behaviour and conflict with the local community.
- *Spread of sexually transmitted infections*: It is noted that the size of the workforce will be small relative to the large numbers of tourist visitors that ART municipal district receives each year. However, as the majority of workers are expected to be adult males, and as there is scope for a diverse range of countries of origin, this poses potential risks in terms of transmission of infectious disease. Potential impacts were identified given the sensitivity of the local population and because the infection impacts may go beyond the Construction and Pre-commissioning Phase with wider prevalence implications for local communities and health resources.
- *Employment opportunities for the local population*: Whilst the Project will provide some opportunities for local labour to access employment, the effects of direct employment are expected to be relatively modest as the majority of the construction work force required will be highly skilled and is anticipated to come from outside the local area.
- *Construction noise impacts from vehicles, plant and vessels*: Noise and vibration emissions from construction plant and vehicles, including: piling; excavation; tunnelling; heavy goods vehicles; loading and unloading activities; and construction road traffic have the potential to adversely affect health by disturbance to residential dwellings, local workforce (notably shift workers) and visitors.

- *Impacts on road safety due to construction traffic:* Road traffic has been an issue of particular interest for stakeholders. However, this impact is limited by provision of the two construction traffic bypasses. The exception is the community of Rassvet, on the junction of the M25 where the construction traffic arriving from east and west on the M25 will turn south towards the landfall section of the Project. In general, increased vehicular traffic leads to increased likelihood of road traffic incidents and injuries.
- *Seawater contamination:* In theory, dredging and pipe-laying activities could disturb and mobilize existing toxins or pollutants within the seabed. However, the risk of this occurring is very low.
- *Local health and emergency service resources due to in-migration of non-local workers:* In the absence of mitigation, the Project may affect demand for local health and emergency response service providers particularly in the event of an unplanned event that affects large numbers of the construction workforce.

During the Operational Phase, the main community health and safety issues relate to perceptions or fears associated with the presence and operation of the pipeline. This includes controlled or uncontrolled natural gas releases, which will be visible and may give rise to public anxiety. Stakeholder comments cited safety as a concern, including a fear of potential gas explosion or fire and the possibility of seismic activity.

There is also potential for the additional government income generated though natural gas exports (made possible by this development) to be spent on directly or indirectly improving the health and wellbeing of the Russian people resulting in potential beneficial impacts.

Mitigation

A Community Health Construction Management Plan (CHCMP) will form part of the Environmental and Social Management Plan for the Project. The CHCMP will establish the proposed actions needed to mitigate identified impacts and promote health opportunities in the Project.

To address conduct of the workforce in the community, all workers contracted or sub-contracted for the Project will be required to comply with a code of conduct. Residents and visitors to the town of Anapa and the communities in the vicinity of the Project will be able to contact the Project at any time if there are any concerns regarding security arrangements and acts of security personnel.

South Stream Transport will have a policy statement regarding sexually transmitted infections including HIV / AIDS, and this policy will be communicated internally to staff, and externally to contractors. All workers will be required to attend awareness training regarding sexual health.

To address transportation related impacts, the Traffic Management component of the Russian Landfall CMP will include procedures relating to logistics, timing of deliveries and speed control. A further traffic assessment at the community of Rassvet will be undertaken to determine the current state of road safety infrastructure and the need for any additional mitigation measures such as appropriate traffic calming measures.

The potential for seawater contamination will be carefully controlled. Water quality will be actively monitored, and spill response plans and protocols will be in place in case an issue is identified.

Prior to the start of construction, agreement will be reached with local health services as part of a Rapid Health Appraisal to confirm how the healthcare needs of the construction workforce, including non-Russian workers, will be met. This appraisal will also consider the contractor's plans for workforce accommodation and transport, and potential impacts associated with this (as well as related mitigation and management measures).

Stakeholder engagement will continue throughout the life of the Project to ensure that appropriate Project information on operations and safety is communicated.

Residual Impacts and Conclusions

Based on adoption of the mitigation measures set out in in the ESIA, the residual impact significance levels are identified below for impacts during the Construction and Pre-Commissioning Phase:

- Impacts related to the presence and conduct of the workforce, in Anapa and other local communities, as well as the potential for spread of sexually transmitted infections, are considered to be **Low**;
- Noise impacts (including construction activities, traffic and pre-commissioning tests), and road safety impacts, are considered to be **Low-to-Moderate;**
- Impacts arising from employment opportunities during the Construction and Pre-Commissioning Phase are considered to be limited and Beneficial; and
- Health impacts related to potential seawater contamination, are considered to be **Not Significant**.

It is not expected that the Project workforce will put significant pressure on local health care infrastructure, as the Project will provide medical services for workers. Any additional information obtained during the Rapid Health Appraisal and continuous engagement with local health authorities will ensure that the residual significance remains at **Not Significant**.

During the Operational Phase, on-going stakeholder engagement will provide information about the Project and respond to questions and concerns. As a result, the risk of public anxiety related to the Pipeline is expected to be **Not Significant**.

6.9 Cultural Heritage

The cultural heritage assessment considered how archaeological and cultural heritage sites and objects—including shipwrecks, historic ruins, and local cemeteries—could be affected by the Project. The assessment has considered cultural heritage sites and objects both on land and in the sea.

Baseline Conditions

The Krasnodar Krai region is rich in cultural heritage including remains of settlements and burials dating to the Bronze Age, Iron Age, Antique and medieval periods. On land, the following features were identified in relation to the Project:

- A kurgan burial mound is located close to the Project footprint. This is a formally designated site and may be an outlier of a wider group of Bronze Age kurgans; and
- The Varvarovka village cemetery is an Armenian and Russian cemetery. It is located east of Varvarovka village, close to vineyards.

A number of other sites and items of cultural heritage importance were identified during the baseline studies, including churches, memorials and historical artefacts in Varvarovka, Gai Kodzor, Supsekh and Sukko. However, further information about the proposed traffic routes and the implementation of the Varvarovka and Gai Kodzor bypass roads removed these sites from the assessment as they no longer had the potential to be affected. The remains of three settlements (dating to prehistoric, Antique and early medieval periods) were also identified northwest of the Project, although they have already been largely destroyed by the cultivation and ploughing of vineyards. These scattered remains are not designated as cultural heritage sites and are not assessed further.

The marine environment also has a high potential for archaeological remains, including: shipwrecks; maritime structures and objects; and remains associated with 19th and 20th century conflict (e.g. sunken aircraft). In addition, there is a high degree of preservation for any CHOs in deeper waters (i.e. water depths of 120 m or more) due to anoxic conditions.

Baseline studies of the offshore and nearshore sections of the Project used sonar and magnetic scans to survey the seabed and identify any anomalies. Sites of interest were then visually inspected using ROVs equipped with underwater cameras. Surveys discovered a total of 26 CHOs (including potential but unconfirmed CHOs) within 1 km of the underwater pipeline route[12].

Of these, eight CHOs were located within 150 m of the original pipeline route, four of which were confirmed as CHOs ranging in date potentially from the medieval period to the modern period, including:

- An aircraft wing with an integrated fuel reservoir;
- Remains of a metal component from either a marine vessel or an aircraft;
- A single ceramic amphora[13] which could date to the medieval period (Figure 21); and
- A buried wooden shipwreck whose exact cultural affiliation or age are uncertain.

[12] Early cultural heritage surveys were based on an earlier route of the Project. This route has been refined based on the results of cultural heritage and ecological surveys, so that sensitive or important sites are avoided.

[13] An ancient style of jug or vase, generally with an oval body, long neck and two handles.

The remaining four potential CHOs are likely to be metal or wooden shipwrecks, associated shipwreck debris or scatters, or similar anthropogenic structures (e.g. aircraft remains). These potential CHOs, as well as the metal component (above), were later avoided by at least 150 m as a result of further adjustments to the pipeline route, and were therefore not assessed further.

Impacts and Receptors

The cultural heritage assessment looked at how the Project could affect cultural heritage resources in the Project Area (including landfall, nearshore and offshore sections). This includes potential disturbance of, physical damage to, or loss of sites and objects of cultural heritage importance (i.e. receptors).

Terrestrial receptors include:

- Varvarovka village cemetery (approximately 100 m west of temporary microtunnel access road); and
- Kurgan burial mound (approximately 50 m north of microtunnels).

During the Construction and Pre-Commissioning Phase, the activities that could impact terrestrial receptors include physical damage a result of ground preparation or ground breaking activities, rubble and waste dumping, and vehicle collisions. Additionally, increased construction activity and increased construction related traffic will have an impact on the setting of Varvarovka village cemetery, including noise and visual impacts for people visiting the cemetery. During the Operational Phase, there is little potential for cultural heritage impacts as there will be no further ground disturbance.

Marine receptors, which cannot be avoided by 150 m, include:

- Aircraft wing (78 m water depth, approximately 57 m from pipeline);
- Single ceramic amphora (72 m water depth, approximately 24 m from pipeline); and
- Buried wooden shipwreck (443 m water depth, approximately 70 m from pipeline).

During the Construction and Pre-Commissioning Phase, the activities that could impact marine cultural heritage sites and objects include direct physical impacts as a result of pipe-laying activities on the seabed, as well as anchoring. Other seabed intervention activities—including dredging, rock mattresses, removal of obstacles, etc.—could also physically damage CHOs. The potential for survey and monitoring equipment (including ROVs) to physically strike or damage marine CHOs has also been considered. Indirectly, the presence of the pipeline and changes to the seabed could also affect marine CHOs through changes to erosion and sedimentation regimes. During the Operational Phase, routine maintenance and monitoring activities could affect CHOs through similar impacts associated with seabed intervention and the use of ROVs.

There is also the potential that construction and/or operation of the Project could lead to the discovery of previously unidentified CHOs (e.g. buried sites or artefacts); these discoveries are generally known as "chance finds". However, a review of the baseline data suggests that chance finds of marine CHOs are highly unlikely to occur during Project construction and operation activities.

Mitigation

A number of earlier changes to the Project design (i.e. design controls) have effectively avoided or addressed many potential impacts, including adjustments to the pipeline route in the nearshore and offshore sections to avoid known and potential CHOs by at least 150 m where possible; the construction of road bypasses around Varvarovka and Gai Kodzor; and the relocation of the temporary microtunnel access road to avoid the Varvarovka cemetery.

The overarching mitigation framework for cultural heritage is defined by the Project's cultural heritage stewardship programme. The objective of such programme is to ensure that all parties involved in the construction and operation of the Project are at all times aware of the importance of cultural heritage, and that all Project activities are compliant with national and international requirements and good international industry practice.

Within this commitment to stewardship, mitigation measures include an archaeological watching brief on all areas of ground disturbance and on marine seafloor works. The watching brief provides for real-time monitoring of construction activities by a qualified archaeologist to identify and address potential issues of archaeological concern. There will also be a formal Chance Find Procedure, which describes the steps that will be taken in the event that new potential CHOs are discovered through the course of construction or operations, including provisions to stop work and notify the relevant authorities and experts. In the marine area, real-time visual monitoring of underwater activities, including the touch-down of the pipeline on the seabed, will be done using ROVs.

Throughout the life of the Project (including construction, as well as maintenance activities during the Operational Phase), impacts on cultural heritage will be systematically controlled and monitored by the application of a Cultural Heritage management plans and an Anchor Management Plan. Workers will receive Cultural Heritage Awareness Training to enable them to identify and act on potential issues of cultural heritage concern, including chance finds.

Potential impacts to terrestrial cultural heritage designated kurgan burial mound have been avoided as the result of the design control of microtunnelling which places the pipelines approximately 20 m below the receptor. At the surface, the site will be flagged and fenced.

The route of the temporary microtunnel access road has been relocated so as to minimise impacts by moving construction traffic away from the cemetery area and its immediate surroundings. Further mitigation will also involve the preparation and implementation of the Traffic Management component of the Russian Landfall CMP (which will contain measures to manage traffic in proximity to the cemetery) along with implementation of the Cultural Heritage CMP.

In the marine area, the ceramic amphora will be carefully recovered and brought to the surface prior to the start of construction activities. The aircraft wing will be further investigated and may also be brought to the surface, or else will be avoided by approximately 60 m; this decision will be made in consultation with local authorities. The wooden shipwreck will also be further investigated and will be avoided by approximately 70 m. The Russian Ministry of Culture will be involved in all decisions relating to recovery activities.

Residual Impacts and Conclusions

With the Project design controls and mitigation measures—including careful routing to avoid and minimise impacts on sensitive cultural heritage objects, management measures and chance find procedures—residual impacts are predicted to be **Not Significant** for the kurgan burial mound, and **Low** adverse for the Varvarovka village cemetery and the submerged aircraft wing.

However, two marine cultural heritage features (amphora and wooden shipwreck) would experience a **moderate** adverse residual impact despite the implementation of site-specific mitigation, comprising investigation (wooden shipwreck) and recovery (amphora). For the ceramic amphora, this impact is related not to damage to the object, but because it will be removed from its context on the sea floor.

The Project will also generate beneficial impacts during all phases of the Project by carrying out further archaeological investigations of sites and contributing to the existing body of archaeological and cultural heritage knowledge. The information gathered during the further investigations, which will be supervised by Russian archaeologists, may enhance the current knowledge of maritime history in the Russian Sector of the Black Sea.

6.10 Ecosystem Services

Baseline Conditions

Ecosystem services refer to the benefits that people (including businesses) obtain from ecosystems. The baseline assessment draws on the survey work undertaken as part of the ESIA process and provides a description of baseline conditions in the study area for the ten key ecosystem services identified in the Project Area:

- **Crops**: Vineyard cultivation (generally for wine making) is a source of income to landowners in the vicinity of the Project;
- **Fishing**: Capture fisheries in the Black Sea have importance for particular groups of people, even though this does not a substantial part of local economy;
- **Water supply**: Both surface water and groundwater sources provide for a range of drinking, industrial, and agricultural uses;
- **Water quality regulation**: The quality of ground and surface waters are regulated through a number of natural processes and supports a range of uses;
- **Air quality regulation**: The Anapa Resort Town municipal district is designated as a "health improving" area with a reputation for therapeutic air;
- **Soil quality regulation**: Soil quality has ties to many other processes, including crops and water, and is an important service in reducing health risks, determining land productivity, and regulating surface flows;
- **Hazard regulation**: Natural habitat and vegetation reduce the risks of natural hazards by regulating water flows and controlling erosion;

- **Tourism and recreation**: Local communities and residents rely on a strong local tourism sector, which is tied to the natural environment and recreational opportunities (including beach and inland areas);
- **Cultural and spiritual**: The local landscape includes a number of unique and valued cultural sites; and
- **Wild species diversity**: A number of threatened and protected terrestrial and marine species (including plants and animals) and species of local importance.

Impacts and Receptors

Considering the results of the baseline studies, the impact assessment identified five "priority" ecosystem services that may be affected during the Construction and Pre-Commissioning Phase. Priority services are those services that may require mitigation measures in order to maintain the value and functionality of the affected service. These were:

- Crops;
- Soil quality regulation;
- Tourism and recreational values;
- Cultural and spiritual values; and
- Wild species diversity.

Crops and soil quality regulation could be impacted by loss of agricultural land, as a limited area of vineyard land will be cleared during construction. There is also the potential for soil contamination due to leaks or spills from construction equipment and machinery. The appreciation of recreational areas (including beaches and trails) may be affected by increased noise and visual disturbance during construction. Although temporary, this will be a change from the relatively rural and peaceful nature of the area. Cultural and spiritual values may be affected at the Varvarovka cemetery, as noise from construction vehicles may temporarily change the peaceful setting of the cemetery. Finally, loss of habitat due to the construction footprint has the potential to impact upon wild species diversity.

No priority services were identified during the Operational Phase.

Mitigation

Many of the priority ecosystem services identified above are related to local residents and communities, tourists, and land users. As such, mitigation measures are centred on engagement with these stakeholders, including providing people with information about the Project and its activities, and providing means by which people can register complaints and impacts and request assistance.

A Grievance Procedure which will be implemented by South Stream Transport in partnership with its contractors and will ensure that grievances are brought to the attention of the appropriate Project staff and addressed in an appropriate and timely way. In the event that impacts on land users or other stakeholders are identified, a Compensation Management Framework will guide the evaluation and determination of compensation measures, and a

Livelihood Restoration Framework will provide for further mitigation should livelihood impacts occur. This framework will define the process that will be undertaken to identify the need for specific livelihood restoration measures, and the development of these measures in consultation with affected stakeholders and relevant local agencies.

On-going stakeholder engagement throughout the Construction and Pre-Commissioning Phase (and into the Operational Phase) will take place to facilitate dialogue with relevant stakeholders, including those potentially affected by the Project, or who are concerned about or interested in the Project. These activities will allow potential impacts, issues and concerns to be identified early on and addressed.

In addition to the above, mitigation measures described in other sections of the ESIA are also relevant to ecosystem services, including those addressing impacts on terrestrial and marine ecology (for wild species diversity); noise and visual impacts (for tourism and recreational values); cultural heritage (for cultural and spiritual values); soils, groundwater and surface water (for soil quality); and socio-economics (for crops, and for tourism and recreational values).

Residual impacts and Conclusions

The values which ecosystem service beneficiaries attached to ecosystem goods and services are appropriately considered and addressed within the ESIA process. The assessment identified five priority services which the Project is likely to impact during the Construction and Pre-Commissioning Phase: crops; soil quality regulation; tourism and recreational values; cultural and spiritual values; and wild species diversity. No priority services were identified for the Operational Phase.

With the application of the above mitigation measures, all potential adverse effects associated with the Project will be mitigated to the degree that residual impacts would be **Not Significant** to **Low** significance.

6.11 Waste Management

The waste assessment considered the types and quantities of waste products that will be generated by the Project, and identifies how these wastes will be managed and disposed of.

Baseline Conditions

A review of available waste management facilities was undertaken, which included site visits to the ECOBIO Waste Treatment Facility near Krymsk, and the Alfa Landfill Facility near Anapa, to evaluate the suitability of these facilities to manage Project wastes. The existing waste management facilities at Temryuk and Novorossiysk Ports were also reviewed to assess their suitability for the management of wastes generated by the Project's marine activities if required. The ports of Temryuk and Novorossiysk have arrangements in place with port waste management companies to provide waste reception facilities for vessels using the port.

Impacts and Receptors

Waste residues produced by the Project have the potential to impact upon human health and the environment, as well as causing nuisance (including litter, odour, dust and vermin). Such impacts can arise throughout the waste management supply chain and therefore the generation, storage, collection and transport, reuse, recycling, recovery, treatment and disposal of waste all needs to be taken into account when managing potential impacts. The waste management assessment considered potential impacts during the Construction and Pre-Commissioning Phase, as well as the Operational Phase. Impacts identified include:

- Waste from workforce, including activities at site such as food waste, packaging, and sewage (chemical toilets);
- Waste from construction activities, such as:
    - Vegetation clearance;
    - Excavated material from earthworks and open-cut trenching;
    - Excavated material from microtunnelling;
    - Packaging from construction materials and supplies;
    - Welding and metal waste;
- Dredging spoil (excavated material from seabed);
- Hazardous wastes, including fuels, solvents, etc.; and
- Waste from vessels at sea, including waste from construction as well as that generated by workers living on vessels (including sewage).

Mitigation

The general approach to managing solid waste will be described in an integrated Waste Management Plan. This will provide guidance on:

- Waste minimisation and prevention;
- Identification and segregation of waste materials at source;
- Recycling and reuse of suitable materials; and
- Treatment and disposal of specific waste streams.

The integrated Waste Management Plan will refer to vessel-specific waste management plans which will include provisions for segregating waste on board, having secure areas for storage of hazardous waste and recycling or reuse where practicable. Existing waste management facilities at Temryuk and Novorossiysk Ports will be used for the management of wastes generated by the Project's offshore activities. The Ports of Temryuk and Novorossiysk have arrangements in place with port waste management companies to provide waste reception facilities for vessels using the port.

The Project will use existing licensed facilities which comply with Russian regulations as well as international requirements and standards.

Residual Impacts and Conclusions

The overall quantities of waste requiring management are relatively small in comparison with the capacity of the receiving facilities, and no constraints are anticipated. An integrated Waste Management Plan will control activities and minimise risks associated with waste management, including the risk of accidental release during the transport or temporary storage of hazardous wastes.

The wastes that require landfill disposal are non-hazardous and relatively small in quantity (typically less than 1000 tonnes per waste stream). Alfa Landfill (the main regional landfill) is due to be replaced once it ceases operation in 2016, and thereafter the replacement landfill would be used by the Project, which is expected to be an engineered facility. Use of the Alfa facility is cause for concern, as this landfill is not lined, and the potential for a moderate adverse impact is identified. However, in the event that any Project wastes are deposited at Alfa landfill, no significant impacts are identified since the wastes would be non-hazardous, and would form only a very small proportion of the overall waste disposed of at the Alfa Landfill.

With the waste management mitigation measure and integrated Waste Management Plan in place, impacts related to the Project's generation and management of waste are expected to be **Not Significant**.

7 Unplanned Events

Unplanned events are events, such as accidents and malfunctions, which are not expected to occur during the Project's normal activities. The Project has been designed in accordance with national and international safety and engineering standards, but it is important to recognise, assess and manage potential risks associated with unplanned events, some of which could result in adverse impacts on the environment, cultural heritage, or communities.

The ESIA Report is supported by a Quantitative Risk Assessment (which considers the risks to the public as associated with the operation and maintenance of the onshore pipeline and landfall infrastructure and facilities) and a Maritime Risk Assessment (which considers the risks that marine vessel accidents could occur and the potential for consequential oil spillages or other impacts). Oil spill modelling has also been undertaken to understand what could happen in the event of an oil spill. Terrestrial and marine geohazards (e.g. seismic activity and other changes in earth or seabed) have also been evaluated.

The key outcomes of the unplanned events assessment are described below, for events that could occur on land (related to the landfall section of the Project), and at sea (related to the nearshore and offshore sections).

7.1 On Land

During the Construction and Pre-Commissioning Phase, unplanned events in the landfall section have been assessed in relation to the use of construction equipment and machinery, power generators, and from vehicular traffic. These events could result from factors such as equipment malfunction or human error. During the Operational Phase, unplanned events could occur as a result of accidental leakages of natural gas from the pipeline or from landfall facilities. Potential unplanned events and their management are described below.

Fuel and Oil Spillages

Construction-related fuel and oil spillage incidents on land are likely to be relatively small (e.g. less than 100 litres) given the nature of the vehicles and construction equipment and machinery that will be used. To reduce the likelihood that fuel or oil spillages will occur, and limit the extent of impacts if one does occur, a series of control measures will be defined within a Spill Prevention and Response Plan, which will be applied across all Project activities.

Fire

Fires during construction could occur, for example, as a result of the accidental ignition of dry vegetation during certain activities that involve the use of gas torches (known as "hot works"), such as heat wrapping of the coating that is applied to the pipe welds, or during welding of mechanical components. Fire risks will be minimised through the enforcement of strict control measures, which will include the adoption of a "permit to work" system for hot works. There will also be a smoking ban for all construction personnel whilst undertaking construction activities. Other ignition sources, such as open fires along the construction corridor, will also be prohibited, whilst dry vegetation will be removed from areas around hot works. Emergency

Preparedness and Response Plans will also detail fire prevention, detection and fire-fighting systems, and will be coordinated with local fire-fighting services.

During the Operational Phase, unplanned events could occur as a result of accidental leakages of natural gas from the pipeline or from landfall facilities which could result in fires as discussed above. The Operational Phase will also be subject to fire prevention, detection and fire-fighting measures and Emergency Response Plan.

Traffic Accidents

Stakeholder engagement identified public and community safety concerns as related to traffic accidents when construction vehicles pass through or near residential settlements. Such traffic accidents could be caused by vehicle malfunction or by human error.

South Stream Transport will implement a range of measures prior to the start of construction in order to address transportation-related risks and impacts, including:

- Preparation and implementation of a Logistics Plan to manage and coordinate the transport and logistics requirements of the Project;
- Preparation and implementation of a Construction Traffic Management Plan (CTMP), which will include strict driving guidelines and speed limits, and designated access routes; and
- Implementation of safe driving procedure protocols, which will ensure drivers are aware of the Project's requirements and driving practices, will be properly trained, and will be monitored to ensure good driving performance and behaviours.

Contractors will also be required to regularly inspect and maintain their construction fleet in order to minimise accident risks as associated with mechanical failures.

Damage to Third-Party Property and Utilities

Existing third-party services (e.g. water mains, communication cables) will be located, marked, and either safeguarded or diverted in accordance with agreements with service owners. In the event that unknown services are encountered during construction, the potential for damage to that infrastructure will be minimised by stopping work in the immediate area until the nature of the services can be established. Ownership of the services will be established where possible, and the owners consulted if service diversions are deemed necessary.

7.2 At Sea

Unplanned events in the nearshore and offshore sections have been assessed in relation to the vessel traffic, including the potential for fuel or oil spillages, and the transport of invasive species in ballast waters. During operation, the potential for leakages of natural gas from the pipeline has also been considered.

Fuel and Oil Spillages

The likelihood of marine vessel collisions occurring during construction is very low. However, if collisions were to occur, fuel and/or oil spillages could result and could have adverse effects on

the marine environment, particularly on marine species. To manage the potential risks, the Project will adopt appropriate marine procedures to further reduce the likelihood of a marine oil spill. This will include coordination with relevant maritime authorities and notifications of the location of the pipe-lay vessel and the navigational Safety Exclusion Zone. In addition, the Project will develop and implement Oil Spill Prevention and Response Plans to minimise the potential for adverse impacts on marine species and habitats.

The development and implementation of appropriate plans, such as an Emergency Preparedness and Response Plan, a Shipboard Oil Pollution Emergency Plans (SOPEP) and a Shipboard Marine Pollution Emergency Plans (SMPEP), will help to minimise the likelihood of an oil spill occurring, and develop response measures and reduce the potential adverse impacts to the marine environment. Potential impacts will also be reduced by the use, where practicable, of "non-persistent" fuels by Project vessels.

Introduction of Invasive Species

Invasive species are non-native species which could outcompete local species and consequently affect ecosystems and biodiversity. These could be introduced by marine vessels, most commonly if ballast water is transported from other regions and released into the Black Sea. Since invasive species can have serious ecological consequences, the Project has adopted a number of measures to reduce the likelihood of invasive species being introduced into the Black Sea. This includes a requirement that vessels will implement a Ballast Water and Sediments Management Plan, and records of ballast water intakes and discharges.

Gas Releases from the Pipeline

The unplanned events assessment has also considered the possibility of accidental leakages of natural gas from the subsea pipeline. The only possible source of a large scale release of gas into the atmosphere would be the result of a pipeline rupture. The chance that a properly designed and installed deep-water pipeline will experience a failure is extremely remote, and South Stream Transport is committed to ensuring that the design and construction processes are suitably robust. Likewise, the likelihood of an external incident (such as a ship sinking on top of the Pipeline) could result in damage to the pipelines, resulting in the release of gas, is equally remote.

Nevertheless, management controls are built into the Project design in order to minimise the potential for uncontrolled gas releases from the Pipeline in the event of damage. Should a rupture occur any escape of gas would be short-lived as the leak would be detected at the landfall facilities in Russia and Bulgaria and the affected pipeline would be immediately shut down.

8 Cumulative Impacts

While the impacts of an individual project may be judged to be acceptable, there is also a need to consider the potential for a project's impacts to interact with the impacts associated with other developments. These combined interactions are known as "cumulative impacts". This may include cumulative increases in noise, air or water emissions, habitat loss and other issues. Interactions could take the form of additively increasing the level of impact, and/or resulting in new or spin-off impacts.

To assess potential cumulative impacts, other developments (underway and proposed) in the vicinity of the Project were identified. The potential activities and impacts of these developments were considered and used to assess the potential cumulative impacts that could result from the combination of the Project and these developments.

Since the majority of the Project's impacts (as described in Chapter 6) are associated with the Construction and Pre-Commissioning Phase, the potential that the construction impacts of other developments may overlap in time with this Phase is of particular interest to the assessment of cumulative impacts.

Developments Underway and Proposed

In total, more than ten developments (either currently underway or proposed) were considered with respect to potential cumulative interactions with the Project. A number of these were ultimately not included in the assessment as they were unlikely to coincide with the timing of the Project, or were a far enough distance away that interactions were unlikely, or only conceptual and lacking certainty or information on which to base the assessment. In the end, the following four developments were included in the cumulative impact assessment:

- The United Gas Supply pipeline system and the Russkaya compressor station, both of which are upstream of and connected to the Project. The United Gas Supply pipeline system connects to the Project approximately 100 m east of the Project's landfall facilities, and the Russkaya compressor station is approximately 2.5 km northeast. Construction activities are ongoing;
- The Anapolis development, a mixed use development (residential, hotel, commercial) approximately 350 m south of the pipeline. Construction is planned to begin in 2014;
- The Lesnaya Polyana residential development, currently under construction and effectively an extension of the village of Varvarokva. This development is located approximately 500 m northwest of the microtunnel entry shafts. Construction activities are ongoing; and
- The Club Village Chateau residential development, proposed for an existing vineyard area approximately 200 m northeast of the landfall facilities and adjacent to the village of Varvarovka. Construction is planned to begin in 2014.

Construction of these developments is expected to overlap with the Construction and Pre-Commissioning Phase of the Project.

In the marine area, there are a number of offshore oil and gas development concessions held by a Russian oil and gas company. Based on publicly available information, exploratory wells

may be drilled by 2015. However, no further details on anticipated activities or schedule are available, and these activities were not included in the assessment. Other than these oil and gas exploration activities, there are no known marine development proposals outside of the Project.

Potential Cumulative Impacts

The cumulative impact assessment considered the outcomes of the Project's impact assessment (as summarised in Chapter 6), and—in particular—the anticipated residual impacts of the Project. Of particular note are the potential adverse impacts of the Project that were assessed to have a residual significance of Moderate or High. These impacts include changes to landscape character and visual quality; residential amenity in local communities, which could be affected by increased noise and/or visual impacts; and impacts on marine cultural heritage sites and objects (specifically the ceramic amphora and wooden shipwreck).

The known information and potential impacts from the other developments were also considered. This information was used to identify areas where impacts of the Project and the other developments may overlap or interact in time and space, thus having the potential to combine as a cumulative impact.

Conclusions

Most of the potential cumulative impacts are associated with the Project's onshore construction activities and in particular potential interactions with the development of the United Gas System pipeline system and Russkaya compressor station.

The cumulative impact assessment has not identified any cumulative environmental or social impacts that are considered to be significant and in need of specific mitigation, monitoring or management measures beyond those already being undertaken for the Project. However, the assessment has made a number of recommendations with regard to the alignment of mitigation strategies and working together with local developers. This includes the following:

- South Stream Transport will seek to engage with Gazprom Invest (i.e. the developer of the upstream United Gas System pipeline system and Russkaya compressor station) with the aim of aligning Gazprom Invest's ecological mitigation strategy and mitigation measures as related to the construction of the compressor station with those of the Project. Of particular interest is the avoidance of impacts through the sensitive timings of works (e.g. seasonal limitations on some activities); implementation of fencing for reptiles and amphibians, along with a programme of translocation; adherence to good international industry practice; and the development of measures that would enhance biodiversity management within the wider area;
- South Stream Transport will seek to engage with Gazprom Invest to investigate the potential beneficial use of inert materials (soils or rock) generated by the Project and the Russkaya compressor station development;
- South Stream Transport will liaise with Gazprom Invest with the aim of developing aligned and coordinated traffic management plans;
- South Stream Transport will engage with the Anapolis and Club Village Chateau developers with the aim of aligning the developers' mitigation measures with those of the Project;

- In developing the Project's Biodiversity Action Plan, South Stream Transport will engage with the Anapolis and the Club Village Chateau developers with an aim to develop measures that would enhance biodiversity management within the wider area;
- South Stream Transport will liaise with Gazprom Invest with the aim of developing aligned and coordinated mitigation approaches to minimise the potential for cumulative public health and security impacts as associated with the influx of construction workers and construction activities; and
- South Stream Transport will seek to further liaise with Rosneft with the aim of minimising the potential for any cumulative marine environmental impacts that might result from any simultaneous activities.

9 Transboundary Impacts

The ESIA considered whether impacts from the Project could cross international borders and affect neighbouring countries. Generally speaking, transboundary impacts include issues such as air pollution that will not be confined within geographic borders, and issues affecting international waterways and water bodies.

In relation to Russia, the transboundary impact assessment considered potential impacts on the neighbouring countries of Turkey, Georgia and Ukraine.

Over land, due to the distances between the Project and the territories of Turkey, Georgia and Ukraine, it is unlikely that planned activities or unplanned events could result in impacts that cross territorial borders. Therefore, no significant transboundary environmental impacts are anticipated.

In the marine area, some potential transboundary impacts are identified, particularly since Project activities will take place close to the boundary between the Russian and Turkish EEZs, and due to the dynamic nature of the marine environment. The ESIA defines a series of mitigation strategies to minimise and avoid impacts associated with air emissions, waste generation and disposal, invasive marine species, underwater noise generation (and impacts on marine species), and the cross-border movements of marine vessels. This includes measures to address potential impacts on marine species including migratory birds, marine mammals and fish, as well as on the people who rely on fisheries livelihoods.

With respect to the marine area, unplanned events—such as disruption or damage to subsea infrastructure (e.g. subsea telecommunications cables), and fuel or oil spillages (e.g. as a result of maritime collisions)—could result in transboundary environmental and socio-economic impacts. However, all of these potential impacts are manageable with prior planning. This will include discussions with infrastructure owners to verify the location of subsea infrastructure and form crossing protocols and agreements, and coordination of activities with maritime authorities. The Project will also implement emergency response and oil spill prevention and response plans to define actions in the unlikely circumstance that an unplanned incident occurs.

10 Management Systems

South Stream Transport is committed to develop and operate the South Stream Offshore Pipeline in an environmentally and socially responsible manner. To support this objective, a number of management systems will guide the safe and responsible construction and operation of the Project. This includes an Environmental and Social Management Plan (ESMP), a monitoring programme, and an overarching Health, Safety, Security and Environmental Integrated Management System (HSSE-IMS).

All the commitments from the ESIA—including commitments to specific mitigation and management measures—have been tracked and compiled in a Commitments Register for the Project, and incorporated into the ESMPs. While the ESIA identifies what will be done to manage the potential impacts of the Project, the ESMPs and other management systems identify how these commitments will be achieved, and who is responsible.

Environmental and Social Management Plan (ESMP)

The South Stream Offshore Pipeline will be constructed and operated as a single coherent project across three countries. An effective environmental and social management system is a requirement of many international standards and guidelines (including the IFC Performance Standards) and of good international industry practice.

The ESMP is the principal means by which South Stream Transport will ensure that the company's commitments to managing environmental and social impacts, including commitments to specific mitigation measures, are achieved in compliance with the necessary requirements. The ESMP will be subject to regular review to determine adequacy and effectiveness and may be subject to adjustments to improve future performance. Furthermore, South Stream Transport's contractors will be contractually obliged to comply with the relevant environmental and social requirements, specifications, and procedures set out in South Stream Transport ESMP.

In order to capture and manage these requirements, the ESMP will comprise a suite of activity-specific and overarching Construction Management plans and Operations Management plans (CMPs and OMPs). The overarching management plans will cover Project activities that are applicable to the South Stream Offshore Pipeline as a whole, independent of the location or nature of the activity in question. Overarching management plans that will be developed include plans for labour and working conditions, stakeholder engagement, cultural heritage, biodiversity and compensation. The activity-specific management plans will be designed for identifiable discrete Project activities (e.g. offshore construction activities).

ESMPs, including Construction Management plans and Operations Management plans, will define roles and responsibilities for the implementation of each item, and performance indicators by which compliance and success will be monitored.

Monitoring Plans

The Monitoring Plan of the ESMP details the monitoring requirements based on the findings of the ESIA process. Monitoring is required in order to both demonstrate compliance with legal

limits and South Stream Transport's internal standards and commitments, as well as to verify the overall design and effectiveness of the implemented mitigation and management measures.

The key objectives of South Stream Transport's proposed monitoring activities are to:

- Monitor compliance with relevant standards and South Stream Transport's environmental and social objectives;
- Provide an early indication of any mitigation and management measures or practices that are failing to achieve objectives;
- Determine whether environmental and social changes are attributable to Construction and Operational activities; and
- Provide a basis for continuous review of, and improvement to, the monitoring activities.

Health, Safety, Security and Environmental Integrated Management System (HSSE-IMS)

South Stream Transport is responsible for the overall environmental and social performance of the South Stream Offshore Pipeline, including the performance of its contractors, through its Health, Safety, Security and Environmental Integrated Management System (HSSE-IMS). This includes responsibility for ensuring that the Project and all supporting infrastructure are designed, constructed and operated in conformance with Russian and international legislative requirements and good international industry practice.

The HSSE-IMS provides a framework for the implementation of the ESMP and monitoring programme, and has been developed to align with the international standards for environmental management systems (i.e. ISO 14001), occupational health and safety management systems (i.e. OHSAS 18001), and the management of environmental and social risks and impacts (IFC Performance Standard 1). The HSSE-IMS also defines how its objectives and actions will interface with those of other corporate policies, including corporate social responsibility and sustainability.

The HSSE IMS will define annual objectives and targets, along with key performance indicators and benchmarks with which to assess the Project's performance in these areas. Audits, inspections and performance reviews will confirm compliance with the Project's standards and objectives, identify areas for improvement, and implement corrective actions as necessary.

11 Conclusion

The South Stream Pipeline System will transport natural gas from Russia to the countries of Central and South-Eastern Europe. The offshore component of the South Stream Pipeline System is known as the South Stream Offshore Pipeline and will comprise four adjacent and parallel pipelines, each 32 inches (813 mm) in diameter, extending approximately 930 km across the Black Sea. The Pipeline crosses three countries: it begins on land on the Russian coast near Anapa, travels across the Black Sea including Russian territorial waters and EEZ, the Turkish EEZ, and the Bulgarian EEZ and territorial waters; and ends on land on the Bulgarian coast near Varna.

The South Stream Offshore Pipeline is being developed by South Stream Transport B.V., an international joint venture between the Russian company OAO Gazprom, the Italian company Eni S.p.A., French energy company EDF Group and German company Wintershall Holding GmbH (BASF Group). South Stream Transport is responsible for the development, ESIA and permitting of the Pipeline in all three countries (Russian, Turkish and Bulgarian sectors). Complementary permitting and ESIA procedures are also being undertaken in Bulgaria and Turkey.

The ESIA for the Russian Sector of the South Stream Offshore Pipeline was carried out by a team of international and Russian ESIA experts between 2012 and 2014. The team analysed the existing conditions of the environment and the proposed Project activities and components, assessed the anticipated impacts on the environment, communities, and cultural heritage and provided design controls and mitigation measures with which to avoid or minimise these impacts.

This document has provided a non-technical summary of the Project and the ESIA. Further details are provided in the ESIA. The key issues and conclusions that have emerged from the assessment are summarised below.

11.1 ESIA Findings

Overview

Potential impacts of the Project are mainly related to the Construction and Pre-Commissioning Phase of the Project, as this is when most activities will occur. On land, this includes construction of the aboveground landfall facilities; the open-cut trenching, pipe-laying, and reinstatement of the landfall section pipeline corridor; and the excavation of the microtunnels. Construction will also involve the use of construction equipment and machinery, and construction traffic. Pre-commissioning tests will involve the use of air compressors to confirm the integrity of the pipeline.

At sea, construction of the Project includes pipe-laying in the nearshore section (which involves a short section of dredging to bury the pipelines in shallower waters) and offshore section (where the pipeline will be laid on top of the seabed). A main pipe-laying vessel, plus an array of support vessels, will be involved in construction at sea.

During the Operational Phase, activities will be limited to regular maintenance and monitoring activities. On land, the pipeline will be buried and only the permanent aboveground landfall facilities will be visible, as well as the Right-of-Way above the pipeline corridor, which will be revegetated but kept clear of trees and other deep-rooting vegetation. At sea, there will be regular inspections of the pipeline, and certain activities affecting the seabed (e.g. oil and gas drilling, bottom trawling) will be restricted in the area surrounding the pipelines.

The ESIA assessed potential impacts on a range of environmental and social components, including soil, freshwater, air, noise, terrestrial and marine ecology, landscape, socio-economics, cultural heritage, health and cultural heritage. After implementation of design controls, and management and mitigation measures, the majority of residual environmental and social impacts of the Project are predicted to be either Not Significant or of Low Significance. A few exceptions are predicted to be of moderate significance, but these will be short-term and temporary. These and other notable impacts are described below.

Noise

Pre-commissioning tests will require the use of air compressors to clean, gauge and dry the pipelines. This will result in a short-term and temporary increase in night-time noise in residential areas close to the Project. However, with careful selection and placing of equipment and the use of noise barriers, impacts are anticipated to be of Low significance. Noise will also be generated by construction traffic, particularly for areas near the Varvarovka bypass road. A noise barrier will also be used on the bypass road to minimise noise experienced by residents in north-eastern Varvarovka, and the residual impact is expected to be Low significance.

Terrestrial Ecology

Potential impacts on terrestrial habitats and species were also assessed, with a particular focus on protected species including Nikolski's tortoise (internationally listed as Critically Endangered) and migratory birds. Impacts are mainly related to construction and pre-commissioning activities when land clearance, traffic, and noise emissions will peak, but will generally be temporary and short term.

A number of ecological mitigation measures are in place, including the relocation of protected species in advance of construction, and the real-time monitoring of construction activities by a ecologist. Tunnels will be constructed under roads in order to allow tortoises and other animals to safely cross underneath. With these and other mitigation measures in place, a Low significance residual impact is predicted on migratory birds during the Construction and Pre-Commissioning Phase, whilst other impacts are predicted to be Not Significant. Additionally, a Biodiversity Action Plan will be implemented, aiming to provide a net benefit for biodiversity in the Project Area.

Marine Ecology

In the marine environment, construction activities may result in underwater noise levels that could disturb fish and marine mammals. Underwater noise emissions have been modelled and assessed in the ESIA. Mitigation will include the presence of trained Marine Mammal Observers on board certain vessels, to help detect the presence of marine mammals or seabirds in the

vicinity of Project activities, and to determine whether any additional measures are needed. Impacts are predicted to be of Low significance, and will be short-term, temporary and limited to the duration of construction activities.

Landscape and Visual Amenity

The landscape and visual assessment considered the potential impacts of the Project on the character of existing landscapes, and on the views of people living in and using the surrounding area. An impact of Moderate significance on the character of the Undulating Plateau LCA was identified due to the short term and temporary presence of construction activities (and associated noise, use of machinery, etc.) in what is presently a quiet rural area. However, this impact will be temporary and limited to the period of construction (up to two years).

Some people living in and using the Project Area will also be able to see the construction activities, including residents in Varvarovka, visitors to the Varvarovka cemetery, people using trails in the area, and people looking out to sea from the beach. From these locations, a Moderate significance visual impact is anticipated, though this will also be short-term and limited to the period of construction (up to two years). No lasting impacts significant are anticipated.

During operations, views of the permanent aboveground landfall facilities will be mitigated by painting the facilities to complement the surrounding landscape, and using vegetation to screen from view.

Cultural Heritage

In the marine area, the Pipeline route was adjusted to avoid cultural heritage objects (CHOs) on the seabed by at least 150 m, wherever possible. Three marine CHOs could not be avoided by this distance. A Low significance impact is predicted for a submerged aircraft wing. Moderate significance impacts are identified in relation to a ceramic amphora (which will be removed and brought to the surface) and a wooden shipwreck which will be investigated and avoided by a distance of approximately 70 m and therefore may experience some impacts due to seabed disturbance.

On land, two cultural heritage sites were identified. A kurgan burial mound will be avoided and protected, and no significant impact is anticipated. The Varvarovka cemetery may also experience impacts in relation to increased noise at this site, which could affect how it is used or appreciated by the community. To mitigate this impact, the microtunnel construction access road will be rerouted so that it is further from the cemetery, and a Low significance impact is predicted.

Socio-Economics and Community Health, Safety and Security

Potential benefits of the Project include the possibility for local employment and business opportunities. However, due to the highly specialised and technical nature of pipeline construction, many workers will be hired internationally by the construction contractor, and opportunities for local residents will likely be limited. To manage interactions between international workers and local communities, workers will be required to comply with a standard

Worker Code of Conduct, and a rapid health appraisal will be undertaken to assess options for workforce accommodation.

Noise impacts—particularly in relation to construction traffic and pre-commissioning tests—will be experienced by communities in the vicinity of the Project. In particular, the assessment predicts that residents of the north-eastern part of Varvarovka could experience a Low-to-Moderate significance impact as a result of these noise sources. However, this impact will be temporary and short-term, especially with respect to night-time noise from pre-commissioning tests which will be limited to a period of approximately 45 days, and will not extend beyond the construction period.

Traffic issues are a topic of interest amongst local stakeholders, with concerns about whether construction traffic will pass through communities and what the potential impacts will be. The Varvarovka and Gai Kodzor bypass roads will re-route traffic around these communities and avoid road safety impacts. However, a Moderate significance impact is anticipated as a result of construction traffic using the main road running through the community of Rassvet.

Potential impacts on local businesses and workers were assessed and are not expected to be significant. However, South Stream Transport will maintain contact with local stakeholders so that potential issues can be identified and addressed proactively. Stakeholders will also have access to a formal complaints process through the Grievance Procedure.

Other

Impacts on other aspects of the environment are assessed to be either Not Significant or of Low significance. This includes potential impacts on soil, groundwater and surface water; air quality; ecosystem services; and waste disposal and management.

11.2 Mitigation and Monitoring

The mitigation, management and monitoring measures identified in the ESIA are specifically designed to avoid, prevent, minimise or offset potential adverse impacts and enhance potential beneficial impacts associated with the Project. As the development of the Project progresses, these measures will be adapted as needed to ensure that they are effective and having the anticipated results.

To support the implementation of these measures (by South Stream Transport and its contractors), these measures and requirements form the basis of the Project's Environmental and Social Management Plan (ESMP), which will be linked to the HSSE-IMS for the broader South Stream Offshore Pipeline.

11.3 Stakeholder Engagement

Throughout the development of the ESIA, including the identification of impacts and mitigation measures, the Project has implemented a programme of stakeholder engagement. The stakeholder engagement program has been designed to ensure that stakeholders, including local communities, were able to feedback comments and concerns to the Project. To date, the most common issues raised by stakeholders during stakeholder engagement activities included

concerns about potential environmental impacts, including impacts upon the marine environment, the coastline and onshore habitats. Concerns over safety of the Project and what measures would be put in place in an emergency situation were also expressed. Various social-related issues were highlighted including traffic and road safety.

Consultation related to the ESIA Report (and this NTS) is summarised in the Preface of this document. Stakeholder engagement will continue over the life of the Project, throughout the Construction and Pre-Commissioning, Operational and Decommissioning phases. Engagement approaches for these later phases are further described in the Stakeholder Engagement Plan.

Grievance Procedure

A key part of the stakeholder engagement program is the implementation of a Grievance Procedure, which will be accessible to all stakeholders.

A grievance is a formal complaint by an individual (or group) who feel they are, or have been, adversely affected by Project-related activities. South Stream Transport's Grievance Procedure is the process by which a grievance is recorded and managed so that it can be tracked through to a resolution. Further information about the Grievance Procedure is available online (www.south-stream-offshore.com) and in the Stakeholder Engagement Plan.

Managing Impacts

On-going stakeholder engagement is a fundamental principle of South Stream Transport's activities in Russia, and—to some degree—will help to mitigate a wide range of impacts. On-going stakeholder engagement will not only allow South Stream Transport to share information about Project activities and monitoring results, but also enable the early identification of issues and concerns so that they can be proactively addressed. Stakeholder engagement will continue throughout the Construction and Pre-Commissioning Phase, and through the rest of the life of the Project.

11.4 Summary

Based on the studies undertaken, the experts responsible for this ESIA Report are confident that the Project, as described and assessed in the ESIA—including the mitigation, management and monitoring measures described therein—provides an environmentally and socially acceptable approach to the construction and operation of the Project. Furthermore, the Project is in compliance with the provisions of the Russian legislative framework, and in alignment with good international industry standards for pipeline design, construction and operation.

References

Number	Reference
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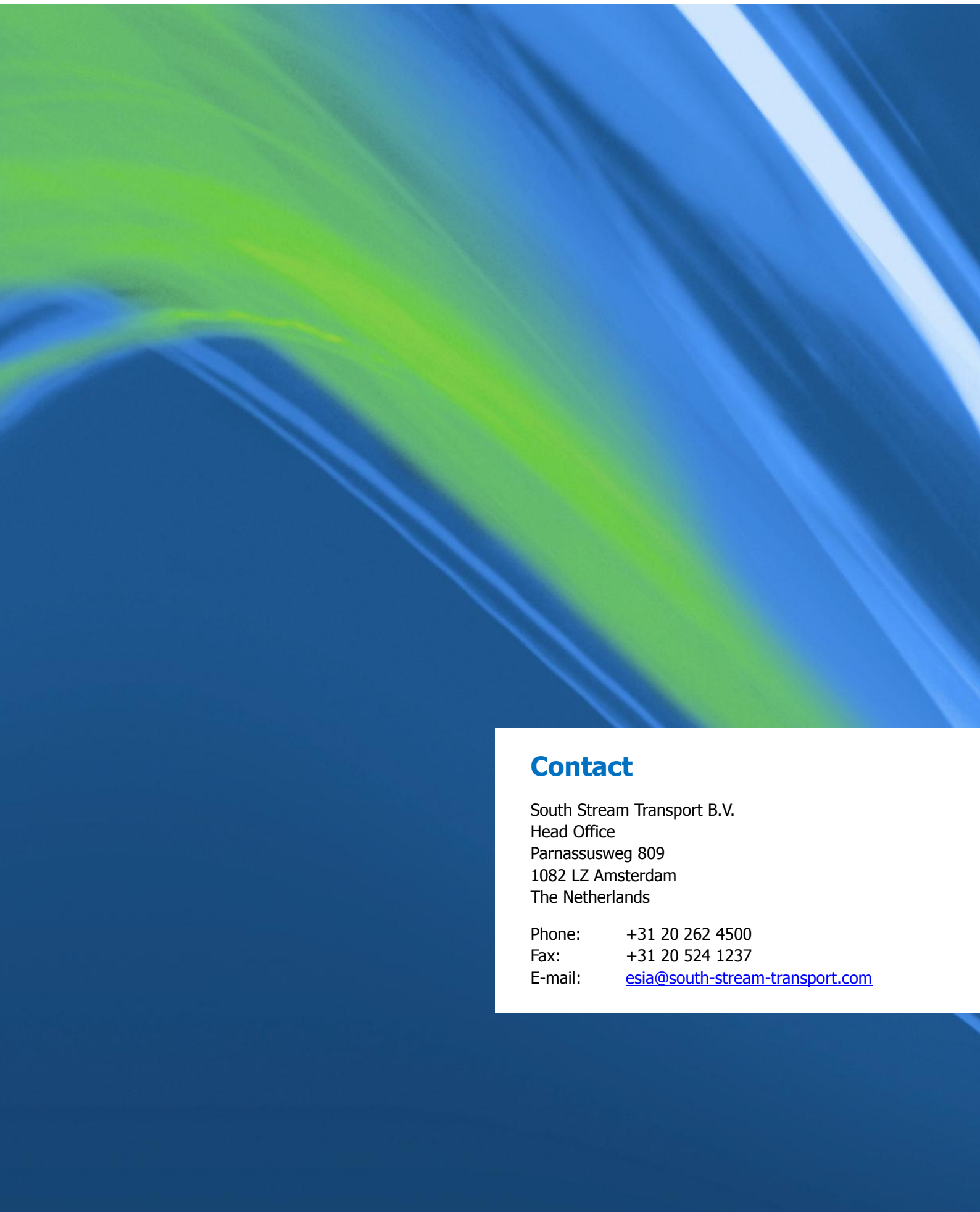
Acronyms and Abbreviations

Abbreviation/Term	Description
bcm	Billion Cubic Metres
CHO	Cultural Heritage Object
CHCMP	Community Health Construction Management Plan
CMP	Construction Management Plan
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
EP	Equator Principles
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
EU	European Union
HSSE-IMS	Health Safety Security and Environmental Integrated Management System
IFC	International Finance Corporation
IUCN	International Union for Nature Conservation
JBIC	Japan Bank for International Cooperation
km	Kilometre
km^2	Square kilometre
LNG	Liquefied Natural Gas
m	Metre
mm	Millimetre
NGO	Non-Governmental Organisation
NTS	Non-technical summary
OECD	The Organisation for Economic Co-operation and Development
PIG	Pipeline Inspection Gauge

Abbreviation/Term	Description
RDB RF	Red Data Book Russian Federation
RDB KK	Red Data Book of the Krasnodar Krai region
ROV	Remote Operated Vehicle
SEP	Stakeholder Engagement Plan
UXO	Unexploded Ordnance



Contact

South Stream Transport B.V.
Head Office
Parnassusweg 809
1082 LZ Amsterdam
The Netherlands

Phone: +31 20 262 4500
Fax: +31 20 524 1237
E-mail: esia@south-stream-transport.com